DOE/EV-0024/2

Inventory of Federal Energy-Related Environment and Safety Research for FY 1977

Volume II—Project Listings

July 1978

U.S. Department of Energy
Assistant Secretary for Environment
Division of Environmental Impacts

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Washington, D.C. 20545

PREFACE

This volume contains Biomedical and Environmental Research, Environmental Control Technology Research, and Operational and Environmental Safety Research project listings. The projects are ordered numerically by log number.

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Department of Agriculture

<000001>
TITLE: Revegetation and Reclamation of Land Areas Disturbed by Mining
PROJECT NUMBER: EPA-IAG-D5-E763
PRINCIPAL INVESTIGATOR: Bennett, O.L.;Power, J.F.
ADDRESS: US Department of Agriculture, Agricultural Research Service, Morgantown, WV 26506
AFFILIATION: Agricultural Research Service, Morgantown, W. Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: Hall, Clinton W.
TELEPHONE: C(202)426-4567
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$640,000
TECHNOLOGY: FOSSIL FUEL/Coal (90%);FOSSIL FUEL/Oil Shale (10%)
ENERGY CYCLE: WASTE MANAGEMENT (10%)
POLLUTANTS: METALS (5%);VISUAL AESTHETICS (5%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To develop the criteria for premining reclamation plans and methodology for utilizing reclaimed strip mine lands, and to determine the effects of strip mining and reclamation on quality and quantity of water leaving the area, and on the nutritional quality of forages and other crops. Investigation will include utilization of waste material in revegetation and reclamation. Methods will be developed for controlling instability of mined lands, stabilizing and restoring disturbed areas, and restoring and maintaining a favorable organic matter component in reclaimed areas.
APPROACH: Controlled experiments will be conducted in the field, laboratory, and greenhouse for those areas in the United States where strip mining is having a major impact on agriculture and/or land use. Data will be collected from these experiments and analyzed to build up a scientific base of data to be used in developing technically sound practices, methods, and recommendations to reclaim and revegetate strip-mined areas.
RESULTS: Results expected are those necessary to accomplish the objective. To develop the criteria for premining reclamation plans and methodology for utilizing reclaimed strip mine lands, and to determine the effects of strip mining and reclamation on quality and quantity of water leaving the area, and on the nutritional quality of forages and other crops. Investigation will include utilization of waste material in revegetation and reclamation. Methods will be developed for controlling instability of mined lands, stabilizing and restoring disturbed areas, and restoring and maintaining a favorable organic matter component in reclaimed areas. Interim and final reports will be developed from interpretation of the data collected in the field, laboratory, and greenhouse experiments.
PROJECT MILESTONES: To date, 15 milestones have been accomplished and all were on schedule. All of the milestones are associated with accomplishment of the objective. To develop the criteria for premining reclamation plans and methodology for utilizing reclaimed strip mine lands, and to determine the effects of strip mining and reclamation on quality and quantity of water leaving the area, and on the nutritional quality of forages and other crops. Investigation will include utilization of waste material in revegetation and reclamation. Methods will be developed for controlling instability of mined lands, stabilizing and restoring disturbed areas, and restoring and maintaining a favorable organic matter component in reclaimed areas. Additional milestones are scheduled to meet the objective.
KEYWORDS: STRIP MINING;SPOILBANKS;MINES;LAND USE;WATER QUALITY;CROPS;WASTES;LAND RECLAMATION;AGRICULTURE;COAL MINING;ENVIRONMENTAL EFFECTS;CLIMATES;ECOSYSTEMS;SOILS

<000002>
TITLE: Environmental Effects of Energy Mining
PROJECT NUMBER: D6-E762-FM
PRINCIPAL INVESTIGATOR: Miller, E.V.;Wilson, M.L.;Alorich, S.R.
ADDRESS: CSRS (Cooperative State Research Service), USDA, Washington, DC 20250
AFFILIATION: Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service
MONITOR: Miller, Eilif V.
TELEPHONE: P447-0348
TYPE OF FUNDING: Contract No.-662526V88A;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$500,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (20%);PARTICULATES (20%);ORGANICS (10%);VISUAL AESTHETICS (20%);SPECIFIED OTHER POLLUTANTS/Salts (20%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);DEVELOPMENT/Pilot plant (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the effect of energy mining development on soils microorganisms vegetation and water quality
APPROACH: Analysis of soils, water and vegetation resources associated with mine development to detect the detrimental effects and to plan for their amelioration.
RESULTS: Selection and application of methods, techniques and plant species suitable for affected problem areas.
OJECT MILESTONES: Annual reports on accomplishment.
YWORDS: MINING;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;SOILS;MICROORGANISMS;PLANTS;WATER QUALITY;WATER;CHEMICAL ANALYSIS;EARTH ATMOSPHERE;CHEMICAL EFFLUENTS;NITROGEN COMPOUNDS;REPRODUCTION

<000003>
TITLE: Control Technology for Mine Reclamation (Resource Extraction)
PROJECT NUMBER: D6-E762-ER
PRINCIPAL INVESTIGATOR: Miller, E.V.
ADDRESS: CSRS, USDA (Work in State Experiment Station), Washington, DC 20250
AFFILIATION: Food and Drug Administration, Washington, D.C. (USA)
MONITORING AGENCY: Food and Drug Administration, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service
MONITOR: Miller, Eilif V.
TELEPHONE: F447-4348
TYPE OF FUNDING: Contract No.-662326V88B;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$459,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (80%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);DEVELOPMENT/Pilot plant (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To develop systems for the reclamation of land disturbed by mining of coal, lignite, and oil shale and to return the mined areas to productive uses.
APPROACH: Experimental work includes surface manipulations and vegetation trials related to the specific problems of reclamation sites. Non-mine waste and fertilizers are used as soil amendments for topsoils and overburden layers. Irrigation and drainage management systems are worked out in relation to water supplies and water quality available. Employment of mine spoils for agricultural and forest crops is planned.
RESULTS: Methods will be developed useable in all ecological regions of the continental U.S. for reclamation of surface mines spoils.
PROJECT MILESTONES: Annual reports of progress.
KEYWORDS: LAND RECLAMATION;COAL MINING;OIL SHALES;LIGNITE;ENVIRONMENTAL EFFECTS;PLANTS;FERTILIZERS;SOILS;IRRIGATION;CROPS;AGRICULTURE;ECONOMICS;FOOD;FORESTS;LAND USE;SOILS;SURFACE MINING;SPOIL BANKS;SEWAGE

<000004>
TITLE: Integrated Assessment; Social and Economic Consequences of Coal and Oil Shale Development
PROJECT NUMBER: EPA-IAG-D6-E766-EG
PRINCIPAL INVESTIGATOR: Davis, V.
ADDRESS: Room 420, GHI Building, US Department of Agriculture, Washington, DC 20250
AFFILIATION: Economic Research Service, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals and Industry
MONITOR: Plotkin, Steve
TELEPHONE: C(202) 755-0646
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement
77 FUNDING: Environmental Protection Agency FY77:$396,000; Department of Agriculture FY77:$129,000
TECHNOLOGY: FOSSIL FUEL/Coal:Conversion liquefaction;FOSSIL FUEL/Coal:Conversion gasification (85%);FOSSIL FUEL/Oil Shale (15%)
ENERGY CYCLE: EXTRACTION (25%);COMBUSTION IN SITU (5%);TRANSPORTATION (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (15%);ELECTRICITY GENERATION (20%);ELECTRICAL TRANSMISSION (5%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (10%);PARTICULATES (20%);NOISE, VIBRATION (10%);HEAT, THERMAL (20%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;HYDROGRAPHIC AREAS/Other hydrographic areas:River basins
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Assess social and economic consequences likely from alternative patterns of coal and oil shale development.
APPROACH: Develop interregional analytical system to evaluate trade offs for different areas from different development patterns.
RESULTS: Series of reports in accord with milestones.
PROJECT MILESTONES: (1) Sept. 76-Feb. 78 7 reports, regional resource profiles: Great Plains, Rocky Mountains, interior, east, Gulf, Pacific, oil shale areas. (2) 1976-77 Reports on income, population, employment, government services effects. (3) 1978 Reclamation technologies, costs. (4) 1977 Water needs. (5) 1978 Interim report, interregional system. (6) 1980 Environmental cost-benefit report. (7) 1981 Final report.
KEYWORDS: COMMUNITIY IMPACT;DEVELOPMENT OPTIONS;COAL;OIL SHALES;SOCIO-ECONOMIC FACTORS;RESEARCH PROGRAMS;ENVIRONMENTAL EFFECTS;ECONOMICS;MINING;WATER;LAND RECLAMATION

<000005>
TITLE: Effects of Mining and Related Activities on the Forest and Range Environment and Users and Associated Communities
PROJECT NUMBER: 000020
PRINCIPAL INVESTIGATOR: Brown, H.E.
ADDRESS: 12th and Independence Ave., SW, Washington, DC 20250
AFFILIATION: Forest Service, Washington, D.C. (USA)
MONITORING AGENCY: Forest Service, Washington, D.C. (USA)
DIVISION: Forest Environment Research
MONITOR: Brown, Harry E.
TELEPHONE: F235-1071
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Forest Service FY77:$817,000; Environmental Protection Agency FY77:$583,000
TECHNOLOGY: FOSSIL FUEL/General (90%);FOSSIL FUEL/Oil Shale (5%);NUCLEAR/General (5%)
ENERGY CYCLE: EXTRACTION (95%);TRANSPORTATION (5%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (25%);METALS/Copper;METALS/Iron (10%);PARTICULATES/Dust;PARTICULATES/Ash;PARTICULATES/Carbon (30%);ORGANICS (10%);HEAT, THERMAL (5%);VISUAL AESTHETICS (20%)

CHARACTER OF STUDY: RESEARCH/Applied (35%);DEVELOPMENT/Laboratory scale (35%);FULL SCALE DEMONSTRATION (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To assess the physical and socioeconomic impacts of mining on forest and related ecosystems. The assessments are needed for the timely formulation and implementation of policies and programs for extracting fuels in a manner that will maintain a quality environment and pertinent surface values.
APPROACH: Solutions to these mining-related problems will be achieved by a comprehensive R and D program undertaken on a national scale. The Forest Service research organization cooperating universities and other cooperators will address specific problems as they occur in affected areas of the nation.
RESULTS: The understanding and evaluation of potential mining effects so that the general health, safety, welfare, and environmental related to energy development may be protected and enhanced.
PROJECT MILESTONES: Assessment of potential impacts of mining activities by year 1990. Collect knowledge for the development of abatement measures by 1980.
KEYWORDS: FORESTS;SOCIO-ECONOMIC FACTORS;TERRESTRIAL ECOSYSTEMS;FUELS;RESEARCH PROGRAMS;MINING;ENVIRONMENTAL EFFECTS;ENERGY;EARTH ATMOSPHERE;LAND RECLAMATION;WATER POLLUTION ABATEMENT;WATER

<000006>
TITLE: Technologies for Controlling Effects of Mining on the Forest and Range Environment and on Users and Related Communities
PROJECT NUMBER: 000021
PRINCIPAL INVESTIGATOR: Brown, H.E.
ADDRESS: 12th and Independence Ave., SW, Washington, DC 20250
AFFILIATION: Forest Service, Washington, D.C. (USA)
MONITORING AGENCY: Forest Service, Washington, D.C. (USA)
DIVISION: Forest Environment Research
MONITOR: Brown, Harry E.
TELEPHONE: F235-1071
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Forest Service FY77:$2,199,000; Environmental Protection Agency FY77:$539,000
TECHNOLOGY: FOSSIL FUEL/General (90%);FOSSIL FUEL/Oil Shale (5%);NUCLEAR/General (5%)
ENERGY CYCLE: EXTRACTION (95%);TRANSPORTATION (5%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (35%);METALS/Copper;METALS/Boron;METALS/Iron (10%);PARTICULATES/Dust;PARTICULATES/Ash;PARTICULATES/Carbon (35%);ORGANICS (10%);HEAT, THERMAL (5%);VISUAL AESTHETICS (5%)
CHARACTER OF STUDY: RESEARCH/Applied (35%);DEVELOPMENT/Laboratory scale (35%);FULL SCALE DEMONSTRATION (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To develop technologies for controlling environmental and economic effects of mining on forest and range lands. These technologies are needed to protect and enhance the environment and to insure compliance with public health standards and social criteria.
APPROACH: A comprehensive national R and D program will be utilized to provide control technology for solutions to the mining related problems. The in-house research organization of the Forest Service and external organizations will be used to search problem solutions in all geographic areas of concern.
RESULTS: Development of technologies for extracting energy minerals, redepositing spoils, and revegetating or otherwise rehabilitating mined lands and maximize productivity and environmental quality.
PROJECT MILESTONES: Development of a broad range of control technology by 1990, with substantial development by 1980.
KEYWORDS: MINING;ENVIRONMENTAL EFFECTS;ECONOMICS;SOCIO-ECONOMIC FACTORS;PUBLIC HEALTH;STANDARDS;MINERALS;LAND USE;FORESTS;EARTH ATMOSPHERE;TERRESTRIAL ECOSYSTEMS;LAND RECLAMATION;WATER POLLUTION ABATEMENT

<000007>
TITLE: Plant Materials Studies to Improve Technologies of Surface Mine Land Reclamation
PROJECT NUMBER: EPA-IAG-D5-E765
PRINCIPAL INVESTIGATOR: MacLauchlan, R.S.
ADDRESS: U.S. Department of Agriculture, Soil Conservation Service, Washington, DC 20250
AFFILIATION: Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Soil Conservation Service, Plant Sciences Division
MONITOR: MacLauchlan, Robert S.
TELEPHONE: F447-5667
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding;Interagency agreement-EPA-IAG-D5-E765 Subagreement 77BEE
77 FUNDING: Department of Agriculture FY77:$400,000; Environmental Protection Agency FY77:$192,000
TECHNOLOGY: FOSSIL FUEL/Coal (90%);FOSSIL FUEL/Oil Shale (10%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Soil sediment control (100%)
CHARACTER OF STUDY: RESEARCH/Applied (90%);FULL SCALE DEMONSTRATION (10%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To accelerate plant materials studies to improve technology of surface mine reclamation, to determine plant materials best suited for mine spoil reclamation under a wide range of site conditions, to develop techniques for their successful establishment and survival, and to determine the modification of equipment for seed collection, processing, and planting disturbed areas.
APPROACH: Assembling and testing large collections of native and introduced plant materials under a wide range of site and climatic conditions, selection of those found most suitable, modify conventional equipment to establish selected plants on disturbed areas, determine seed or plant production techniques, and work with commercial seed growers and nurserymen to assure an adequate commercial supply.

RESULTS: Knowledge of plants best suited for surface mine reclamation, recommendations on seeding and management of disturbed areas, and the commercial availability of needed seed and plants.
PROJECT MILESTONES: (1) Progress reports 6/76, 6/77, 6/78, and 6/79. (2) Final report 6/80.
KEYWORDS: PLANTS;COAL MINING;LAND RECLAMATION;SEEDS;AGRICULTURE;SURFACE MINING;ENVIRONMENTAL EFFECTS;TERRESTRIAL ECOSYSTEMS;FOOD;PREFERRED SPECIES;CULTIVATION TECHNIQUES;EROSION

<000008>
TITLE: Revegetation and Reclamation of Land Areas Disturbed by Mining
PROJECT NUMBER: 77BBO
PRINCIPAL INVESTIGATOR: Bennett, O.L.
ADDRESS: West Virginia University, Morgantown, WV 26506
AFFILIATION: West Virginia Univ., Morgantown (USA). Dept. of Agronomy
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Agricultural Research Service
MONITOR: Barrows, H.L.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$330,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To develop technology required for preparing reclamation plans before mining operation begins. Approach: to characterize overburden material at several major mine sites; initiate research on weathering, leaching and other changes in mine spoils; and to screen, develop, select, and assemble laboratory procedures best adapted to characterize the chemical properties of mine spoil. (2) To study the effect of strip mining and reclamation processes on the quality and quantity of water leaving the area. Approach: predictive mathematical equations will be developed and then verified with data obtained from reclamation research plots. Management practices will be developed for restoring the hydrology of the mined area. (3) To evaluate the effect of utilizing reclaimed strip mined land for the production of specialty crops or other crops of economic importance. Approach: soil fertility management methods will be developed that will permit the production of specialty crops including buckwheat, alfalfa, clovers, grasses, and vegetables. (4) To evaluate the effect of strip mine reclamation practices on the nutritional quality of forages or other crops grown on the reclaimed area. Approach: forages and other crops will be grown on spoil material that has undergone various management methods in the reclamation process. Evaluation will be made through chemical analysis of plant material
KEYWORDS: COAL MINING;SURFACE MINING;LAND RECLAMATION;REVEGETATION;HYDROLOGY;CROPS;TECHNOLOGY ASSESSMENT;PLANTS;SOILS;SOIL CHEMISTRY;SOIL MECHANICS;CLIMATES;WATER QUALITY;WATER POLLUTION ABATEMENT;OVERBURDEN

<000009>
TITLE: Socio-Economic Analysis of Coal and Oil-Shale Development in Rural Areas
PROJECT NUMBER: EPA-1AG-D5-E766-EG
PRINCIPAL INVESTIGATOR: Schaub, J.R.
ADDRESS: 500 12th St., S.W., ERS/USDA, Washington, DC 20250
AFFILIATION: Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: NRED, Economic Research Service
MONITOR: Schaub, John R.
TELEPHONE: C(202)447-8735
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$396,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) The study focuses on analyzing the primary and secondary socio-economic impacts of expanded surface mining of coal and the development of oil shale on agriculture, non-metro areas, rural people, rural communities, rural industries, and environmental quality. Significant aspects of the overall study include: assessing current resource use; estimating direct and secondary employment changes induced by energy development; analyzing population changes; estimating changes in community infra-structures, changes in demand for community services, and revenue needs and revenue potentials for impacted communities; evaluating reclamation costs and social and economic feasibility of alternative uses of reclaimed areas; appraising the effect of alternative development and processing activities on water demands and transfers; and the effect of institutions on coal and oil shale development. A major effort is to develop an analytical system to evaluate interregional economic and environmental implications and trade-offs for agricultural and rural areas. (2) Data will be collected primarily from secondary sources and analyzed using accepted procedures including partial budget analysis and linear programming. Some methodology development is required. (3) Research will be coordinated with other USDA agencies and with universities and other institutions. Cooperative relationships are to be established
KEYWORDS: REVENUE;COAL MINING;SURFACE MINING;OIL SHALES;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;RURAL POPULATIONS;ECONOMY;LAND RECLAMATION

<000011>
TITLE: Air Pollution--Fate and Effects Outdoor Atmosphere
PROJECT NUMBER: NJ00526-A
PRINCIPAL INVESTIGATOR: Lillian, D.
ADDRESS: Old Queens Building, New Brunswick, NJ 08903
AFFILIATION: Rutgers--the State Univ., New Brunswick, N.J. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service New Jersey
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (70%);PARTICULATES (30%)

PROJECT DESCRIPTION: To learn what happens to the pollutants after their emission to the atmosphere and to assess possible subsequent effects on various materials and surfaces.
APPROACH: The research will deal with the interactions of oxidizing pollutants with synthetic polymers. Interaction of atmospheric NO2 with water and subsequent influence on aqueous biological growth. Gas phase interactions of oxidizing compounds and Co.
RESULTS: Studied C2Cl4, Freon 11 and Freon 12. Only C2Cl4 decomposes under tropospheric simulations--all go under stratospheric. C2Cl4 gives CCl4--this may be a major source of the observed ambient CCl4 budget. Other products are COCl2 and trichloroacetylchloride. Investigated extent, nature and rate of heterogeneous reactions of primary species (SO2 and O2) to form secondary pollutants (SO4 and O3) on surface of metal oxide particulate matter. Both SO2 and O2 were chemisorbed at room temperature on the cadmium oxide. Some SO2 oxidized on surface to SO4. Rate of reaction was slow, but could be factor in long range transport. Two regimes of SO2 chemisorption: from 0 to 40% relative humidity and from 40% up to the point of condensation. In lower regime, SO2 was adsorbed directly onto CdO. In higher regime SO2 was sorbed into sheath of H2O vapor surrounding the particle. At higher humidities, more H2O vapor was adsorbed and resulted in increase in SO2 sorption and rate of SO4 formation. Larger submicron particles more effective catalysts than smaller ones. Evidence that chemisorbed O2 dissociated on the surface into atomic radicals. Some of these radicals escaped from the surface, reacted with oxygen and formed ozone.
KEYWORDS: AIR POLLUTION;FREONS;CHEMICAL REACTIONS;PHOTOCHEMICAL OXIDANTS;SULFUR OXIDES

<000012>
TITLE: Breeding and Evaluation of Kentucky Bluegrass for Turf
PROJECT NUMBER: MD-B-109
PRINCIPAL INVESTIGATOR: Hall, J.R.
ADDRESS: Agricultural Experiment Station, College Park, MD 20740
AFFILIATION: Maryland Univ., College Park (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Maryland
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/O3 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
PROJECT DESCRIPTION: Evaluate germplasm resources. Study the effect of different environmental factors, light intensity day length, management, humidity pollutants temperature and related environmental factors, on growth responses of turfgrass varieties and mixtures.
APPROACH: Valuable germplasm will be collected from old turf stands in Maryland. Kentucky bluegrass will be emphasized, however, other turfgrass species will not be passed over. Fumigation procedures with ozone and sulfur dioxide will be utilized to select bluegrass varieties that are least affected by these major pollutants. A study will be conducted to determine management factors that will increase resistance of varieties to air pollutants. The effect of air pollutants on varietal respiratory functions will be monitored with an infrared gas analyzer. Plots of several superior bluegrass varieties will be established separately and in combination with fine-textured ryegrasses. Combinations will be selected that give quick germination, minimum ryegrass competition and high quality turf.
RESULTS: Kentucky bluegrass cultivar testing continues intensively at two locations. Third year quality ratings indicate that the best cultivars in the metropolitan Washington, DC area under a 1 inch mowing height are: Sydsport, Brunswick, Adelphi, Plush, Warrens A-34, Vantage, Windsor, Parade and EVB391. A traffic machine with football cleats was run over one half of each cultivar entry in a split plot fashion to evalute cultivar traffic recuperative potential. Entries providing the highest quality turf under traffic during the month of August were: Ba62-55, Vantage, Brunswick, K1-155, NJE P-59, Adelphi, Parade, Enmundi, EVB 391 and Plush. Best performing cultivars over all three years at a one inch mowing height in the metropolitan Washington area are: Warrens A-34, Parade, Windsor, K1-155, NJE P-59 and a combination of Vantage and Victa. In a trial located on the Eastern Shore containing 100 entries the best performing cultivars and mixtures in 1975 were Windsor, USGA RAM No. 1, BA 61-91, Enmundi, NJE P-141, NJE P-57 + NJE P-59, NJE P-151 and NJE P-164.
KEYWORDS: GRASS;PLANT GROWTH;ENVIRONMENTAL EFFECTS;GENETIC VARIABILITY;PLANT BREEDING

<000013>
TITLE: Ecological Relationships of Pesticides, Radionuclides and Nutrients with Organisms in Aquatic Communities
PROJECT NUMBER: MICL00940
PRINCIPAL INVESTIGATOR: Kevern, N.R.
ADDRESS: New Administration Building, East Lansing, MI 48823
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Michigan
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Pesticides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Evaluate amount, storage, build-up and releases of pesticides under varying biological and chemical conditions.
APPROACH: Studies on contamination and levels necessary to produce injury, debility, sterility or mortality will be conducted. The physiological effects of pesticides on energy exchange measured at the cellular level. Direct bioassay and gas chromatography employed to monitor the accumulation of pesticides in aquatic systems. Determine site of damage and identification of effects of detergents, metallic ions, BOD and other chemicals. Rate of transfer, buildup and exchange within the biota of aquatic systems will be determined.
RESULTS: We have collected data, from the shore waters of western Lake Erie, on the distribution of the stable element counterpart of radionuclides potentially available from nuclear power reactors. Compartments consist of sediments, water and biomass (fish and plankton). Concentrations of Cs, Co, Fe, Mn, Sr, and Zn, while varying in percent, were all concentrated mainly in the sediments. Concentrations were less in the water, but the water was most significant mass and thus accounts for a considerable portion of the elements. The biomass was insignificant in the budget of the elements but remains important as the link with humans through the food web. Analyses have been made for fall-out concentrations of 134 and 137 Cs, 57 and 60 Co, 54 Mn and 65 Zn. A mathematical model is being developed from these data that

will alloy prediction of the distribution of accidental or controlled releases of radionuclides from proposed nuclear-powered, electric generating plants on western Lake Erie.
KEYWORDS: AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;BIOMASS;LAKE ERIE;PESTICIDES;BIOLOGICAL EFFECTS;WATER POLLUTION;DETERGENTS;METALS;CESIUM;COBALT;IRON;MANGANESE;STRONTIUM;ZINC;FALLOUT DEPOSITS;CESIUM 134;CESIUM 137;COBALT 57;COBALT 60;MANGANESE 54;ZINC 65;ENVIRONMENTAL TRANSPORT;BIOCHEMICAL OXYGEN DEMAND

<000014>
TITLE: Forest Tree Breeding
PROJECT NUMBER: TEN00271
PRINCIPAL INVESTIGATOR: Thor, E.
ADDRESS: W. Cumberland Avenue, SW, Knoxville, TN 37916
AFFILIATION: Tennessee Univ., Knoxville (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Tennessee
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/CO (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
PROJECT DESCRIPTION: Develop yellow-poplar, loblolly pine, Virginia pine, white pine and black walnut with superior quality for paper and lumber production. A Pinetum for testing of exotic pine species and production of interspecific hybrids.
APPROACH: Superior phenotypes of yellow-poplar, white pine and black walnut will be selected in Tennessee. Breeding orchards will be established by grafting of the superior phenotype material, except for Virginia pine which will be established by selection in open-pollinated progeny tests. Controlled pollinations will be carried out between clones. Progeny testing will be carried out with seed resulting from the controlled clones in order to determine general and specific combining ability. An area of approximately 60 acres will be cleared and laid out in one-acre plots. Seedlings of available pine species will be planted. Seed, both domestic and imported, will be purchased and seedlings grown for Pinetum. Periodic measurements for survival, growth, disease and insect damage and stem quality will be recorded. Controlled pollinations will be carried out to produce inter-specific hybrids. The progenies will be tested to determine hybrid vigor and adaptability.
RESULTS: Height and survival were measured in the Pinetum. Of the 39 species planted only 18 had acceptable survival after 10 growing seasons; the good survivors included all 11 species native to the Southeastern United States. None of the 16 pine species from the Western United States or Mexico survived. Of the seven surviving species exotic to the Southeast not a single species had a growth rate better than the poorest native species. About 2000 seedlings representing 10 open-pollinated families of eastern white pine have been grown for use in an experiment to measure the additive variation in depression of CO-assimilation when exposed to SO fumigation. Two growth chambers have been installed and an assimilation chamber has been constructed.
KEYWORDS: TREES;PLANT BREEDING;GENETIC VARIABILITY;FORESTS;PLANT GROWTH;WOOD;PAPER INDUSTRY;BIOMASS;ENVIRONMENT;BUILDING MATERIALS

<000015>
TITLE: Action of Air Pollutants on Plants and Methods of Damage Control Especially Through Resistance
PROJECT NUMBER: 1103-14780-001
PRINCIPAL INVESTIGATOR: Heggestad, H.E.;Howell, R.K.;Bennett, J.H.
ADDRESS: Building 001, Room 206, Beltsville, MD 20705
AFFILIATION: Department of Agriculture, Beltsville, Md. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Agricultural Research Service, Beltsville Agriculture Research Center
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Develop a better understanding of the effects of air polllution on agronomic, horticultural, and ornamental plants and develop technology for minimizing and preventing damage.
APPROACH: In greenhouse and field studies many species and varieties within species are evaluated after exposure to pollutants in ambient air, to filtered air, and to various dosages and mixtures of pollutants under controlled environment conditions. Variations in injuries, yield, quality and chemical composition are assessed and the physiological and biochemical basis of the effects determined. Technology for reducing damage will result from research to develop resistant varieties, chemical protectants, improved cultural practices, and mechanical filtering devices. Pollutants and environmental parameters are monitored.
RESULTS: Experiments were conducted to determine the effects of ambient oxidants, ozone, and sulfur dioxide on nutritional quality of forage. When Kenland red clover was grown from seed to bloom in unfiltered air of greenhouses, foliage was damaged about 60%, percent protein was decreased, percent carbohydrate and crude fiber was increased, but Vitamin A and percent lipid were unchanged. Clover plants exposed to 0.5, 1.0, and 1.5 ppM SO2 for 2 hrs developed about 10, 30, and 60% foliar injury. At the highest concentration of SO2 vitamin A was reduced. None of the treatments altered percent lipids, and the changes in other constituents were nonlinear. Exposure of Team alfalfa to either 20, 25, or 30 pphm ozone for 4 hrs caused about 20, 30, and 60% foliar injury. The 25 and 30 pphm concentrations reduced vitamin A content significantly, but the treatments did not significantly affect other quality factors. Microenvironmental conditions in open-top field chambers. During calm conditions, the interior ventilation of the chamber primarily resulted from the chamber blower although downdrafts into the chamber were common when winds were gusty. On a breezy day, oxidants were reduced about 50% in the chambers but under calm conditions they were reduced about 80%. In full sunlight the light on shaded areas was reduced as much as 50%.
KEYWORDS: AIR POLLUTION;BIOLOGICAL EFFECTS;PLANTS;PLANT BREEDING;GENETIC VARIABILITY;DISEASE RESISTANCE;BIOLOGICAL RECOVERY;PLANT GROWTH

<000016>
TITLE: Relationship of Air Pollution to Forests in the Eastern United States
PROJECT NUMBER: NE-2208
PRINCIPAL INVESTIGATOR: Dochinger, L.S.
ADDRESS: Upper Darby, PA 19082
AFFILIATION: Northeastern Forest Experiment Station, Upper Darby, Pa. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Forest Service, Northeast Forest Experiment Station
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
PROJECT DESCRIPTION: Assess and predict losses due to air pollution, prevent or control air pollution effects on trees, and determine how trees can be used to cleanse pollutants from the air.
APPROACH: Studies will be made of the effect of air pollution on tree growth and mortality, the efficacy of protecting trees against air pollution by sprays, tree injections, site manipulation, and genetic resistance, and the ability of trees to remove gaseous and particulate pollutants.
RESULTS: An increasing global population and their demands for a better standard of living will assure the continuing presence of low level air pollution problems involving plant species. Cooperative research programs are needed for delineating the role of ozone and sulfur dioxide on woody vegetation. When the nature and extent of these aerial phytotoxicants on forests and trees are established, a realistic appraisal of the magnitude of air pollution incidences will be possible. As our research findings imply, these assessment data will thereby aid in defining forest economic losses, in determining pollution impact on forest resources, and in recommending control criteria for air quality conservation. Although tree species and varieties with improved tolerance to air pollution are vitally needed throughout the world, information is not available on the feasibility of developing such plant material. Significant variation in tolerance to ozone during several plant and leaf ontogenetic stages was expressed among red maple (Acer rubrum L.) progeny. The consistent exhibition in response signifies quantitative control and this genetic stability may facilitate the selection of ozone tolerant red maple seed sources and plants.
KEYWORDS: AIR POLLUTION;ENVIRONMENTAL IMPACTS;ECONOMICS;FORECASTING;AIR CLEANING;TREES;AIR POLLUTION CONTROL;USA;TREES;RESPONSE MODIFYING FACTORS;TOLERANCE;BIOLOGICAL VARIABILITY;PREFERRED SPECIES;FEASIBILITY STUDIES;OZONE

<000017>
TITLE: Influence of Environmental Parameters Upon Physiology of Avian Species
PROJECT NUMBER: TEX01604
PRINCIPAL INVESTIGATOR: Cain, J.R.;Suter, D.A.
ADDRESS: College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Texas
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Investigate physiological responses of domestic birds to their environment; determine optimum conditions and effects of stressors. Establish relationships between air pollution and poultry production units.
APPROACH: Build and test bioclimatic chambers. Measure physiological responses of birds when subjected to controlled environmental variables; light, temperatuure, humidity, air flow rate, noxious gas level. Analyse discharge air for pollutants and evaluate methods to clean the air. Test environmental housing for practical application in the poultry industry.
RESULTS: Egg production from commercial broiler breeders during the summer was tested under four lighting regimes in 2/3 slat floor pens at a density of 1 sq. ft./bird. No difference in Hen Day Production (HDP) existed between hens beginning a day at 8:00 hrs (48.27%) and those beginning at 22:00 hrs (48.11%) despite cooler temperatures for the night lighted hens. Intermittent lighted hens receiving 1/2L:1/2D laid better (49.64%) than controls while those receiving 1/4L:3/4D laid poorer (42.11%) overall. Pertility was not affected by any treatment. Control and Night Light treatments consumed 1.13 times more kilowatt hours of energy than Long Intermittent and 1.75 times more than Short Intermittent treatments. Intermittent lighting schedules show promise for broiler breeders as improved egg production can be anticipated while saving electrical energy. Construction of bioclimatic chambers is currently progressing under the supervision of a new staff member, Mr. Larry Olson, agricultural engineer. Environmental-ovulatory control studies with coturnix were continued. Radioimmunoassay revealed peak progesterone levels (5 mg) 1 to 2 hrs prior to oviposition. Blood samples taken at 30 min. intervals showed progesterone levels rose about 6 hrs prior and continued through 1 hr prior to oviposition on days when an egg was laid the following day. This implies a somewhat different ovulatory control time sequence than that of the chicken.
KEYWORDS: BIRDS;BIOLOGICAL STRESS;ENVIRONMENTAL EFFECTS;WILD ANIMALS;CHICKENS;CONTROLLED ATMOSPHERES;AIR POLLUTION;BIOLOGICAL EFFECTS

<000018>
TITLE: Factors Affecting Post-Harvest Market Quality of Processed Potatoes
PROJECT NUMBER: NYC-161414
PRINCIPAL INVESTIGATOR: Ewing, E.E.
ADDRESS: Ithaca, NY 14850
AFFILIATION: Cornell Univ., Ithaca, N.Y. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service New York
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Enzymes, exhaust fumes (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Identify and quantify pre- and post-harvest conditions including storage and handling which affect the market quality of potatoes for processing.
APPROACH: Enzymes responsible for carbohydrate transformation in the potato, nucleic acid metabolism in relation to enzyme changes and chipping quality, and kinetics of carbohydrate changes in various genotypes during maturation and storage will be studied, with special attention to effects of temperature.
RESULTS: Investigations have been continued into the possible role of invertase and its endogenous inhibitor in the development of reducing sugars in potato tubers. For growing seasons, tubers have been harvested at

regular intervals from July to October. Invertase before harvest is most active at a neutral pH, whereas after harvest the optimum pH is acidic. The inhibitor seems to appear only after harvest. Two forms of invertase were separated from immature tubers, and five different forms of invertase were separated from mature tubers that had been stored. The multiple forms differ in the way that temperature affects the catalysis rate and in the binding rates between enzyme and endogenous inhibitor. They also appear to have different binding affinities toward the inhibitor. Experiments the last three storage seasons tested the effects of exhaust fumes from internal combustion engines on the incidence of sugar spot in processing potatoes. No evidence was found that either pure ethylene (a component of the fumes) or the fumes contributed to the disorder, the cause of which remains unknown.
KEYWORDS: POTATOES;CROPS;STORAGE LIFE;SPROUT INHIBITION;BIOCHEMICAL REACTION KINETICS;ENZYMES;TEMPERATURE EFFECTS;CONTROLLED ATMOSPHERES;EXHAUST GASES;BIOLOGICAL EFFECTS;ETHYLENE;TESTING

<000019>
TITLE: Effects of Pesticides and Other Environmental Pollutants on Honey Bees
PROJECT NUMBER: 1110-15560-002
PRINCIPAL INVESTIGATOR: Michael, A.S.;Shimanuki, H.;Lehnert, T.
ADDRESS: Beltsville, MD 20705
AFFILIATION: Department of Agriculture, Beltsville, Md. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Agricultural Research Service, Beltsville Agriculture Research Center
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/O3 (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
PROJECT DESCRIPTION: Measure and counter harmful effects of commonly used pesticides and other pollutants on honey bees.
APPROACH: Determine direct and indirect effect of sulfur dioxide and ozone on honey bee populations. Develop diagnostic methods for malathion, carbofuran, and diazinon in bees, honey and beeswax. Screen juvenile hormones as supplied by BEC Lab for effect on bees. Test pollen traps and other devices for protection of honey bee colonies against pesticides.
RESULTS: An undetermined number of post offices use dichlorvos strips for the control of insect pests. Package honey bees may be killed by this practice. The LD(50) of dichlorvos for honey bees in laboratory situations was 0.76 micrograms/l. However, when tests were conducted in rooms, dichlorvos levels of 0.05 to 0.15 micrograms/l resulted in nearly 100% mortality. In enclosed rooms, even 1/2 of the recommended levels of dichlorvos was sufficient to kill 100% of the adult bees. Recommendations made to the Postal Service based on this work have resulted in a major change in the use of dichlorvos strips. Laboratory tests with selected insect growth regulators indicated a need for further research on the potential hazard to nontarget insects. At a level of 0.1 microgram/larvae (4 to 5-day-old larvae), a reduction in emergence of honey bees was noted in some compounds. The significance of the levels in field conditions is not known at present.
KEYWORDS: PESTICIDES;BIOLOGICAL EFFECTS;INSECTS;POPULATION DYNAMICS;SULFUR DIOXIDE;OZONE;HONEY;PRODUCTION;TESTING;CONTROLLED ATMOSPHERES

<000020>
TITLE: Effects, Rates and Transformations of Gaseous Air Pollutants on Agronomic and Horticultural Plants
PROJECT NUMBER: 7802-14780-004
PRINCIPAL INVESTIGATOR: Heck, W.W.;Reinert, R.A.;Heagle, A.S.
ADDRESS: Raleigh, NC 27607
AFFILIATION: North Carolina State Univ., Raleigh (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Agricultural Research Service, Mid Atlantic Area
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/O3;NOXIOUS GAS/SO2;NOXIOUS GAS/NH3 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Investigate: growth and physiological responses of selected crops to air pollutants (O3, SO2, NH3); dose-response relationships; effects of pollutant combinations; response of plants as affected by environmental and biotic factors; potential of plants as pollutant sinks; the economic impact.
APPROACH: Use phytotron, greenhouse and field exposure facilities for control and monitoring of pollutants. Plant responses include: pollutant uptake, net photosynthesis, transpiration (stomatal response), growth and yield parameters, nutrient ratios and visible injury. Exposures will be acute, acute-chronic and chronic. Response measures will be over time to permit generation of rate functions. Screening procedures permit cooperation with plant breeders. Field exposures will study ambient pollution effects.
KEYWORDS: AIR POLLUTION;BIOLOGICAL EFFECTS;PLANTS;GROWTH;PHYSIOLOGY;BIOLOGICAL STRESS

<000021>
TITLE: Physiological Response of Shade and Ornamental Trees to Environmental Stress
PROJECT NUMBER: 3306-16020-004
PRINCIPAL INVESTIGATOR: Roberts, B.R.;Townsend, A.M.
ADDRESS: P.O. Box 365, Delaware, OH 43015
AFFILIATION: Agricultural Research Service, Delaware, Ohio (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Agricultural Research Service, Illinois-Indiana-Ohio Area
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Develop fundamental information on the physiological interactions which occur in woody plants subjected to environmental stress, particularly air pollution. Study methods of modifying the plant or its environment to reduce stress injury.
APPROACH: Selected shade and ornamental tree species will be subjected to a variety of stress factors, singly and in combination, under controlled environmental conditions. Physiological and biochemical responses will be evaluated and comparisons made within and between species. Radiochemical procedures will be used to trace the absorption and distribution of SO2 in woody plants.
RESULTS: Foliar uptake of 1.0 ppM sulfur dioxide (SO2) was measured in a variety of shade and ornamental species. Red maple, white birch, and sweetgum showed appreciably greater vegetal sorption than comparable species of rhododendron, white ash, and azalea. There was no significant difference in the capacity of

foliage from white ash and azalea to remove SO2 from the air at concentrations of 1.0, 0.5, and 0.2 ppM. However, leaves of white birch and firethorn showed significantly less uptake at 0.2 ppM compared with uptake at the higher concentrations. Significant interspecific and intraspecific variation was demonstrated in the rate of foliar sorption of ozone (03) at a concentration of 0.2 ppM. White oak and white birch foliage removed the largest quantities of 03, while red maple and white ash were less efficient. Variation in tolerance to 03 (0.75 ppM) was also observed among red maple seedling progenies from seed sources in Alabama, Minnesota, Maine, and Pennsylvania. Differences in seedling response occurred in extent of injury but not in type of injury. The stability of 03 tolerance during several plant and leaf ontogenetic stages signifies strong genetic control.
KEYWORDS: TREES;PHYSIOLOGY;BIOLOGICAL ADAPTATION;BIOLOGICAL STRESS;AIR POLLUTION;BIOLOGICAL EFFECTS;RESPONSE MODIFYING FACTORS;BIOCHEMISTRY;ECOLOGICAL CONCENTRATION;SULFUR DIOXIDE;ENVIRONMENTAL TRANSPORT;UPTAKE;OZONE;TOLERANCE;BIOCHEMICAL REACTION KINETICS

<000022>
TITLE: Economics of Coal and Oil Shale Development on Environmental Quality in Rural Areas
PROJECT NUMBER: NRE-42-309-11-00
PRINCIPAL INVESTIGATOR: Magleby, R.;Schaub, J.;Krause, O.
ADDRESS: 14th Street and Independence Avenue, SW, Washington, DC 20250
AFFILIATION: Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Economic Research Service, Division of Natural Resource Economic
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil and Gas (40%);FOSSIL FUEL/Oil Shale (30%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Coal residues (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: Assess the economic implications of alternative coal and oil shale development and associated activities on environmental quality and the competition for resources in rural areas.
APPROACH: Develop regional reports on current land and water use, the economic implications for future resource use, resource competition, and environmental quality resulting from alternative levels of coal and oil shale development, and related activities. Develop an interregional linear program to evaluate conflicting reclamation budgets from available literature, cooperation with other agencies within and without USDA, and limited empirical studies. Budgeting techniques and linear programming will be used to estimate water demand and to appraise the economic and environmental implications of alternative water supplies.
RESULTS: The general objective of this project is to assess specific-socio-economic impacts and implications of coal and oil shale development and to integrate these separate assessments into an interregional analytical system. The system can then be used to make comparative assessments of alternative patterns of coal and oil shale development which might be chosen by private decisionmakers and public policymakers. The work is being performed partly with pass-through funds from EPA, under ERS-EPA/USDA-EPA interagency agreements. Research results from the project are not yet available. In accord with the research agreement with EPA, and the initial Accomplishment Plan with milestone dates for completing specific objectives, work began on the following tasks: (1) provide regional reports on resources available to meet alternative demands for new energy, land and water resources which would be affected, and economic implications for agriculture; (2) evaluate costs of reclaiming mined lands at specific sites; (3) develop an analytical system for evaluating interregional economic implications and tradeoffs for agriculture and rural areas resulting from coal development; (4) assess the demand for water for energy development and the competition for water between agriculture and energy use in coal mining and processing.
KEYWORDS: COAL INDUSTRY;OIL SHALE INDUSTRY;SOCIO-ECONOMIC FACTORS;ECONOMIC IMPACT;LAND USE;ENVIRONMENTAL EFFECTS;WATER RESOURCES;DECISION MAKING;REGIONAL ANALYSIS;RURAL AREAS

<000023>
TITLE: Economics of Coal and Oil Shale Development on Environmental Quality in Rural Areas
PROJECT NUMBER: NRE-42-309-38-01
PRINCIPAL INVESTIGATOR: McMartin, W.
ADDRESS: Fargo, ND 58103
AFFILIATION: North Dakota State Univ., Fargo (USA). Agricultural Experiment Station
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Economic Research Service, Division of Natural Resource Economic
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil and Gas (30%);FOSSIL FUEL/Oil Shale (40%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Coal residues (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: Assess the economic implications of alternative coal and oil shale development and associated activities on environmental quality and the competition for resources in rural areas.
APPROACH: Develop regional reports on current land and water use, the economic implications for future resource use, resource competition, and environmental quality resulting from alternative levels of coal and oil shale development, and related activities. Develop an interregional linear program to evaluate conflicting reclamation budgets from available literature, cooperation with other agencies within and without USDA, and limited empirical studies. Budgeting techniques and linear programming will be used to estimate water demand and to appraise the economic and environmental implications of alternative water supplies.
RESULTS: Major reserves for economical stripping are located in the northern half of the Appalachian Basin, the Illinois Basin and the Northern Great Plains regions. Major concern is with the socio-economic problems associated with coal development, problems which will result primarily from the thrusting of large numbers of people quickly into a sparsely populated rural area and impact of employment and wage rates, social costs and benefits, effects on other sectors of the economy and on government and questions of equity. The location and level of development activities will depend upon: energy prices; coal quality, depth of seam; water availability of the cost of extraction, transportation, and processing, air pollution laws; reclamation laws; severance taxes; and other factors. The national goal of increased energy self-sufficiency has placed major importance on increased coal production and potential oil shale

development. The economically attractive surface mined coal is expected to provide much of the increased output in the near future. The environmental impacts of surface mining, energy conversion, and urbanization are a major concern in coal and oil shale producing areas.
KEYWORDS: COAL INDUSTRY;OIL SHALE INDUSTRY;SOCIO-ECONOMIC FACTORS;ECONOMIC IMPACT;LAND USE;WATER RESOURCES;ENVIRONMENTAL EFFECTS;DECISION MAKING;REGIONAL ANALYSIS;RURAL AREAS

<000024>
TITLE: Economics of Coal and Oil Shale Development on Environmental Quality in Rural Areas
PROJECT NUMBER: NRE-42-309-08-01
PRINCIPAL INVESTIGATOR: Whetzel, V.;Skold, M.;Juers, L.
ADDRESS: Fort Collins, CO 80521
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Economic Research Service, Division of Natural Resource Economic
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Coal residue (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: Assess the economic implications of alternative coal and oil shale development and associated activities on environmental quality and the competition for resources in rural areas.
APPROACH: Develop regional reports on current land and water use, the economic implications for future resource use, resource competition, and environmental quality resulting from alternative levels of coal and oil shale development, and related activities. Develop an interregional linear program to evaluate conflicting reclamation budgets from available literature, cooperation with other agencies within and without USDA, and limited empirical studies. Budgeting techniques and linear programming will be used to estimate water demand and to appraise the economic and environmental implications of alternative water supplies.
RESULTS: Major reserves for economical stripping are located in the northern half of the Appalachian Basin, the Illinois Basin and the Northern Great Plains regions. Major concern is with the socio-economic problems associated with coal development, problems which will result primarily from the thrusting of large numbers of people quickly into a sparsely populated rural areas and impact on employment and wage rates, social costs and benefits, effects on other sectors of the economy and on government and questions of equity. The location and level of development activities will depend upon: energy prices; coal quality, depth of seam; water availability of the cost of extraction, transportation, and processing, air pollution laws; reclamation laws; severance taxes; and other factors. The national goal of increased energy self-sufficiency has placed major importance on increased coal production and potential oil shale development. The economically attractive surface mined coal is expected to provide much of the increased output in the near future. The environmental impacts of surface mining, energy conversion, and urbanization are major concern in coal and oil shale producing areas.
KEYWORDS: COAL INDUSTRY;OIL SHALE INDUSTRY;SOCIO-ECONOMIC FACTORS;ECONOMIC IMPACT;LAND USE;WATER RESOURCES;ENVIRONMENTAL EFFECTS;DECISION MAKING;REGIONAL ANALYSIS;RURAL AREAS

<000025>
TITLE: Economics of Coal and Oil Shale Development on Environmental Quality in Rural Areas
PROJECT NUMBER: NRE-42-309-11-00
PRINCIPAL INVESTIGATOR: Magleby, R.;Schaub, J.;Krause, O.
ADDRESS: 14th Street and Independence Avenue, SW, Washington, DC 20250
AFFILIATION: Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Economic Research Service, Division of Natural Resource Economic
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Coal residue (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: Assess the economic implications of alternative coal and oil shale development and associated activities on environmental quality and the competition for resources in rural areas.
APPROACH: Develop regional reports on current land and water use, the economic implications for future resource use, resource competition, and environmental quality resulting from alternative levels of coal and oil shale development, and related activities. Develop an interregionl linear program to evaluate conflicting reclamation budgets from available literature, cooperation with other agencies within and without USDA, and limited empirical studies. Budqeting techniques and linear programming will be used to estimate water demand and to appraise the economic and environmental implications of alternative water supplies.
RESULTS: Major reserves for economical stripping are located in the northern half of the Appalachian Basin, the Illinois Basin and the Northern Great Plains regions. Major concern is with the socio-economic problems associated with coal development, problems which will result primarily from the thrusting of large numbers of people quickly into a sparsely populated rural area and impact on employment and wage rates, social costs and benefits, effects on other sectors of the economy and on government and questions of equity. The location and level of development activities will depend upon: energy prices; coal quality, depth of seam; water availability of the cost of extraction, transportation, and processing, air pollution laws; reclamation laws; severance taxes; and other factors. The national goal of increased energy self-sufficiency has placed major importance on increased coal production and potential oil shale development. The economically attractive surface mined coal is expected to provide much of the increased output in the near future. The environmental impacts of surface mining, energy conversion, and urbanization are a major concern in coal and oil shale producing areas.
KEYWORDS: COAL INDUSTRY;OIL SHALE INDUSTRY;SOCIO-ECONOMIC FACTORS;ECONOMIC IMPACT;LAND USE;WATER RESOURCES;ENVIRONMENTAL EFFECTS;DECISION MAKING;REGIONAL ANALYSIS;RURAL AREAS

<000026>
TITLE: Effects of SO2 and O3 on Respiration and Assimilation in Trees and Shrubs in Relation to Resistance
PROJECT NUMBER: PL-FS-74
PRINCIPAL INVESTIGATOR: Bialobok, S.;Jensen, K.F.
ADDRESS: Kornik, PL
AFFILIATION: Polska Akademia Nauk, Warsaw
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Forest Service, Washington Office Forest Service
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/O3 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Improve the understanding of mechanisms of resistance in trees and shrubs to sulfur dioxide and ozone so as to provide physiological indices for selecting woody plants for use in areas exposed to air pollutants.
APPROACH: Experimental trees and shrubs will be exposed in laboratory chambers to controlled dosages of sulfur dioxide and ozone. Included will be pines, oaks, ash, poplars, and shrubs of varying degrees of resistance to air pollutants. Photosynthesis and respiration will be monitored and cytochemical responses will be observed. Physiological responses will also be determined for plants in a carefully monitored field site with likely acute episodes of sulfur dioxide and ozone air pollution. Physiological indices to sulfur dioxide and ozone resistance will be formulated from resulting data.
KEYWORDS: SULFUR DIOXIDE;OZONE;ENVIRONMENTAL EFFECTS;TREES;RESPIRATION;AIR POLLUTION;PLANTS;PHYSIOLOGY;PREFERRED SPECIES;RESPONSE FUNCTIONS;RESPONSE MODIFYING FACTORS;BIOLOGICAL EFFECTS

<000027>
TITLE: Acidification of Forest Environment (Niepolomicka Forest) Caused by SO2 Emissions from Steel Mills
PROJECT NUMBER: PL-FS-75
PRINCIPAL INVESTIGATOR: Grodzinsk, A.;Jensen, K.E.
ADDRESS: Krakow, PL
AFFILIATION: SEE CODE- 3253500 Polish Academy of Sciences, Krakow. Inst. of Nuclear Physics
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Forest Service, Washington Office Forest Service
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
PROJECT DESCRIPTION: Determine the rate of acidification of the forest environment.
APPROACH: Identify forest bioindicators which are most sensitive to sulfur dioxide emissions and investigate sulfur cycling in the forest ecosystem.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;AIR POLLUTION;BIOLOGICAL EFFECTS;METAL INDUSTRY;ENVIRONMENTAL EFFECTS;SULFUR DIOXIDE;ENVIRONMENTAL TRANSPORT;STEELS;PRODUCTION;SULFUR;METABOLISM;TREES;PLANTS;BIOASSAY;CHEMICAL EFFLUENTS;GASEOUS WASTES

<000028>
TITLE: Monitoring and Assay of Phytotoxic Airborne Pesticides and Volatile Pollutants
PROJECT NUMBER: IOW01802
PRINCIPAL INVESTIGATOR: Sherwood, C.H.;Shaw, R.H.
ADDRESS: Beardshear Hall, Ames, IA 50010
AFFILIATION: Iowa State Univ. of Science and Technology, Ames (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Iowa
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: Evaluating (uncontrolled) air pollution cases involving appreciable concern to the public or damage to crops. Detecting pollution incidence in representative Iowa rural and urban areas and improving use of instruments and biological tests. Relate damage potential to plant characteristics, pollutants, pollution patterns and environment. Provide concerned gardeners and commercial growers means for limiting damage from air pollution.
APPROACH: Obtain notification of pollution and other cooperation by extension personnel and state horticultural organizations. Monitor and assay representative rural and urban sites for pollution as related to environmental conditions, identifying advantages and disadvantages of instrumentation and biological tests and relating to sources and risks. Through controlled exposure patterns and pre- and post-exposure conditions improve diagnosis and prognosis procedures relating to 2,4-D, NH3, O3, SO2 and other pollutants, pollutant combinations and patterns. Test use of indicator plants and observation training for concerned gardeners. Test advantages of incorporating warning or marking agents in high risk home-use packaged pesticides and formulations of professional applicators. Develop use of protective or antagonistic materials such as organic irons, sequestrins and oxidation catalysts against known or expected pollutants.
RESULTS: Doubling plant content of treatment chambers increased time to attain 1 ppM O3 by 20%. Average person capable of smelling 0.1 ppM O3. Exposure to 0.1 to 1 ppb 2,4-D hastens germination by 48 hrs and recovery of plants; 0.1 to 1 ppM delays germination, kills radical tip and plants die. Pentachlorophenyl formulations insidious, differing in toxicity though labels similar. Of other penta forms tested, M-chlorcphenyl much more toxic than pentachlorophenyl. Drying time of formulations not major problem; Iowa home treated 3 yrs ago still toxic. No practical way to decontaminate treated homes found. Lab tests establishing the competence of XAD-2 as an absorber of trifluralin. Experiments on humidity dependence of XAD efficiency of absorption were initiated but need to be extended. Field samples of 2,4-D were taken at the pesticide circle at the horticulture farm, along with wind speed and direction and temperature.
KEYWORDS: AIR POLLUTION;BIOLOGICAL EFFECTS;PLANTS;URBAN AREAS;RURAL AREAS;BIOASSAY;PESTICIDES;ENVIRONMENTAL TRANSPORT;CHEMICAL COMPOSITION;TOXICITY

<000029>
TITLE: Biology, Behavior, Management and Venoms of Bees and Wasps
PROJECT NUMBER: PEN01896
PRINCIPAL INVESTIGATOR: Benton, A.W.
ADDRESS: 201 Shields Building, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Pennsylvania
77 FUNDING: Department of Agriculture
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Develop new honey products; improve crown vetch pollination and relate to feeding behavior; study chronic and acute effects of SO2; study toxicity and immunogenicity of vespid venoms.
APPROACH: Various sources of fruit flavors will be tested in creamed honey and consumer acceptability determined. Colony arrangement in the field, effect of external and internal feeding on % crown vetch pollen collected, rotation of colonies and period of rotation, selectivity of honey bees for crown vetch genotypes will be determined. Fumigation with various concentrations of SO2 and monitoring flight activity, mortality, etc. will be bioassayed. Chronic toxicological studies on three animal species with vespid venoms will be done by noting behavioral and pathological changes.
RESULTS: Extensive progress has been made in the desensitization of individuals hypersensitive to insect venoms. Pure honey bee venom has been approved for sale by the Bureau of Biologics and should be on the open market by Spring 1976. Extensive human studies in conjunction with Johns Hopkins University are now being done with the vespid venoms. Preliminary indications are that they are just as therapeutically effective as honey bee venom.
KEYWORDS: HONEY;PRODUCTION;VICIA;REPRODUCTION;SULFUR DIOXIDE;BIOLOGICAL EFFECTS;AIR POLLUTION;VENOMS;TOXICITY;ORGANOLEPTIC PROPERTIES

<000030>
TITLE: Carcinogen-DNA Complexes--Structure and Interactions
PROJECT NUMBER: R01 CA 17922-02
PRINCIPAL INVESTIGATOR: Clarke, R.H.
ADDRESS: 755 Commonwealth Ave., Boston, MA 02215
AFFILIATION: Boston Univ., Mass. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$32,070
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The proposed research program seeks to detail the geometry of complexes of carcinogenic polycyclic hydrocarbons with DNA and chromatin and to elucidate the intermolecular interactions which stabilize them. Our approach will be through the utilization of magnetic properties in the excited triplet states of the carcinogen to probe the orientations and interactions within the complex, using newly developed methods of optical detection of magnetic resonance.
APPROACH: Our experiments will focus on complexes of nucleic acids with polycyclic hydrocarbons which have been postulated to be actively involved in carcinogenesis and which may be of importance in elaborating mechanisms of chemical carcinogenic activity at the molecular level.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;DNA;CARCINOGENS;BIOLOGICAL EFFECTS;NUCLEIC ACIDS;CHEMICAL EFFLUENTS;BIOCHEMICAL REACTION KINETICS;CHEMICAL COMPOSITION;CHROMATIN;MOLECULAR STRUCTURE

<000031>
TITLE: Responses of Selected Southern Tree Species to Specific Environmental Contaminants
PROJECT NUMBER: LAZ00007
PRINCIPAL INVESTIGATOR: Garrett, H.E.
ADDRESS: School of Forestry, Ruston, LA 71270
AFFILIATION: Louisiana Tech Univ., Ruston (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: Evaluate the sensitivity of certain important Louisiana timber species to industrial contaminants. Relate the intensity of damage to combinations of environmental variables (i.e. temperature, light, and relative humidity), plant moisture relations, and to a range of concentrations of the specific contaminants (SO2,H2S, and O3). Determine maximal levels of the contaminants which are tolerable without producing serious physiological disorders in the selected species. Establish the effects of industrial air pollutants on the growth of important timber species under field conditions using the results of the laboratory studies as guidelines. Develop sound proposals to counteract observed effects of industrial air emissions on trees; establish criteria upon which more meaningful federal and state air pollution regulations could be founded.
APPROACH: Seedlings of selected tree species will be field-lifted, potted, and moved to laboratory facilities. Exposure to controlled concentrations of SO2, H2S, and O3, and regulated combinations of light, temperature, relative humidity, and plant moisture relations will occur. ''Apparent photosynthesis'' and chemical composition of plant materials will be monitored to determine the effects of contaminants on plant growth. Field observations in areas of high contaminant concentrations will be made using procedures developed in the laboratory. Comparisons between field and laboratory results will be done.
RESULTS: A screening program to determine the relative sensitivity of nine study species to SO2 and H2S has been completed.
KEYWORDS: AIR POLLUTION;FORESTS;TREES;LOUISIANA;GENETIC VARIABILITY;TOLERANCE;ENVIRONMENTAL EFFECTS;TEMPERATURE EFFECTS;SULFUR DIOXIDE;OZONE;HYDROGEN SULFIDES;CHEMICAL EFFLUENTS;BUILDING MATERIALS;WOOD;ECONOMICS;AIR POLLUTION ABATEMENT;BIOLOGICAL EFFECTS;BIOMASS;PLANT GROWTH

<000032>
TITLE: Effect of Rainfall Acidity on Coniferous Trees
PROJECT NUMBER: COL00326
PRINCIPAL INVESTIGATOR: Marlatt, W.E.;Striffler, W.D.
ADDRESS: Agricultural Exeriment Station, Fort Collins, CO 80521
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Determine the tolerance levels of native coniferous species to artificially applied acid precipitation. Determine the effects of artificially applied acid precipitation on the growth, vigor, and foliage characteristics of native coniferous seedlings.
APPROACH: Three species of native coniferous species will be subjected to acid precipitation applied at two levels of acidity plus a control. Test will be done on plot basis with approximately 3 year old seedlings as subjects. Seedlngs will be examined by color, needle length, bud formation, shoot elongation, etc.
RESULTS: Seven species of conifer seedlings were subjected to various concentrations of sulphuric acid spray, from pH 6 to pH 1. After 5 months no significant differences were observed except the pH 1 sulphuric acid solution spray treatment. After a year, the pH 6-pH 2 treatments showed no measurable treatment effects on the seedlings. The irrigated pH 2 and pH 3 treatments showed a significant increase in soil acidity. It appears for acid rainfall to cause direct damage to plant tissue it must be able to wet the surface and be sufficiently concentrated to burn the tissue.
KEYWORDS: FORESTS;TREES;CONIFERS;ACID RAIN;BIOLOGICAL EFFECTS;GENETIC VARIABILITY;AIR POLLUTION;TOLERANCE;TERRESTRIAL ECOSYSTEMS;SOILS;PH VALUE

<000033>
TITLE: Microspectrophotometric Analyses of Tissue Changes in Vertebrates Exposed to Water Pollutants
PROJECT NUMBER: PEN10921
PRINCIPAL INVESTIGATOR: Anthony, A.;Neff, W.
ADDRESS: 201 Shields Bldg., University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (20%);PARTICULATES (30%);ORGANICS (50%)
PROJECT DESCRIPTION: Develop and evaluate short term methods for detecting (by means of quantitative histochemical bioassays) the presence of hazardous levels of specified toxicants in streams.
APPROACH: Tissue samples will be obtained from fish exposed to sublethal and lethal levels of metal toxicants and acidity simulating conditions found in waters polluted by acid mine drainage. Laboratory and field studies will be made on fish subjected to acute (1 to 7 days) and longer term (1 month) exposures to different concentrations of heavy metal ions in acidified water. Emphasis will be on histophysiological effects of single metallic ions, ion-ion interactions and ion-acid interactions. Quantitative cytophotometry will be used to assess toxicant induced aspects of tissue damage.
RESULTS: Both field collected and laboratory maintained fish were used in experiments validating the feasibility of employing histopathological changes in fish as indicators of stream or river pollution by industrial effluents. Field specimens consisted of white perch and tomcod collected from estuaries near a nuclear power plant and central sites of the Hudson River; laboratory specimens were brook trout maintained in acidified water to stimulate different severities of mine acid pollution. Histochemical analyses of respiratory, digestive and excretory organs include tests for nucleic acids, polysaccharides, lipids and proteins. Conventional and multiple differential staining methods were used for cytomorphological studies. It was established that Papanicolaou staining of microscopic sections is ideally suited for screening specimens and detecting the presence of pathology in specific organs. Histochemical studies, on the other hand, often provide clues regarding the etiological basis of metabolic disturbances in different organs.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;METALS;TOXICITY;FISHES;ACID MINE DRAINAGE;PATHOLOGICAL CHANGES;BIOLOGICAL EFFECTS;MICROSCOPY;SAMPLE PREPARATION

<000034>
TITLE: Socio-Economic Analysis of Economic Development and Environmental Degradation--Four Corners Area
PROJECT NUMBER: NM00203
PRINCIPAL INVESTIGATOR: Randall, A.J.;Carruthers, C.E.;Eastman, C.E.
ADDRESS: University Park, Las Cruces, NM 88070
AFFILIATION: New Mexico State Univ., University Park (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: METALS (25%);PARTICULATES (25%);ORGANICS (25%);RADIATION (25%)
PROJECT DESCRIPTION: Calculate the social and economic benefits and costs of environmental degradation.
APPROACH: Methodology will be developed for measurement of social and economic costs of environmental degradation, demand curves will be fitted to the supply curve for abatement, and a regional input-output model will be developed to evaluate effects on employment and income.
RESULTS: An analysis of the impact of public policy upon the magnitude and timing of coal and oil shale development has been completed. The results indicate that reclamation requirements are an important determinant of development feasibility and that proposed alterations in federal lease terms may tend to reduce the rate of energy resource development. An atmospheric diffusion model was utilized to estimate the concentration and geographical distribution of pollutants emitted from the Four Corners Power Plant. The results indicate that the highest concentrations of pollutants occur east and west of the plant in the region's major centers of population and agricultural production. Concentrations are sufficient to produce odor and taste on occasion as far away as forty kilometers from the facility. A simulation study of the effects of atmospheric pollutants upon crops indicates that the current concentration is not sufficient to reduce yields. However, a comparison of the full social benefits of increased pollution control to the cost of control provides evidence that the environmental regulations adopted by the state of New Mexico are economically justified. Alternative projections of the demand for electricity in the southwest region have been developed. It is concluded that current planning procedures may result in an overinvestment in generating capacity and that internalization of environmental costs may result in a reduction of the

growth rate in demand.
KEYWORDS: NEW MEXICO;COAL INDUSTRY;OIL SHALE INDUSTRY;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;AIR POLLUTION ABATEMENT;WATER POLLUTION ABATEMENT;COST;LAND RECLAMATION;LAND USE;DECISION MAKING;AIR POLLUTION;MATHEMATICAL MODELS;FOSSIL-FUEL POWER PLANTS;CHEMICAL EFFLUENTS;GASEOUS WASTES;ENVIRONMENTAL TRANSPORT

<000035>
TITLE: Air Pollution; Fate and Effects
PROJECT NUMBER: NJ00526-B
PRINCIPAL INVESTIGATOR: Manganelli, R.
ADDRESS: Old Queens Bldg., New Brunswick, NJ 08903
AFFILIATION: Rutgers--the State Univ., New Brunswick, N.J. (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (25%);ORGANICS (50%)
PROJECT DESCRIPTION: Determine the chemical and physical factors governing the concentration in time and space of sulfur dioxide, oxidants, ozone, carbon oxides, carbonyls, organic acids, inorganic and organic nitrogen compounds, inorganic and organic aerosols. Study the effects of these materials on natural and anthropogenic material of construction, i.e., textiles, plastics, metals and alloys.
APPROACH: Source sink studies, capture atmosphere studies, reactor studies, and chamber studies will be conducted.
RESULTS: Laser light scattering determination of the growth of aerosolized saline droplets has been made. Preliminary computer analysis results indicate that submicron droplets complete about 90% of their growth in the first second after environmental exposure i.e. relative humidity. Cooling tower intake water was aerosolized under the same conditions with the results indicating a more complex growth mechanism, which limits the growth potential of the drops and alters the initial crystalline morphology. Note, the cooling tower operated with brackish intake water.
KEYWORDS: AIR POLLUTION;SULFUR DIOXIDE;OXIDIZERS;OZONE;CARBON OXIDES;CARBONYLS;ORGANIC ACIDS;NITROGEN COMPOUNDS;ORGANIC NITROGEN COMPOUNDS;MONITORING;BUILDING MATERIALS;CORROSION;AEROSOLS;CORROSIVE EFFECTS;PARTICLE SIZE;ENVIRONMENTAL TRANSPORT

<000036>
TITLE: Ethical Choices in Environmental Decisions
PROJECT NUMBER: WIS01888
PRINCIPAL INVESTIGATOR: Heberlein, T.A.
ADDRESS: 116 Agriculture Hall, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Determine conditions under which individuals and organizations make ethical choices about action which has environmental impact. Discover the attitudes values, and perceptions of those individuals who are influenced by environmental standards. Learn how decision makers in public utilities make trade offs between environmental and economic concerns in decisions involving power generation.
APPROACH: Observe actual behavior in a situation where the individual could choose to act consistently with an environmental standard at a high cost or to violate the standard by taking some cheaper or easier alternative ation. Mailed questionnaires will be used to assess attitudes, values, and perceptions of these groups. Several case studies of the decision making process involved in the development of electrical generating facilities.
RESULTS: Two-hundred and sixty-six Standard Oil dealers in the State of Wisconsin were asked to observe people who purchased lead-free gasoline, and a control group of those who purchased regular. From these license numbers, names and addresses of those to whom the car was registered were obtained. Of these 443, accurate questionnaire data was obtained from 305, or 68.8 percent. This questionnaire included measures of a number of attitudes, beliefs and other personality characteristics, as well as behavior reports and background variables. Analysis of the data suggest that less than 25 percent of the lead-free buyers are making a purely ethical choice. Most are making a choice based on economic rationality as well as a sense of personal obligation. Those who are making an ethical choice have less cognitive bolstering and are less committed to the behavior. The personal norm to purchase lead-free gasoline is weak, but noticeable and has a substantial effect on behavior. Ascription of responsibility and awareness of consequences also have an effect on behavior. There is a feedback between holding a personal norm and perceiving a social norm for the behavior. Economic rationality and social influence from the gasoline dealer and car seller also influence behavior. It was further found that as attitudes become more specific, they become better predictors of behavior.
KEYWORDS: HUMAN POPULATIONS;BEHAVIOR;DECISION MAKING;SOCIO-ECONOMIC FACTORS;PETROLEUM INDUSTRY;ELECTRIC POWER;PUBLIC UTILITIES;ENVIRONMENTAL EFFECTS;AUTOMOBILES;GASOLINE;FUEL CONSUMPTION

<000037>
TITLE: Impact of Sulfur Dioxide on Physiological Processes of Woody Plants
PROJECT NUMBER: IND059034
PRINCIPAL INVESTIGATOR: Chaney, W.R.
ADDRESS: Executive Bldg., Lafayette, IN 47907
AFFILIATION: Purdue Univ., Lafayette, Ind. (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Determine the effects of sub-acute levels of sulfur dioxide on various aspects of growth of selected tree species. Measure the effects of sulfur dioxide on gas exchange phenomena of sensitive and non-sensitive individuals and species.
APPROACH: Selected branches and potted seedlings will be variously fumigated with low levels of sulfur dioxide in isolette chambers in the field and greenhouse. Effects of development of bud primordia, expansion of dormant buds, and leaf abscission will be quantified. Effect on gas exchange phenomena will

be determined in the laboratory with an infrared gas analyzer and thermocouple psychrometer.
RESULTS: Investigations of antagonism between sulfur dioxide and cadmium were continued. Red pine (Pinus resinosa Ait.) pollen was germinated in water cultures. Pollen germination in water of approximately 90% was reduced to 30% by CdCl concentrations of 250 ppB and to 10% by 500 ppB CdCl. The inhibitory effect of 250 ppB CdCl was reduced by 25 and 50 ppM NaHSO so that 70% of pollen germinated. The detrimental effect of 500 ppB CdCl could be partially overcome by NaHSO; 30% pollen germination with 25 ppM NAHSO and 50% germination with 50 ppM NaHSO. Antagonism between cadmium and other compounds was continued in greenhouse experiments involving soybeans (glycine max) in pots with acid washed quartz sand. Cadmium chloride conc. of 0 and 20 ppM were mixed with concentrations up to 500 ppM CaCO and Cd(OH) and added to the pots. Biomass of roots and shoots was reduced to about 10% of controls by 20 ppM CdCl alone or in combination wih all concentrations of CdCO. The detrimental effects of CdCl were more than 50% overcome by 40 ppM Ca(OH) and completely eliminated by 200 or 400 ppM Ca(OH). These results are significant because they demonstrate antagonism between two pollutants, Cd and SO, which often enter the environment from the same source. The environmental effects of these pollutants may be ameliorated when they occur together. These studies also suggest the possibility of reducing the impact of soil borne Cd by liming.
KEYWORDS: SULFUR DIOXIDE;BIOLOGICAL EFFECTS;PLANTS;GENETIC VARIABILITY;FOLIAR UPTAKE;CADMIUM;BIOMASS;PINES;AIR POLLUTION;TOXICITY

<000038>
TITLE: Air Pollution Interactions on Crop Plants
PROJECT NUMBER: WIS01947
PRINCIPAL INVESTIGATOR: Tibbitts, T.W.
ADDRESS: 116 Agriculture Hall, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Determine sensitivity of selected crop cultivars to ozone, sulphur dioxide and nitrogen dioxide alone and in combination. Evaluation of symptomology and extent of damage to these crops around a coal fired power plant in Central Wisconsin.
APPROACH: Controlled fumigations will be undertaken in the Biotron under optimum growth conditions to determine minimum threshold dosages for fumigations of 1 to 8 hrs for carrots, mint, peas, turfgrass, and alfalfa. The threshhold levels for ozone, sulphur dioxide and nitrogen dioxide as separate pollutants and as mixed pollutants will be determined. Study of stomatal response of the separate cultivars during fumigations will be followed with porometer measurements and silicone rubber impressions. Crop injury around a new coal-fired power plant will be followed both through a series of 16 alfalfa plantings located in a uniform manner around the plant and through continuous monitoring of the atmospheric pollutants.
RESULTS: Alfalfa fields have been sampled at regular intervals in 1972, 1973, 1974 to establish the normal level of alfalfa yields and types of injury before the generating plant began operations and sampled during this summer of 1975 as partial operation was initiated. No evidence of air pollution injury was found in any season. Fumigations in controlled environments with SO2 and O3 upon the A1 sweet cultivar of peas have demonstrated that 2100 ug/m(3) of SO2 and 400 ug/m(3) of O are minimum critical levels and that a combination of these pollutants is damaging at 520 ug/m(3) SO2 and 260 ug/m(3) O. Procedures are being develcped to utilize the level of chlorophyll in the leaf tissue as the basis for determining accurately the degree of pollution injury to the leaves. A study of soil and foliar applications with an experimental compound, DPX 4891, from E.I. du Pont de Nemours and Co. was undertaken at Hancock, WI for protection of Norland potatoes from oxidant injury. No significant results were obtained for no evidence of pollution injury was observed in the control treatments. Oxidant data has been collected and analyzed during the past season from these instruments; one located near the Portage generating station, one at Madison, and one at Hancock. Similar oxidant levels were recorded at all sites with levels significantly greater than during the summer periods of 1972-74.
KEYWORDS: PLANTS;CROPS;OZONE;SULFUR DIOXIDE;NITROGEN DIOXIDE;BIOLOGICAL EFFECTS;TOXICITY;SYNERGISM;AIR POLLUTION;ROOT ABSORPTION;FOLIAR UPTAKE;PLANT GROWTH;GENETIC VARIABILITY

<000039>
TITLE: Change in Air Pollution and Noise Pollution After the Introduction of Plant Materials
PROJECT NUMBER: DEL.X-PR-0002-3234
PRINCIPAL INVESTIGATOR: Dill, N.H.;Helmy, E.;Howell, J.T.
ADDRESS: Undergraduate School, Dover, DE 19901
AFFILIATION: Delaware State Coll., Dover (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);NOISE, VIBRATION (50%)
PROJECT DESCRIPTION: Discover improved methods of habitat modification through active environmental manipulation of selected habitats and through assessment of previous manipulation practices.
APPROACH: The interactions of man and environment are major concerns not only of the agriculturist, engineer, envircnmentalist, biologist, ecologist, and conservationist but also of the sociologist, psychologist, physician, and philosopher. The study of man in nature involves the study of the natural system and the nature of man himself. The program is divided into the following areas: The Human Habitat (Environmental Effects of Introducing Plants into a Designed Landscape), Wildlife Habitat Improvements, Agricultural Ecosystems (Agricultural Drainage), Fisheries Management.
RESULTS: Noise measurements on original sites continue: Grass campus area perpendicular to U.S. 13, 3-m white pines on 6-ft centers in 7-yr plantation, 10-m wide alleyway between pine plantations, 40-ft wide powerline shrub strip (mostly Clethra alnifola and ericads, 2-m max height) and dirt road adjacent to site No. 4. Two sites have been added: 2-m scotch pine and 3-m loblolly pine plantations. Attenuation per doubling of distance (March 75) on white, loblolly, and scotch pines and deciduous shrubs averaged 8 dbA with a range of 0 to 15 dbA. For same period, excess attenuation (open control areas minus plants) averaged over monitoring stations at 25, 50, 100, 200, and 400 ft are as follows--deciduous shrubs: 12 dbA at 250 H, 10 dbA at 500 H, 4 dbA at 1000 H; scotch pine: 7 dbA at 250 H, 1 dbA 500 H, dbA at 1000 H; white pine: 6 dbA at 250 H, 7 dbA at 500 H, 2 dbA at 1000 H; loblolly pine: 3 dbA at 250 H, 7 dbA at 500 H, 2 dbA at 1000 H. These averages assume attentuation is linear with distance. Noise source is placed at edge of vegetation. A more suitable speaker has been specially developed for our work; a monitoring technique

using six matched microphones has been devised. Further noise measurements will include extensive air temperature and humidity correlations. Averaged preliminary campus ozone measurements (75/9/1) are .043 ppM at highway and .021 ppM at campus interior.
KEYWORDS: HUMAN POPULATIONS;ENVIRONMENT;NOISE;HEALTH HAZARDS;BIOLOGICAL EFFECTS;RESPONSE MODIFYING FACTORS;NOISE POLLUTION CONTROL

<000040>
TITLE: Effects of an Altered Temperature Regime and Chemical Contaminants on the Aquatic Ecosytem
PROJECT NUMBER: M-000171
PRINCIPAL INVESTIGATOR: Witt, A.;Campbell, R.S.;Jones, J.R.
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AFFILIATION: Missouri Univ., Columbia (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
PROJECT DESCRIPTION: Determine the effect of an altered thermal regime on reproduction in fishes. Determine the effect of an altered thermal regime on disease, and the growth of diseased fish and their resistance to thermal stress.
APPROACH: Control fish and fish in a thermal effluent will be caged and fed ad libitum. Time of reproduction and fecundity determined from gonads. Eggs and larvae raised in the laboratory; determine relation between thermal history of fish and mortality. Fish sampled from hot water outfall and rest of lake will indicate incidence of lymphocytis. Infected and healthy fish fed experimentally for differences in rate of growth and stress to high temperature.
RESULTS: The incidence of lymphocystis, a disease of fishes, in cooling reservoirs is being investigated. The maximum incidence of the disease in Pomoxis annularis, from a normal reservoir, was 10.7% in July. P. annularis in Thomas Hill, a cooling reservoir, was free of the disease (sample size 2500). Montrose Lake, a cooling reservoir, contains 17 species and 6000 fish were examined. The disease is prevalent in Lepomis humilis. Only 2 L. machrochirus were infected. The monthly incidence of the disease in L. humilis and mean temperature (c) follows: May, 1.8%, 25.5; June, 7.8%, 29.8; July, 10.7%, 31.5; August, 6.0%, 30.7; September, 15.2%, 17.7. Maximum incidence of the disease appears to occur at medial temperatures and not at highest temperatures. Diseased fish may be stressed at high temperature and die, thus reducing the apparent incidence of the disease. A breeding population of L. humilis was established to be used as a source of disease-free experimental fish. A $25,301 grant from the Manufacturing Chemists Association will enable a study of ''Interaction of Phthalic Acid Esters with Hydrosoil Communities'' in cooperation with the U.S. Fish Pesticide Research Laboratory. Problems are delineated, students selected, and literature review initiated.
KEYWORDS: AQUATIC ECOSYSTEMS;FISHES;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;HEALTH HAZARDS;DISEASES;TEMPERATURE DEPENDENCE;POPULATION DYNAMICS

<000041>
TITLE: Physiology of Pollution in Relation to Regeneration and Growth of Forest Trees
PROJECT NUMBER: WIS-02085
PRINCIPAL INVESTIGATOR: Kozlowski, T.T.
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AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Study effects of acute and chronic SO2 levels on physiological processes of woody plants, primarily gymnosperms. Study effects of leaf structure, environmental changes, and protective films on SO2 effects on sensitive and tolerant species.
APPROACH: Fumigate plants with SO2 at Cotyledon and foliage-leaf stages. Determine chlorophyll content (spectronic colorimeter), photosynthesis and carbohydrate translocation (CO2 analyzer, CO2 fixation and liquid scintillation spectrometry), SO2 uptake and translocation (sulfur analyzer S uptake), transpiration (gravimetric method), water potential (pressure chamber), shoot and cambial growth (microscopy), extent of injury (light and electron microscopy), and dry weight increment. Determine effects of silicone emulsions, hexadecanal, and antitranspirants as protective films.
RESULTS: Seedlings of Quercus alba, Platanus occidentalis, Fraxinus pennsylvanica, and Acer saccharum were fumigated with ozone (10 pphm for 3 hrs) or SO (0.75 ppM for 3 hrs) at 0, 3, 5, and 7 days after soil irrigation. These pollutants affected stomatal aperture differently, with ozone inducing stomatal closure and SO suppressing it as soil dried. Soil moisture content decreased faster in SO-treated plants than in controls, reflecting prevention of stomatal closure by SO. Soil moisture content decreased more slowly in ozone-treated plants than in controls, reflecting the stomatal closing effect of ozone. Sulfur uptake by leaves and translocation to stems and roots generally was higher in species with low stomatal diffusion resistance (Fraxinus pennsylvanica) than species with high resistance (Acer saccharum). Species tolerance to pollution was related to stomatal diffusion resistance.
KEYWORDS: SULFUR DIOXIDE;AIR POLLUTION;FORESTS;TREES;GENETIC VARIABILITY;BIOLOGICAL EFFECTS;TERRESTRIAL ECOSYSTEMS;OZONE;PHOTOSYNTHESIS;TRANSPIRATION;PLANT GROWTH;TOXICITY;ENVIRONMENTAL EFFECTS

<000042>
TITLE: Implications of Atmospheric Environment on Coal Development in Western North Dakota (SEAM Phase I)
PROJECT NUMBER: ND-02535
PRINCIPAL INVESTIGATOR: Ramirez, J.M.;Brun, L.J.;Bristol, D.W.
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AFFILIATION: North Dakota State Univ., Fargo (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (33%);ELECTRICITY GENERATION (34%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Characterize the frequency, intensity and duration of low level radiation inversions at the Staton-Beulah, North Dakota area. Simulate the probable dispersion of waste effluents from various operational levels, areal distribution, and techniques of coal development at the Staton-Beulah, North

Dakota area.
APPROACH: Two towers at the study site will be equipped with meteorological instrumentation for continuous temperature and wind profile observations. Time-dependent occurrence of low level inversions will be analyzed and related to surface cover and weather conditions. Atmospheric diffusion models will be used to simulate the dispersion of probable air pollutants from a power plant in the study-area and from a simulated coal gasification plant around the Beulah area.
RESULTS: Eighteen months of continuous temperature and wind profile from a 350-foot and a 620-foot tower were processed and analyzed for information on the climatology of diurnal radiation inversions, and potential fumigation conditions. Preliminary analyses of data during the first year of a four-year study suggest that prolonged occurrence of radiational inversions lasting for as long as six hours in about 10 per cent of days in 1974. In about half of the number of days in the year the radiational inversions occur for one-hour or less. From among these inversion occurrences, potential fumigation conditions given hypothetical stack-height effluent releases are being analyzed.
KEYWORDS: NORTH DAKOTA;REGIONAL ANALYSIS;AIR POLLUTION;COAL INDUSTRY;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;METEOROLOGY;TEMPERATURE MEASUREMENT;WIND;VELOCITY;TURBULENCE;MATHEMATICAL MODELS;SURFACE AIR;DIFFUSION;DAILY VARIATIONS

<000043>
TITLE: Polycyclic Aromatic Hydrocarbons in the Environment
PROJECT NUMBER: WIS-02104
PRINCIPAL INVESTIGATOR: Harkin, J.M.
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MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (33%);ELECTRICITY GENERATION (34%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Determine the distribution and levels of polycyclic aromatic hydrocarbons in soil, water and plants in relation to point or diffuse sources of origin, e.g., from power plants, incinerators, oil refineries, and automobile or marine engine exhausts. Make recommendations for land or water use that will avoid health hazards due to elevated concentrations of carcinogenic or cocarcinogenic polynuclear aromatic hydrocarbons.
APPROACH: Samples of soils, water, and plant materials will be collected from areas where enrichment of polycyclic aromatic hydrocarbons might be expected, e.g., from fallout near incinerators or oil refineries, from automobile exhausts near highways and in metropolitan areas, or from marine engine exhausts near marinas, as well as from control areas where background levels can be established. The hydrocarbon mixtures will be extracted, separated by high-pressure liquid chromatography and/or gas chromatography, and assayed by fluorescence spectroscopy. Regions of enrichment of these hazardous chemicals will be identified. Recommendations for land and water use in these areas will be made which will minimize the health hazard for these compounds.
RESULTS: Methodology for isolation of polycyclic aromatic hydrocarbons (PAHs) from soils and their analysis has been improved: Air-dry soil samples are Soxhlet extracted with purified benzene; the extracts are concentrated and filtered through Millipore teflon filters to remove silt/fine soil particles; preparative thin-layer chromatography on silica gel using cyclohexane/carbon tetrachloride (19:1) separates polar soil organics from PAHs, which are eluted with benzene/dichloromethane; the eluate is treated with permanganate to convert unsaturated lipoid impurities to glycols and substituted aromatics to carboxylic acids; rechromatography on silica gel removes the oxidized contaminants from unchanged PAHs, which are extracted with dichloromethane; the PAH solution is concentrated to 1 ml for high-pressure liquid chromatography (HPLC) or gas chromatography. Pure PAHs have bee used as markers to quantify losses versus enrichment during isolation and analysis. Gas chromatography gives better separation and quantification of most PAHs than HPLC. PAH levels in various soil types have been compared using remote desert soil as a standard.
KEYWORDS: SOILS;WATER;PLANTS;SAMPLING;POLYCYCLIC AROMATIC HYDROCARBONS;SEPARATION PROCESSES;QUANTITATIVE CHEMICAL ANALYSIS;ENVIRONMENTAL TRANSPORT;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;CHEMICAL EFFLUENTS;POINT SOURCES

<000044>
TITLE: Toxicological and Physiological Effects of Heavy Metals and Selected Air Pollutants on Animals
PROJECT NUMBER: NJ-00620
PRINCIPAL INVESTIGATOR: Valengieri, A.J.
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MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (25%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: Determine physiological and biochemical effects of mercury and lead in animals. Specifically, central nervous system effects (spike potentials), cardiovascular system (atherogenesis) and the endocrine system (adrenal steroidiogenesis). Determine the acute (LD50) and chronic (MED50) parameters of CO, SO2, and NOx. Determine these parameters in combination. Study the effects of these air pollutants on respiratory system (exchange), reticulo-endothelial system, central nervous system (spike potentials, synaptic activity, locomotion, taxia, and sensitivity), cardiovascular system (atherogenesis). Attempt to correlate any overt physiological response to a biochemical mechanism.
APPROACH: Mercury and lead compounds will be administered to rats, rabbits and chicks by oral and parental routes. Standard sampling and biochemical techniques will be used in analysis. The study of the physiology and biochemistry of air pollutants will utilize cages housed in plastic envelopes, CO, SO2 or NOx will be pumped in, under flow and pressure controls. Radioisotope tracer methodology will be utilized in mobilization and precursor studies. Quantitative statistical analyses will be run and extension to human levels made.
RESULTS: Ninety-day female rats were fed an 8000 ppM diet containing lead chloride, ad lib. Control animals were fed a regular rat diet (Purina). Both groups were housed in a brightly-lighted room for forty-three hrs and then placed in Whaman Activity Wheels, in a darkened room for five hrs. This regime tends to maximize running activity because of dark-activity cycle deprivation. Revolutions, body weight, and food consumption were recorded daily. Urinary increment-aminolevulinic acid (ALA) and porphyrobilinogen (PB) were analysed weekly. Test animals showed possible hypoactivity of 46% pre-lead levels increasing to 68% after eight months on the lead diet. Control activity remained constant. ALA levels increased dramatically

(1000%) compared to the test animals, reflecting their high level of lead intoxication. PBb levels remained at the same levels as the control. This indicates the lead rats are still producing ample precursor (PBb) to hemoglobin, avoiding anemia.
KEYWORDS: MERCURY COMPOUNDS;LEAD COMPOUNDS;TOXICITY;RATS;RABBITS;CHICKENS;PHYSIOLOGY;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL EFFECTS;CARBON MONOXIDE;SULFUR DIOXIDE;NITROGEN OXIDES;SYNERGISM;INGESTION;CONTROLLED ATMOSPHERES;INHALATION

<000045>
TITLE: Biochemical Effects and Reaction of Sulfur Dioxide
PROJECT NUMBER: CA-D-VCR-3186-H
PRINCIPAL INVESTIGATOR: Yang, S.P.;Horng, A.J.;Peiser, G.
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MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
PROJECT DESCRIPTION: Examine the free radical damage of cell components which is caused by the aerobic oxidation of bisulfite, and the biochemical reactions by which bisulfite ions may inhibit enzymes and cause metabolic disturbance.
APPROACH: The first part consists of a study of the free radical damage of cell components caused by the aerobic oxidation of bisulfite or sulfite ions. The O2, OH, and SO3 radicals, which are generated during the aerobic oxidation of sulfite, are particularly suspect as toxic agents which may destroy amino acids, hormones, lipids and coenzymes. The second part is to examine the effect of sulfite ion on various enzyme and membrane systems and to characterize sulfite oxidase from plant sources. Sulfite oxidase has been suspected to be the key enzyme responsible for the detoxification of SO2. The third part will involve the in vivo effect of SO2 on metabolism of harvested fruits and the fate of SO2 in the fruit.
RESULTS: NADH and NADPH coenzymes are rapidly oxidized in presence of bisulfite, oxygen and peroxidase. Its reaction mechanism and oxidation products are investigated. Chlorophyll extracted from spinach leaves as well as purified chlorophyll in ethanolic solutions was rapidly destroyed, as measured by a decrease in absorbance, in the presence of sodium bisulfite, oxygen and light. Omission of sodium bisulfite, oxygen or light resulted in negligible destruction. The light requirement could be substituted by addition of manganous sulfate and destruction was further stimulated in the presence of linoleic acid. Hydroquinone, a free radical scavenger, inhibited both light and Mn(2+)-mediated (dark) destruction. These results suggest that free radicals produced during the aerobic oxidation of bisulfite are involved in the destruction of chlorophyll. Indole-3-acetic acid was rapidly destroyed in the presence of Mn(2+), oxygen and bisulfite into (2-sulfoindole)-3-acetic acid and dioxindole-3-acetic acid. A chemical mechanism accounting for the formation of the products is presented in which superoxide and hydroxyl radicals, produced during the aerobic oxidation of bisulfite, function as oxidizing agents.
KEYWORDS: PLANT CELLS;BIOCHEMICAL REACTION KINETICS;SULFUR DIOXIDE;TOXICITY;CELL CONSTITUENTS;COENZYMES;METABOLISM;FRUITS;OXIDATION;SULFITES;CELL MEMBRANES;OXIDASES

<000046>
TITLE: Poultry Production and Environmental Quality
PROJECT NUMBER: TEX-03368-RI
PRINCIPAL INVESTIGATOR: Cain, J.R.;Suter, D.A.
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MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Effects of poultry house environment and management practices on production efficiency and product quality. Effect of environmental pollutants of non-poultry enterprise origin on poultry production and product quality.
APPROACH: Develop a system in bioclimatic chambers whereby concentrations of gaseous components normally found in poultry production units can be controlled and measured accurately. Physiological responses of domestic birds to various concentrations of gases and dust will be evaluated. The interaction of gases such as CO2, NH3, CH4, and H2S with various air flow rates, temperatures and humidity levels will be studied. Investigate the interaction of poultry production and gases such as CO, H2S, SO2 and NO2 to ascerain the effect air pollution may have on food production and food quality.
RESULTS: A power failure of 14 minutes duration in an environmental broiler breeder house when ambient temperature was 96 F resulted in 112 F inside temperature and extreme concentrations of NH3, CO2 and moisture. Acute flock mortality of 6.2% occurred and egg production (HDP) dropped from 55% to 40% and remained there for three weeks before returning to previous levels. A power failure (1 hr duration) was simulated when ambient temperature was 64 F without ill effects on production. Inside temperatures reached 69 F, CO2 increased from 550 to 950 ppM and NH3 increased from 6 to 40 ppM during this power failure. Thus a winter power failure is probably of no economic consequence, but very brief losses of mechanical ventilation during the summer months can be devastating to both poultry and humans in the building. Diurnal samples of CO2, NH3 and dust were taken inside an environmental poultry facility at bird level where broiler breeders were housed at a density of 1 sq. ft./bird in 2/3 slat floors-1/3 litter floor pens. Samples were also taken at the exhaust effluents where air flow rates were either 9.5 or 13.5 cfm/bird.
KEYWORDS: CHICKENS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;TEMPERATURE EFFECTS;EGGS;MEAT;PRODUCTION;MORTALITY;PHYSIOLOGY;TESTING;CONTROLLED ATMOSPHERES;BIOASSAY;HUMIDITY;CARBON MONOXIDE;HYDROGEN SULFIDES;SULFUR DIOXIDE;NITROGEN DIOXIDE;BIOLOGICAL EFFECTS

<000047>
TITLE: Energy Requirements of Environmentally Influenced Decisions Involving Water Development and Use
PROJECT NUMBER: CA-D-WSE-3351-H
PRINCIPAL INVESTIGATOR: Hagan, R.M.
ADDRESS: Agricultural Experiment Station, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (33%);ORGANICS (33%);HEAT, THERMAL (34%)
PROJECT DESCRIPTION: Prepare a preliminary summary of energy requirements associated with alternative solutions to problems of water development and use; waste water disposal, reclamation, and re-use; water quality control including desalting; and drainage.
APPROACH: Energy requirements of proposed alternatives or decisions already made concerning water development and use will be analyzed using data from various agencies and numerous consultations with agencies and environmental groups. Use will be made of the working relations already established with the many water agencies, waste water services, environmental groups, and others.
RESULTS: A preliminary report has been prepared for publication examining direct energy requirements for a range of alternatives for water supply and use, waste-water treatment, and water reclamation and reuse. Municipal water supplies considered include surface storage and diversion projects, groundwater pumping, desalting, and waste-water reuse. Irrigation water supplies include groundwater pumping, delivery of water to major service areas through the Central Valley Project and State Water Project, and reuse of municipal waste water. Waste-water treatment methods include primary, secondary, and tertiary treatment, and land treatment. Methods used to estimate the amount of energy consumed indirectly for construction and maintenance of facilities are discussed. Estimates of indirect energy requirements are useful for comparing pumping plants powered by electricity, diesel, natural gas, etc. and for comparing energy costs of damage to household items by poor quality water with energy requirements for supplying water of improved quality. Net energy and total energy cost calculations (measurements of direct plus indirect energy requirements) are used to compare hydroelectric power plants with fosssil-fuel and nuclear plants.
KEYWORDS: CALIFORNIA;WATER RESOURCES;HYDROLOGY;WATER REQUIREMENTS;DECISION MAKING;IRRIGATION;SOCIO-ECONOMIC FACTORS;WATER QUALITY;COST BENEFIT ANALYSIS;WASTE WATER;DRINKING WATER;WASTE MANAGEMENT

<000048>
TITLE: Urban and Rural Environmental Quality Protection
PROJECT NUMBER: CA-D-LAW-2973-H
PRINCIPAL INVESTIGATOR: Myrup, L.O.
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AFFILIATION: California Univ., Davis (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Study the processes determining levels of air pollution. Develop mathematical models of various aspects of the air pollution regime. Improve means for measuring air pollution concentrations. Study the physical and chemical nature of particulates and their effect on atmospheric radiation. Quantify environmental parameters for introduction into the decision-making process.
APPROACH: The approach will be to make measurements of the amounts and properties of the various pollutants in the atmosphere, as well as their radiative effects, and to utilize these data in arriving at mathematical models of the processes involved.
RESULTS: Work on a new approach to modeling of diffusion of pollutants from a line source in the urban atmosphere was completed in this period. The model is based on similarity principles and is meant for practical calculations of the impact of highway emissions of primary pollutants on roadside air quality. Diffusion parameters in the model are calculated from readily available land-use information. Concentrations calculated with the model compare favorably with observations. An analysis was made of the three-dimensional meso-scale wind field over Sacramento, California. The data were gathered by means of a double theodolite pipal network. The measurements showed surprisingly high correlations between the stations to changes in time. Calculations of horizontal divergence indicated substantial subsidence for the summertime case considered. The calculated subsidence was large enough to constitute a significant source of clean air. Progress was made in a study of the relationships between land-use and emission of automotive air pollution. The analysis was based on data for Sacramento, California for the year 1971. It was found that the air quality of this particular city is dominated by freeways.
KEYWORDS: CALIFORNIA;ENVIRONMENT;URBAN AREAS;RURAL AREAS;AIR POLLUTION;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;METEOROLOGY;WIND;VELOCITY;TIME DEPENDENCE;LAND USE;AUTOMOBILES;EXHAUST GASES

<000049>
TITLE: Design and Management of Rural Ecosystems
PROJECT NUMBER: MICL-01202
PRINCIPAL INVESTIGATOR: Koenig, H.E.
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MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Evaluate the economic trade-offs in production agriculture with the physical and human resource requirements of rural landscapes as a function of structural features such as production technologies, scale of operations, locations and ecological characteristics. Develop alternative institutional policies and mechanisms through which the various patterns of land use, scale of operations and technologies can be motivated as related to energy policy, environmental quality, rural development, agricultural production and recreation.
APPROACH: Firm level models have been developed to evaluate the effect of scale and diversification on physical and environmental resources. These models will be expanded and applied to the regional level. The technical findings of this effort (translated for appropriate user groups) will aid in the identification of policy options associated with various land use constraints and objectives.
RESULTS: Conservation of energy and soil can be achieved by: (1) increased technical efficiencies and (2) introduction of more efficient land-use patterns. Basic principles for managing renewable and

non-renewable resources and irreversible conversions of arable land to promote these efficiencies are formulated. Energy and monetary cost trade-offs associated with alternative production systems have been extended to dairying and cash crop production. While the total production cost differences are surprisingly small among different dairy production technologies, the external nutrient requirements can be reduced by improving the recycling of animal waste. The land requirements per unit of dairy product can be significantly reduced by using corn silage instead of alfalfa in meeting the animal's energy requirements. The short-run effect of fertilization intensity on yield was evaluated along with the long-run effects on soil carbon levels. Steady-state soil carbon and yield levels were estimated for alternative production systems. Preliminary results indicate that improper fertilization and cropping practices can have severe long-term impacts on soil carbon levels.
KEYWORDS: RURAL AREAS;AGRICULTURE;LAND USE;ENVIRONMENT;PLANNING;SOCIO-ECONOMIC FACTORS;MILK;PRODUCTION;CATTLE;NUTRIENTS;FERTILIZERS;BIOLOGICAL WASTES;SOILS;CHEMICAL COMPOSITION;CARBON;WASTE MANAGEMENT

<000050>
TITLE: Economic and Environmental Implications of Water and Related Natural Resource Uses
PROJECT NUMBER: CA-D-AEC-3387-H
PRINCIPAL INVESTIGATOR: Snyder, J.H.;Hansen, D.E.;Howitt, R.E.
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AFFILIATION: California Univ., Davis (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: Identify present and potential economic and environmental effects of alternative patterns or programs for natural resource development and use, including energy relationships. Evaluate resource requirements and development potential for water and related natural resources important to the agricultural and non-agricultural sectors of California. Appraise institutional, political and legal relationships and public policies associated with use and development of water and related natural resources.
APPROACH: Determine present economic activity in specific regions, basins, or other meaningful units relevant to current patterns of water and related natural resource use and development, including energy relationships. Identify and measure economic, environmental, and social impact of alternative patterns for resource use associated with changing markets, changing technology, energy sources and availability, etc. Analyse economic, environmental and social consequences--including measurement of trade-offs--of changes in resource use patterns needed to meet objectives of economic development and maintenance of environmental quality. Analyse effectiveness of institutional frameworks in attaining objectives of economic development and environmental quality.
RESULTS: Snyder--Journal papers in progress based on dissertation, ''An Economic Evaluation of Benefit Cost Analysis with Special Reference to the Derived Demand for Irrigation Water for Tree Fruits and Nuts, and Grapes in California.'' A San Joaquin Valley Basin study in progress, ''The Development of Investment Criteria fcr Installing Subsurface Drainage Systems.'' Paper being revised, an economic evaluation by project agencies based on benefit cost analysis. Paper discusses consistent economic analysis and provides an overall theory of resource planning. Hansen--Background study has been presented as a paper at a Conference on Agriculture in the Future and Its Implications for Land-Use Planning and published in the Proceedings. Work planned: Look at transferable development rights. Apply use to water as a means of allocating land along waterways. Johnston--Manuscript being revised, ''Remote Recreational Subdivision: Anticipated Rural Community Impacts in California's Northeastern Plateau'' based on purchaser characteristics.
KEYWORDS: CALIFORNIA;LAND USE;AGRICULTURE;SOCIO-ECONOMIC FACTORS;ENVIRONMENTAL EFFECTS;ENERGY SOURCES;ENERGY DEMAND;PUBLIC OPINION;WATER RESOURCES;REGIONAL ANALYSIS;COST BENEFIT ANALYSIS;IRRIGATION

<000051>
TITLE: Interactions of Chemical Pollutants and Microorganisms in the New Jersey Coastal Environment
PROJECT NUMBER: NJ-00507
PRINCIPAL INVESTIGATOR: Bartha, R.;Antoine, A.D.
ADDRESS: Old Queens Building, New Brunswick, NJ 08903
AFFILIATION: Rutgers--the State Univ., New Brunswick, N.J. (USA)
MONITORING AGENCY: Cooperative State Research Service, Washington, D.C. (USA)
77 FUNDING: Cooperative State Research Service
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Identify and assess specific pollution hazards that will suggest remedies or cleanup procedure.
APPROACH: The interaction of various chemical pollutants such as petroleum hydrocarbons, polychlorinated biophenyls, persistent pesticide residues, heavy metals, especially mercury, and of pollutants that give rise to eutrophication with estuarine microorganisms will be investigated in both laboratory and field experiments. The action of the pollutants on essential microbial processes such as organic matter degradation, nitrification, nitrogen fixation, etc., will be investigated. The concentration of pollutants in microorganisms and through them in higher members in estuarine food chains will be measured by radiometric techniques. Gas chromatography, mass spectrometry and atomic absorption spectrometry will be used in analysis for pollutants.
RESULTS: The biodegradation of South Louisiana (SL) crude oil, and the effects of nitrogen, phosphorus and iron supplements on this process were compared in a polluted and in a relatively clean littoral sea water sample taken along the New Jersey coast. Without supplements, the biodegradation of SL crude oil was negligible in both sea water samples. Addition of nitrogen and phosphorus allowed very rapid biodegradation (72% in 3 days) in polluted sea water. Total iron in this sea water sample was high (5.2 mu M), and the addition of iron did not increase the biodegradation rate further. In the less polluted and less iron-rich (1.2 mu M) sea water sample, biodegradation of SL crude oil was considerably slower (21% in 3 days) and the addition of chelated iron had a stimulating effect. Ferric octoate was shown to have a similar stimulating effect on SL crude oil biodegradation as chelated iron, and this oil-soluble compound, in combination with paraffinized urea and octylphosphate is suitable for treatment of floating oil slicks. We conclude that spills of SL crude oil can be cleaned up rapidly and efficiently by stimulated biodegradation, provided the water temperatures are favorable. The testing of microbiological denitrification by samples from the Cheesequake Park area salt marshes have indicated optimum conditions

for pH, temperature, nitrate-nitrogen concentration and inoculum levels. These results are being applied to the develcpment of a test procedure for monitoring denitrification in the field.
KEYWORDS: AQUATIC ECOSYSTEMS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;FOOD CHAINS;MICROORGANISMS;AQUATIC ORGANISMS;ESTUARIES;COASTAL REGIONS;COASTAL WATERS;PETROLEUM PRODUCTS;METALS;MERCURY;BIOLOGICAL WASTES;DECOMPOSITION;NEW JERSEY;SEAWATER;CHEMICAL REACTIONS;PETROLEUM;WATER POLLUTION;BIOLOGICAL EFFECTS

<000052>
TITLE: Nitrogen and Sulfur Transformations in Soils Related to Fertilizer and Pollution Problems
PROJECT NUMBER: IOW02096
PRINCIPAL INVESTIGATOR: Bremner, J.M.
ADDRESS: Beardshear Hall, Ames, IO 50010
AFFILIATION: Iowa State Univ. of Science and Technology, Ames (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Iowa
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Obtain detailed information concerning nitrogen and sulfur transformations in soils related to fertilizer and pollution problems.
APPROACH: Processes responsible for volatilization of nitrogen and sulfur from soils, and factors affecting these processes, will be studied. The processes investigated will include denitrification, chemodenitrification, urea hydrolysis, sulfate reduction, and biodegradation of organic sulfur compounds. Methods of controlling nitrification, urea hydrolysis, and other nitrogen transformation processes in soils that affect crop utilization of nitrogen and contribute to air and water pollution problems will be evaluated, and factors influencing the effectiveness of nitrification and urease inhibitors will be determined. The fate of urease added to soils will be studied, and factors affecting urease activity and urease levels in soils and sorption of urea by soils will be investigated. The ability of soils to sorb sulfur and nitrogen gases identified as atmospheric pollutants, including NO, NO2, SO2, and H2S, will be studied, and the potential value of soils for purification of air polluted by these gases will be assessed.
RESULTS: Studies of factors affecting the production and persistence of urease activity in soils showed that treatment of soils with urea did not induce urease activity, but that production of urease activity occurred on addition of glucose and other materials that promote microbial activity. The persistence of the urease activity produced by addition of these materials varied with the soil, but, with each soil studied, the urease activity after addition of organic materials eventually was identical to that of the unamended soil. No increase or decrease in urease activity was observed when unamended soils were incubated under aerobic or waterlogged conditions for several months. This work and other studies performed indicate that soil constituents protect urease against microbial degradation and other processes leading to inactivation of enzymes and that every soil has a stable level of urease activity determined by the ability of its constituents to provide this protection. Studies of the relationship between soil urease activity and other soil properties suggest that organic soil constituents are largely responsible for the remarkable stability of native soil urease.
KEYWORDS: NITROGEN;SULFUR;SOIL CHEMISTRY;AIR POLLUTION;LAND POLLUTION;FERTILIZERS;ENVIRONMENTAL IMPACTS;AGRICULTURE

<000053>
TITLE: Coal Industry As a Basis for Rural Development in Eastern Kentucky
PROJECT NUMBER: KY00043
PRINCIPAL INVESTIGATOR: Randall, A.;Pagoulatos, A.
ADDRESS: Limestone and Euclid, Lexington, KY 40506
AFFILIATION: Kentucky Univ., Lexington (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Kentucky
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Estimate income and employment multipliers for the coal industry in eastern Kentucky. Analyze the economics of the coal mining industry, and hence, the relationship between the price of coal and the level of activity in the coal industry. Estimate the impact of the coal industry of local public sector revenues and the demand for local government services. Evaluate the potential impact of the coal industry on income, employment, local public sector finances and quality of life in eastern Kentucky.
APPROACH: The impact of potential changes in demand for coal, mining technology and policies (e.g., taxation, environmental, health and safety) on employment, income, local public finances and quality of life will be estimated. Tasks include input-output analysis of the eastern Kentucky regional economy, estimation of the supply and demand relationships for eastern Kentucky coal, flow of funds analysis of local government finances as impacted by the coal industry, and analysis of the impacts of alternative policies on the target variables.
RESULTS: Work initiated on coal supply response, income and employment multipliers for the coal sector, and fiscal impact of coal industry on local government.
KEYWORDS: KENTUCKY;COAL INDUSTRY;SOCIO-ECONOMIC FACTORS;ECONOMIC IMPACT

<000054>
TITLE: Impact of Petroleum-Related Developments on the Coastal Zone
PROJECT NUMBER: RI00150
PRINCIPAL INVESTIGATOR: Grigalunas, T.A.
ADDRESS: Administration Building, Wakefield, RI 02881
AFFILIATION: Rhode Island Univ., Wakefield (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Rhode Island
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS (20%);ORGANICS (30%);VISUAL AESTHETICS (50%)
PROJECT DESCRIPTION: Assess the resource planning issues that may result from offshore oil and gas

development; prepare policy recommendations based on the study findings.
APPROACH: Postulate alternative petroleum-development hypotheses; relate the resulting demands for land use to southeastern New England. Inventory the availability constraints of resources central to the support of OCS operations; assess management issues.
KEYWORDS: RHODE ISLAND;COASTAL WATERS;ENVIRONMENTAL EFFECTS;LAND USE;PETROLEUM;NATURAL GAS;OFFSHORE DRILLING

<000055>
TITLE: Effects of Air Pollution on Tree Growth and Forest Community Composition
PROJECT NUMBER: OH000015-MS
PRINCIPAL INVESTIGATOR: McClenahen, J.R.;Weidensal, T.C.
ADDRESS: Ohio Agric. Res. and Dev. Center, Wooster, OH 44691
AFFILIATION: Ohio Agricultural Research and Development Center, Wooster (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Ohio
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: Determine relative gradients for SOx, F, and Cl in forests in a portion of the Ohio River Valley in SE Ohio; compare radial growth of selected tree species and species composition, diversity, and structure in mature mixed mesophytic stands to the relative air pollutant gradients.
APPROACH: Structure and composition will be determined for a number of mature stands at varying distances from sources of airborne SOx, F, and Cl. Importance values for major species and indices of stand diversity developed from this analysis will be compared with relative gradients of the above air pollutants. Relative pollutant gradients will be established for each stand by exposure of sulfation plates (SOx) and vegetation analyses for F and Cl. Correlation analysis will be used to compare radial growth of two or more common tree species with relative pollutant levels.
KEYWORDS: AIR POLLUTION;TREES;GROWTH;GENETIC VARIABILITY;OHIO;TERRESTRIAL ECOSYSTEMS;SULFUR DIOXIDE;FLUORINE;CHLORINE;BIOLOGICAL EFFECTS;DOSE-RESPONSE RELATIONSHIPS

<000056>
TITLE: Influence of Sulfur Dioxide on Forest-Ecosystems of the Northeastern United States
PROJECT NUMBER: PEN12210
PRINCIPAL INVESTIGATOR: Davis, D.D.
ADDRESS: 201 Shields Bldg., University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Pennsylvania
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
PROJECT DESCRIPTION: Determine the relative SO2 susceptibility of woody plants in northeastern United States; study the influence of environmental factors on response; and develop a model for predicting SO2 injury to vegetation.
APPROACH: Seedlings of forest tree species and associated understory vegetation will be exposed to acute and/or chronic levels of SO2 in specially constructed exposure chambers. The relative susceptibility of various species will be determined based on precentage of foliage injured. Temperature, humidity, and light will be varied and plant response to SO2 recorded under various regimes. A computer model will be developed to express findings.
KEYWORDS: SULFUR DIOXIDE;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL EFFECTS;AIR POLLUTION;TREES;SEEDLINGS;INJURIES

<000057>
TITLE: Effects of Air Pollution on Native Plants and Crops of Wyoming
PROJECT NUMBER: WYO-123-076
PRINCIPAL INVESTIGATOR: Bridgmon, G.H.;Lang, R.L.
ADDRESS: P.O. Box 3944, University Station, Laramie, WY 82071
AFFILIATION: Wyoming Univ., Laramie (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service, Wyoming
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: Determine acute injury symptoms of SO2 and other pollutants on various crop and native plants of Wyoming and in areas where such pollution is anticipated. Appraise factors which influence the amount of damage to plants by fumigation, i.e., temperature, relative humidity, presence of moisture, etc. Select indicator plants that show more susceptibility to injury in areas of the state as visual indicators of pollution damage.
APPROACH: Fumigation of many plant species will be made in both closed and open top chambers for various periods of times at varying measured rates of SO2 or other pollutants. Readings on symptoms of injury will be determined after fumigation to determine dose-response-time and recovery-time. Photographic records will be made of the vegetation and damage after exposure. Records will be kept on concentrations or amounts of gas or pollutants, time of exposure, species of plants, growth stage, temperature, humidity, available moisture, condition of plants and types of damage caused (symptoms). Fumigation will be made on both native species and many crop plants including introduced vegetables and ornamental plants to determine most susceptible and thus the best indicator plants in the area.
KEYWORDS: AIR POLLUTION;PLANTS;BIOLOGICAL EFFECTS;CROPS;WYOMING;HABITAT;BIOLOGICAL INDICATORS;SULFUR DIOXIDE;AGRICULTURE;VEGETABLES

<000058>
TITLE: Role of Microorganisms in Waste Disposal
PROJECT NUMBER: WVA00244
PRINCIPAL INVESTIGATOR: Hoe, P.G.;Bissonnette, G.K.
ADDRESS: Agricultural and Forestry Export Station, Morgantown, WV 26506
AFFILIATION: West Virginia Univ., Morgantown (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service West Virginia
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (60%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: Study: Anaerobic digestion for disposal of wastes generated in a family dwelling unit; disposal of effluent and sludge from community sewage disposal plants; generation of methane gas through the anaerobic digestion of animal manures; aerobic composting of manures; soil applications as a waste disposal system for industrial waste materials; disposal of acid mine drainage, and the disposal of industrial wastes in aquatic environments.
APPROACH: Laboratory and field experiments will be conducted of waste applications in aquatic and edaphic ecosystems. Systems will be evaluated for their microbiological populations and biological activity. Environmental factors will be manipulated to estimate optimum conditions for biological activity. Effects of toxicity, synergism and antagonism within the populations will be investigated.
KEYWORDS: WASTE DISPOSAL;MICROORGANISMS;ENVIRONMENTAL EFFECTS;BIODEGRADATION;SEWAGE;MUNICIPAL WASTES;METHANE;BIOSYNTHESIS;MANURES;ANAEROBIC CONDITIONS;AEROBIC CONDITIONS;INDUSTRIAL WASTES;AGRICULTURAL WASTES;ACID MINE DRAINAGE;AQUATIC ECOSYSTEMS;TOXICITY;SYNERGISM;PREFERRED SPECIES

<000059>
TITLE: Biological Indicators of Environmental Quality in California Lakes and Streams
PROJECT NUMBER: CA-B-ENT-3806-H
PRINCIPAL INVESTIGATOR: Resh, V.H.
ADDRESS: Agric. Experiment Station, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service California
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: METALS (25%);PARTICULATES (25%);ORGANICS (25%);HEAT, THERMAL (25%)
PROJECT DESCRIPTION: Develop the concept of biological indicators of environmental quality as applied to California's lake and stream environments. Analyze the effect of potential impacting activities (e.g. geothermal energy development, organic and heavy metal effluents) on the energy transfer processes in aquatic ecosystems.
APPROACH: Streams and lakes throughout California will be selected for study. A statistically-sound sampling regime will be developed for quantitative biotic collections and measurements of key water chemistry and physical parameters. Diversity indices, production estimates, and bioassay procedures will be applied in specific cases. A matrix data arrangement will be developed in which biological information, water chemistry measurements, and physical parameters can be used in preparing predictive models of the dynamic interactions occurring in these environments.
KEYWORDS: BIOLOGICAL INDICATORS;WATER QUALITY;CALIFORNIA;LAKES;STREAMS;GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS;ORGANIC COMPOUNDS;METALS;CHEMICAL EFFLUENTS;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;BASELINE ECOLOGY

<000060>
TITLE: Interrelationship Between Heavy Metals and Trees
PROJECT NUMBER: NJ00365
PRINCIPAL INVESTIGATOR: Brennan, E.
ADDRESS: Old Queens Building, New Brunswick, NJ 08903
AFFILIATION: Rutgers--the State Univ., New Brunswick, N.J. (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service New Jersey
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/Heavy metals;lead;METALS/Calcium (100%)
PROJECT DESCRIPTION: Utilize trees as a model system for studying the behavior of heavy metals in biological systems. The objective will be to determine if lead follows the same pattern as cadmium in respect to uptake and accumulation by 15 selected species of trees.
APPROACH: With a view toward evaluating not only phytotoxicity but also the possible merit of trees as sinks, will examine the interaction between trees and Cd. Emphasis will be placed on controlled greenhouse experiments. With hybrid poplar clone as model will concentrate on obtaining dose response data. Using 4 concentrations of Cd and both root and shoot application, will particularly focus on: macroscopic systems of Cd toxicity, rate of Cd accumulation in foliage, rate of linear growth of shoots, rate of photosynthesis in leaves, partition of Cd into leaves, stems, and roots, recovery from Cd toxicity. Continue field study of 1974-75 at the sites involving varying volumes of vehicular traffic.
KEYWORDS: METALS;TREES;ENVIRONMENTAL EFFECTS;BIOLOGICAL MODELS;UPTAKE;CADMIUM;GREENHOUSES;ROOT ABSORPTION;TOXICITY;LEAD;CALCIUM

<000061>
TITLE: Forest Ecosystems as Influenced by the Northwest Alloys Magnesium Plant
PROJECT NUMBER: WNP00231
PRINCIPAL INVESTIGATOR: Zamora, B.A.
ADDRESS: Pullman, WA 99163
AFFILIATION: Washington State Univ., Pullman (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Washington
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (70%);SPECIFIED OTHER POLLUTANTS/Multiple (30%)
PROJECT DESCRIPTION: Establish a data base on forest ecosystems prior to operation of the plant. Document atmospheric sulfur concentrations above the Addy Valley floor both prior to and after plant operations

begin. Determine changes in forest ecosystems within a 10-mile radius of the plant and determine if such changes are caused by increased atmospheric sulfur concentration. Record lateral air movement above the Addy Valley floor.
APPROACH: Normal ecosystem parameters including biological, atmospheric, and meteorologic factors, will be documented prior to operation of the magnesium plant. Subsequent measurements of the same factors will be made in successive years after the plant comes into operation, to determine the effect of emissions (primarily SO2) on surrounding forest ecosystems.
KEYWORDS: FORESTS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL MODELS;DATA ACQUISITION;SULFUR DIOXIDE;AIR QUALITY;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL EFFECTS;MAGNESIUM;INDUSTRY;METEOROLOGY

<000062>
TITLE: Impacts of Coal-Energy Development in N.E. Wyoming on Agriculture and Related Environment Aspects
PROJECT NUMBER: WY000998-WS
PRINCIPAL INVESTIGATOR: Jacobs, J.J.;Vanvig, A.
ADDRESS: P.O. Box 3944, University Station, Laramie, WY 82071
AFFILIATION: Wyoming Univ., Laramie (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service Wyoming
77 FUNDING: Department of Agriculture
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: PARTICULATES/Coal residues (100%)
CHARACTER OF STUDY: RESEARCH/General (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Freshwater
PROJECT DESCRIPTION: Identify the nature and magnitude of land and water transfers associated with coal-energy development in northeastern Wyoming, quantify the benefits and costs of coal mineland reclamation, evaluate the potential impact of coal mines on the surrounding groundwater aquifer, and estimate the impact on agriculture of alternative levels and types of coal-energy development.
APPROACH: Data will be collected on land, water and mineral transfers and leases occurring between ranchers and coal development interests in northeastern Wyoming from public records, state agencies and personal interviews. Data on water demands, groundwater aquifers, and costs of mineland reclamation will be obtained from secondary sources. Productivity of reclaimed land will be determined from several reclaimed areas in the state. A linear programming model will be used to estimate the impact of coal developments on agriculture.
KEYWORDS: ENERGY SOURCE DEVELOPMENT;AGRICULTURE;LAND USE;LAND RECLAMATION;WYOMING;COAL INDUSTRY;ENVIRONMENTAL IMPACTS;COAL;DATA ACQUISITION;LINEAR PROGRAMMING;COMPUTER CALCULATIONS

<000063>
TITLE: Perceptions of Scarcity and Willingness to Alter Consumption Patterns in New Mexico
PROJECT NUMBER: NM00250
PRINCIPAL INVESTIGATOR: Eastman, C.;Stevens, T.
ADDRESS: University Park, Las Cruces, NM 88070
AFFILIATION: New Mexico State Univ., Las Cruces (USA)
MONITORING AGENCY: Department of Agriculture, Washington, D.C. (USA)
DIVISION: Cooperative State Research Service New Mexico
77 FUNDING: Department of Agriculture
TECHNOLOGY: CONSERVATION/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: Estimate future energy resource scarcity and identify associated environmental problems in New Mexico; determine citizens' perception of scarcity of energy resources and associated environmental problems; determine citizens' willingness to alter consumption patterns in response to No. 1; develop scenarios of alternative life styles on the basis of revealed preferences in No. 2; elaborate policy options.
APPROACH: Estimates of resources will be based on secondary data; perceptions and willingness to alter consumption will be determined by questionnaire survey; the scenarios and policy will be based on questionnaire results.
KEYWORDS: ENERGY SOURCES;ENERGY SUPPLIES;ENERGY CONSERVATION;PUBLIC OPINION;ENVIRONMENT;NEW MEXICO;ENERGY SHORTAGES;CONSUMPTION RATES;HUMAN POPULATIONS

<000541> 071914
TITLE: Design and Construction of a Prototype X-Ray Diffraction Instrument for Analysis of Asbestos Fibers in Air and Water
PROJECT NUMBER: G712B-BA-16
PRINCIPAL INVESTIGATOR: Birks, L.S.;Fatemi, M.;Johnson, E.T.;Whitlock, R.R.;Gilfrich, J.V.
AFFILIATION: Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wagman, J.
77 FUNDING: Environmental Protection Agency FY77:$95,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: This is a follow-up to an earlier study that demonstrated the feasibility of an x-ray diffraction measurement technique for asbestos involving prealignment of fibers and direct measurement of mass concentrations.
APPROACH: Additional effort will be devoted to optimizing the sample preparation procedure, including the following steps: (1) Separation of the sample from the collection substrate, (2) Removal of non-asbestos material, (3) Fiber pretreatment to facilitate alignment, and (4) The alignment procedure itself, e.g., alignment medium, grid voltage, etc. Finally, a specially-designed x-ray diffraction analyzer will be fabricated for use by ESRL/RTP.
PROJECT MILESTONES: (1) 06/77 Complete transfer of measurement technology to ESRL.
KEYWORDS: ASBESTOS;FIBERS;AIR;WATER;CHEMICAL ANALYSIS;SAMPLE PREPARATION;OPTIMIZATION;MEASURING INSTRUMENTS;DESIGN;X-RAY DIFFRACTION;FEASIBILITY STUDIES;DESIGN;X-RAY DIFFRACTOMETERS

Department of Commerce/Assistant Secretary - Environmental Affairs

<011001>
TITLE: Environmental Energy Consumption of the Pulp and Paper Industry
PRINCIPAL INVESTIGATOR: Gillespie, W.J.
ADDRESS: Weston Way, West Chester, PA 19380
AFFILIATION: Weston (Roy F.), Inc., West Chester, Pa. (USA)
MONITORING AGENCY: Department of Commerce, Washington, D.C. (USA)
DIVISION: Office of Environmental Affairs
MONITOR: Grant, Robert B.
TELEPHONE: F377-2652
TYPE OF FUNDING: Contract No.-6-35537
77 FUNDING: Department of Commerce FY77:$61,700
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the project titled Environmental Energy Consumption study in the Pulp and Paper Industry is to identify and quantify the energy requirements resulting from environmental controls for the various unit processes in the industry. Data will be developed on existing and projected pre-plant, and post-plant consumption of energy for attainment of existing Federal, State, and local air and water pollution control requirements. Alternative control options which would consume less energy while remaining consistent with the need to protect public health, in the case of air pollution under the Clean Air Act, and best practicable technology for water pollution as defined in Public Law 92-500 will be identified.
APPROACH: Review all state, local, and Federal laws and regulations with respect to air and water pollution control. Review and evaluate all available environmental energy consumption data with respect to existing plants. Supplement and project the known energy data with an appropriate survey, interviews, on-site visits together with the application of computer modeling techniques where necessary. Reevaluate and assess the data taking into account direct and indirect energy impacts and the identification of key variables to provide a total comprehensive environmental energy accounting system for the industry.
RESULTS: The results are twofold: (1) To show how and to what extent environmental requirements increase energy consumption, and (2) The potential savings in energy consumption that exists from lessening the stringency of environmental constraints, allowing the use of alternate technologies and reducing treatment requirements from present levels to requisite public health levels and best practicable control technology.
PROJECT MILESTONES: (1) April 1976 Award contract. (2) July 1976 Interim report. (3) September 1976 Draft report. (4) March 1977 Final report.
KEYWORDS: PAPER;INDUSTRIAL PLANTS;ENVIRONMENTAL EFFECTS;DATA ACQUISITION;AIR POLLUTION;WATER POLLUTION;CONTRCL;ENERGY;CONSUMPTION RATES;POLLUTION REGULATIONS;ECONOMICS;POLLUTION CONTROL EQUIPMENT;ENERGY CONSUMPTION;COST BENEFIT ANALYSIS;COMPUTER CODES

<011002>
TITLE: Environmental Energy Consumption of the Fossil Fuel-Steam Electric Generating Industry
PRINCIPAL INVESTIGATOR: Murphy, B.L.
ADDRESS: 696 Virginia Road, Concord, MA 01742
AFFILIATION: Environmental Research and Technology, Inc., Concord, Mass. (USA)
MONITORING AGENCY: Department of Commerce, Washington, D.C. (USA)
DIVISION: Office of Environmental Affairs
MONITOR: Grant, Robert B.
TELEPHONE: F377-2652
TYPE OF FUNDING: Contract No.-5-35636;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$55,000; Department of Commerce FY77:$75,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of project is to identify and quantify the energy requirements resulting from environmental controls for the various unit processes in the industry. Data will be developed on existing and projected pre-plant, and post-plant consumption of energy for attainment of existing Federal, State, and local air and water pollution control requirements. Alternative control options which would consume less energy while remaining consistent with the need to protect public health, in the case of air pollution under the Clean Air Act, and best practicable technology for water pollution as defined in Public Law 92-500 will be identified.
APPROACH: Review all state, local, and Federal laws and regulations with respect to air and water pollution control. Review and evaluate all available environmental energy consumption data with respect to existing plants. Supplement and project the known energy data with an appropriate survey, interviews, on-site visits together with the application of computer modeling techniques where necessary. Reevaluate and assess the data taking into account direct and indirect energy impacts and the identification of key variables to provide a total comprehensive environmental energy accounting system for the industry.
RESULTS: The results are twofold: (1) To show how and to what extent environmental requirements increase energy consumption, and (2) The potential savings in energy consumption that exist from lessening the stringency of environmental constraints, allowing the use of alternate technologies and reducing treatment requirements from present levels to requisite public health levels and best practicable control technology.
PROJECT MILESTONES: (1) Award contract June 1976. (2) Interim Report September 1976. (3) Final Report November 1976.
KEYWORDS: ENERGY;CONSUMPTION RATES;INDUSTRIAL PLANTS;ENVIRONMENTAL EFFECTS;DATA ACQUISITION;EARTH ATMOSPHERE;FLUE GAS;WATER QUALITY;FOSSIL FUELS;ELECTRIC POWER;STEAM;AIR POLLUTION;WATER POLLUTION;CONTROL

<011004>
TITLE: Environmental Energy/Economic Assessment of the Iron and Steel Industry
MONITORING AGENCY: Department of Commerce, Washington, D.C. (USA)
DIVISION: Office of Environmental Affairs
MONITOR: Grant, Robert B.
TELEPHONE: P377-2652
TYPE OF FUNDING: Agency in-house effort-35604
77 FUNDING: Department of Commerce FY77:$100
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this study is to investigate in detail the technological opportunities for reducing the amount of energy consumed in pollution control activities, and provide the relevant environmental energy, legal and economic information concerning alternative control options to the present mandated controls. This study will go beyond the study of energy costs to address the social and economic costs of environmental goals and the comparison of cost effectiveness (in economic and other measures) for various levels of goals.
APPROACH: Using the comprehensive environmental energy consumption data from the study prepared for the Office of Environmental Affairs integrate additional technological or procedural pollution control options of the following nature: (1) performance characteristics including pollutant removal efficiencies; (2) capital and operating costs, economic impacts including growth effects; (3) material resource requirements; (4) impact on product characteristics; together with other similar factors into an informational framework for presenting and evaluating control options for decisionmaking purposes.
RESULTS: The results of this study are to provide an informational basis for decisionmakers for the possible reformulation of Federal environmental policies, regulations, and legislation.
PROJECT MILESTONES: (1) September 1976 Award contract. (2) February 1977 Interim report. (3) December 1977 Final report.
KEYWORDS: INDUSTRY;POLLUTION CONTROL;SOCIAL IMPACT;ECONOMIC IMPACT;AIR POLLUTION;WATER POLLUTION;CHEMICAL EFFLUENTS;DECISION MAKING;POLLUTION REGULATIONS

Department of Commerce/National Bureau of Standards

<012001>
TITLE: Radiological Pollutant Quality Assurance
PROJECT NUMBER: 2408475 (NBS)
PRINCIPAL INVESTIGATOR: Hutchinson, J.M.R.
ADDRESS: National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Environmental Protection Agency, Office of Energy, Minerals and Industry
MONITOR: D'Allesio, Gregory
TELEPHONE: C(202)426-4567
TYPE OF FUNDING: Interagency agreement-EPA-IAG-IO No. D6-E684
77 FUNDING: Environmental Protection Agency FY77:$51,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);NUCLEAR/Fission:Converters;NUCLEAR/Fission:Breeders (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);PRODUCTION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The aim of the project is to improve and assure the accuracy and reliability of measurements of environmental alpha-particle and gamma-ray emitting radioactivity generated by both fossil fuel power plants and new nuclear power and fuel-cycle plants.
APPROACH: Establish traceability to the EPA Q.C. Laboratory Las Vegas for these materials by making tests on their measurement capability. Produce standards and test samples for EPA distribution to their monitoring networks.
RESULTS: Standards. Test samples. Improved radioactivity measurements.
PROJECT MILESTONES: (1) Po-210 1976; (2) Ra-226, mixed gamma, Pu-239 1977; (3) mixed gamma soil 1978; (4) Th-230, Pu-238, Pu-241 1978; (5) Am-241, Am-242, U-235, U-238 1979; (6) Pb-210, Th-232, Cm-242, Cm-244 1980.
KEYWORDS: ENVIRONMENT;RADIATION MONITORING;ALPHA SOURCES;GAMMA SOURCES;RADIOACTIVITY;DIFFUSION;FOSSIL-FUEL POWER PLANTS;NUCLEAR POWER PLANTS;POLONIUM 210;RADIUM 226;PLUTONIUM 239;THORIUM 230;PLUTONIUM 238;PLUTONIUM 241;AMERICIUM 241;AMERICIUM 242;URANIUM 235;URANIUM 238;LEAD 210;THORIUM 232;CURIUM 242;CURIUM 244;CARCINOGENS;RADIOACTIVE EFFLUENTS;INGESTION

<012002>
TITLE: Development of Standard Reference Materials, Instrumentation and Methods Needed for Monitoring Air Quality Associated with Energy Development
PROJECT NUMBER: D6-E684-79 BCLa
PRINCIPAL INVESTIGATOR: Kirchhoff, W.H.
ADDRESS: Office of Air and Water Measurement, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: D'Alessio, Gregory J.
TELEPHONE: C(202)426-4567
TYPE OF FUNDING: EPA pass-thru funding-IAG D6-E684
77 FUNDING: Environmental Protection Agency FY77:$415,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub 2/;NOXIOUS GAS/CO (40%);PARTICULATES (30%);SPECIFIED OTHER POLLUTANTS/Trace elements in fuel (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale

(50%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To provide the means for the accurate measurement of sulfur dioxide, nitrogen dioxide, carbon monoxide, particulates and other pollutants likely to result from energy production.
APPROACH: Develop Standard Reference Materials (SRMs) for use in the validation of pollutant measurement methods and instruments. Develop SRMs characteristic of raw materials used in combustion processes in order to validate measurement methods used to analyze fuel prior to combustion. By assessing the perfcrmance of measurement methods on certified SRMs, whose properties are accurately known, sources of error in the measurement methods can be identified and the effects of error can be reduced.
RESULTS: Certification and issuance of Standard Reference Materials of SO/sub 2/ in nitrogen, O/sub 2/ in nitrogen, NO/sub 2/ in air, CO in air, airborne particulates, raw materials for combustion processes and associated fuels.
PROJECT MILESTONES: Major Milestones: (a) NO/sub 2/ in air gas blend SRM's at concentrations of 250 ppM, 500 ppM, 1,000 ppM, 2,500 ppM, 1/78 + 9 mos.; (b) O/sub 2/ in nitrogen gas blend at concentrations of 2% and 10%, 6/78; (c) H/sub 2/S in hydrocarbon gas blend SRM for refinery gas stream monitoring, 10/78 + 9 mos.; (d) Gas blend SRM's of 0.1 to 1 ppM concentrations of i) SO/sub 2/ in air, ii) NO/sub 2/ in air and iii) NO in N/sub 2/, 2/78 + 9 mos.; (e) Gas blend of 1 ppM of CO in air (9, 14 and 45 ppM on shelf), 1/78; (f) Standards for X-Ray fluorescence measurements of particulates collected on filter paper, 10/78; (g) Particulate Chemical and Physical Property Standards, 10/78; (h) Standards for raw materials analysis, complete; (i) Standards for products analysis, 6/78; (j) Standards for residue analysis. Evaluate methodology for the organic analysis of coal gas-liquid system products and residues and determine the standards requirements for such analyses, 12/78; (k) Standards for the analysis of oil shale, 10/77.
KEYWORDS: STANDARD REFERENCE MATERIALS;AIR QUALITY;MONITORING;SULFUR DIOXIDE;NITROGEN OXIDES;CARBON MONOXIDE;PARTICLES;AIR POLLUTION;MEASURING METHODS;ERRORS;GASEOUS WASTES;CHEMICAL EFFLUENTS;DIFFUSION;ENVIRONMENT;MULTI-ELEMENT ANALYSIS;COMBUSTION PRODUCTS;STANDARDS;HYDROGEN SULFIDES

<012003>
TITLE: Water Quality Assurance
PROJECT NUMBER: D6-E684-79BCM
PRINCIPAL INVESTIGATOR: Kirchhoff, W.H.
ADDRESS: Office of Air and Water Measurement, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: D'Alessio, Gregory J.
TELEPHONE: C(202)426-4567
TYPE OF FUNDING: EPA pass-thru funding-IAG D6-E684
77 FUNDING: Environmental Protection Agency FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (85%);NUCLEAR/General (10%);GEOTHERMAL/General (5%)
POLLUTANTS: METALS/Multi (18) (50%);ORGANICS/General (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (60%);DEVELOPMENT/Laboratory scale (30%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To provide the means for the accurate measurement of water pollutants likely to occur with energy production. The pollutants of concern include organic substances, suspended particulates and trace elements. Measurements include the determination of concentrations of pollutants in water, sediments and biota. The trace elements under consideration include Hg, Zn, Cu, Cd, Ag, Al, Be, As, Se, Cr, Co, Ba, Fe, Mn, Pb, Sr, and V. Organics include aliphatic and aromatic hydrocarbons and polar organic compounds.
APPROACH: The development of Standard Reference Materials (SRMs) certified for trace element and trace organic composition. These SRMs will be used for validation of existing measurement methods. A series of workshops have been held to determine the most useful SRMs associated with potentially polluting energy sources and production.
RESULTS: Certification and issuance of Standard Reference Materials.
PROJECT MILESTONES: (a) Issue proceedings of Offshore Oil Operations, Coal Conversion and Power Plant Workshops, 6/77; (b) Issue proceedings of Oil Shale Processing Workshop, 7/77; (c) Issue proceedings of Geothermal, Uranium Mining and Mine Drainage Workshops, 9/77; (d) Issue final summary report, 9/77; (e) Issue SRM of trace elements in water, 8/77; (f) Determine feasibility preconcentration, ion exchange filter technique as a potential saline water SRM, 12/77, (g) Determine feasibility of certifying anion concentrations in water SRMs, 3/78; (h) Determine feasibility of preparation, stabilization and analysis of saline water SRM, 3/78; (i) Determine feasibility of certifying trace element depth profiles in sediment particulates using ion microprobe analysis, 6/78; (j) Develop clean sediment SRM certified for trace element composition, 1/80; (k) Report on feasibility of using coated glass bead columns as generators of standard solutions of polynuclear aromatic hydrocarbons in water, 6/77; (l) Develop generator column for polynuclear aromatic hydrocarbons as SRM. (Applicable to coal conversion, shale oil, offshore oil), 1/79; (m) Characterize coal conversion liquids by liquid chromatography, gas chromatography and GC-mass spectroscopy, 7/79; (n) Develop SRM for phenols in a synthetic or natural byproduct water, 6/79; (o) Develop SRM for crude oil, shale oil and liquified coal with selected compounds certified, 1/80; (p) Develop SRM for petroleum in marine sediment and biota, 1/80.
KEYWORDS: STANDARD REFERENCE MATERIALS;WATER POLLUTION;MONITORING;SAMPLING;SURFACE WATERS;SEDIMENTS;BIOLOGICAL MATERIALS;TRACE AMOUNTS;SEAWATER;MERCURY;ZINC;COPPER;CADMIUM;SILVER;ALUMINIUM;BERYLLIUM;ARSENIC;SELENIUM;CHROMIUM;COBALT;BARIUM;IRON;MANGANESE;LEAD;STRONTIUM;VANADIUM;TRACE AMOUNTS;LIQUID CONTAMINATION MONITORS;PERFORMANCE TESTING;CHEMICAL EFFLUENTS;PETROCHEMICALS;HYDROCARBONS

<012004>
TITLE: Energy Related Air Pollutant Analysis Instrumentation
PROJECT NUMBER: D6-E684-79BCLb
PRINCIPAL INVESTIGATOR: Kirchhoff, W.H.
ADDRESS: Office of Air and Water Measurement, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: D'Alessio, Gregory J.
TELEPHONE: C426-4567
TYPE OF FUNDING: EPA pass-thru funding-IAG D6-E684
77 FUNDING: Environmental Protection Agency FY77:$45,000

TECHNOLOGY: FOSSIL FUEL/General (95%);GEOTHERMAL/General (5%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (40%);PARTICULATES/Sulfur containing (60%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (70%);DEVELOPMENT/Laboratory scale (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop instrumental methods for the measurement of particulate sulfate. The sulfate analyzer is based upon a combination of electrostatic precipitator, mobility analyzer and flame photometric detector.
APPROACH: The fluorescence of sulfur dioxide when subjected to uv radiation is used as the basis for quantifying sulfur dioxide in the gas phase at concentrations down to 1 ppb. The quenching of the SO/sub 2/ fluorescence by other gases presents a negative interference. This quenching is being quantified. The effectiveness of using a tuneable dye laser as the uv exciting source is being investigated to improve sensitivity and to locate exciting wavelengths for which the quenching is minimized. The sulfate analyzer is based upon a combination of electrostatic precipitator, mobility analyzer and flame photometric detector.
RESULTS: An improved instrumental method for the measurement of sulfur dioxide and a new instrumental method for the measurement of particulate sulfate.
PROJECT MILESTONES: (a) Provide to EPA a report on the feasibility of producing a continuous, automatic total-particulate-sulfur measurement instrument, complete; (b) Provide to EPA a report on the characteristics of the developmental instrumentation for measuring particulate sulfur, 6/77; (c) Provide to EPA a detailed description of a prototype field instrument (including instrumentation manual) for measuring particulate sulfur, 7/78; (d) Provide to EPA a report on research on speciation of particulate sulfur compounds (with special emphasis on sulfuric acid) and the applicability of instrumental analysis to the measurement of individual species, 6/78.
KEYWORDS: AIR POLLUTION;MONITORING;SULFUR DIOXIDE;SULFATES;PARTICLES;TRACE AMOUNTS;MEASURING METHODS;SAMPLING;AIR SAMPLERS;SURFACE AIR;AIR POLLUTION MONITORS;DESIGN

<012005>
TITLE: Reactor Control Room Infiltration
PROJECT NUMBER: 462-4419
PRINCIPAL INVESTIGATOR: Hunt, C.M.
ADDRESS: National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Technical Review, Office of Nuclear Reactor Regulation
MONITOR: Campe, K.
TELEPHONE: P492-7917
TYPE OF FUNDING: Contract No.-AT(49-24)0105
77 FUNDING: Nuclear Regulatory Commission FY77:$31,600
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;OS
PROJECT DESCRIPTION: The control rooms of atomic reactors are designed so that in case of emergency they can be shut off from their surroundings and operated completely with recirculated air. This air is filtered and purified within the control room enclosure. This project is set up to test the applicability of SF/sub 6/ tracer methodology to assess the leak tightness of control rooms.
APPROACH: (1) Tracer will be distributed in the control room and its associated zones (on same ventilation system), and the rate of decrease in concentration measured. (2) Tracer will be placed in the control room or in selected sites outside the control room and its migration detected.
RESULTS: (1) Air leakage rates. These should be zero for the ideal case. (2) In some cases, leakage patterns may be identified.
PROJECT MILESTONES: The control room zone of one nuclear power plant has already been measured for leakage and the results reported to NRC. Tracer measurements of air leakage have been made in two additional plants for a total of three. Reports on the latter two will be submitted. Fiscal 78 further work in this area will await evaluation by NRC of the results of these three tests.
KEYWORDS: VENTILATION SAFETY;NUCLEAR ACCIDENT;POWER REACTORS;CONTAINMENT SYSTEMS;AIR CLEANING SYSTEMS;LEAK TESTING;SAFETY;HEALTH HAZARDS;CONTROLLED ATMOSPHERES

<012006>
TITLE: Standard Neutron Fields
PROJECT NUMBER: 2405473
PRINCIPAL INVESTIGATOR: Schwartz, R.B.
ADDRESS: Bldg. 235, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Safety Standards and Compliance
MONITOR: Vallario, Edward J.
TELEPHONE: C(301)353-3331
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$71,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The NBS will provide accurately calibrated neutron beams over the energy range from 2 keV to 14 MeV for calibration and other evaluation of personnel neutron dosimeters now in use or under development by ERDA. The NBS will assist ERDA scientists in design of experiments and in the use of these facilities.
APPROACH: The NBS will establish facilities specially suited to neutron monitoring for personnel protection purposes. These facilities will be referenced to more fundamental neutron standards established for the full spectrum of neutron technology. The facilities will be located on the NBS site and will be operated by NBS staff for visiting ERDA scientists. NBS will assist in all phases of experiments when requested and as commensurate with funding.

RESULTS: As a result of this program, the accuracy of existing neutron dosimeters should be improved significantly, particularly at lower neutron energies. In addition, advanced personnel dosimeters may be calibrated with future improvements in accuracy and convenience to the user. The result will be safer working conditions and better time management for personnel exposed to neutron fields.
)JECT MILESTONES: (1) Establish accelerator facility for MeV neutrons September 1977. (2) Establish improved accuracy in neutron beam measurements July 1978.
KEYWORDS: PERSONNEL DOSIMETRY;NEUTRON DOSIMETRY;NEUTRON BEAMS;NEUTRON SOURCES;CALIBRATION;ENERGY LEVELS;ENERGY RANGE;KEV RANGE 01-10;MEV RANGE 10-100;DOSEMETERS;REPRODUCTION;HUMAN POPULATIONS;POPULATION DYNAMICS;MAN

<012008>
TITLE: State Radiation Measurement Standards
PROJECT NUMBER: 2400109
PRINCIPAL INVESTIGATOR: Eisenhower, E.H.
ADDRESS: Building 245, Room C229, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA). Center for Radiation Research
MONITORING AGENCY: National Bureau of Standards, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Bureau of Standards FY77:$250,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: TRANSPORTATION (20%);STORAGE (20%);PROCESSING, CONVERSION (10%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (20%)
POLLUTANTS: RADIATION/Alpha;RADIATION/Gamma;RADIATION/Beta (100%)
CHARACTER OF STUDY: RESEARCH/Applied (10%);DEVELOPMENT/Laboratory scale (20%);PRODUCTION (40%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is to monitor the needs of state radiation control programs with regard to achieving improved accuracy and uniformity in the measurement of ionizing radiation, and to develop an NBS program which will provide the standards and services required to satisfy the most urgent state needs.
APPROACH: Information regarding needs in state programs will be obtained continuously through interaction with a special task force of state representatives. Considerable effort will be devoted to investigation of alternative mechanisms for dissemination of standards and for measurement assurance. Specific pilot programs will be conducted. Institutional arrangements will be studied, and the most promising methods will be selected and tried. Various alternative sources of funding will also be explored. Regional calibration laboratories will be investigated as a possible method for dissemination of national standards.
RESULTS: This project will assist the states in developing their capability to make measurements of ionizing radiation that will be adequate for their responsibilities as regulatory agencies. Since the ultimate objective of the regulations is radiation safety, the beneficiaries will be radiation workers, licensees of nuclear facilities, and the general public. This project will enable NBS to fulfill its legislated responsibility to develop national standards of measurement and means for achieving national consistency with them, and for the investigation of radiation and means of protection of persons from its harmful effects.
PROJECT MILESTONES: Initiate development of a regional calibration laboratory in the State of Illinois April 1977. Initiate efforts to develop a uniform national system for reporting environmental radiation data June 1977. Initiate project to construct a distributed calibration source in the State of Florida May 1977. Complete a detailed study of accuracy requirements for the various types of measurements made in state programs February 1978.
KEYWORDS: RADIATION MONITORING;USA;GAMMA SOURCES;X-RAY SOURCES;RADIATION PROTECTION;STANDARDS;CALIBRATION;MEASURING METHODS;HUMAN POPULATIONS;STATE GOVERNMENT;RADIOISOTOPES;SAFETY

<012010>
TITLE: Theoretical Dosimetry
PROJECT NUMBER: 2401106
PRINCIPAL INVESTIGATOR: Berger, M.J.
ADDRESS: Center for Radiation Research, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA). Center for Radiation Research
MONITORING AGENCY: National Bureau of Standards, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Bureau of Standards FY77:$68,000
TECHNOLOGY: NUCLEAR/General (70%);NUCLEAR/Fusion (30%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;OS
PROJECT DESCRIPTION: To improve radiation meteorology, and to contribute to the safe and effective use of radiation in industry and medicine, by (a) developing a detailed theory and accurate calibration of the response of various radiation detectors (e.g., ionization chambers, thermoluminescent detectors, solid-state devices) to x- and gamma rays and to electrons; (b) to calculate absorbed-dose distributions in human beings (or representative phantoms) for the case of irradiation by x-ray and electron beams, radionuclide sources and environental radiation.
APPROACH: The research involves the following activities: (a) the evaluation, compilation and systematic preparation of scattering and absorption cross sections; (b) the development of mathematical transport theories, involving the numerical solution of the Boltzmann equation or the simulation of transport by random numbers (Monte Carlo); (c) the systematic large-scale calculation of transport problems with the use of computers; (d) organization and analysis of transport results, by scaling procedures and development of semi-empirical formulas.
RESULTS: Compilation and dissemination of critical radiation data, e.g., gamma-ray buildup factors; electron, neutron and x-ray depth-dose curves, gamma ray and electron transmission and reflection coefficients, detector response functions for sodium-iodide, germanium and silicon detectors, absorbed fractions for gamma rays, electrons and beta radiation from radionuclides.
OJECT MILESTONES: (1) Initial phase of critical analysis and new compilation of charged-particle stopping

power and range values for dosimetry. (2) Exploratory calculations of effect of beam-spreading foils on electron absorbed-dose distributions and ionization-to-dose conversion factors in water phantoms.
KEYWORDS: DOSIMETRY;RADIATION DETECTORS;CALIBRATION;PERFORMANCE TESTING;RADIATION DOSE DISTRIBUTIONS;SPATIAL DOSE DISTRIBUTIONS;DEPTH DOSE DISTRIBUTIONS;X-RAY SOURCES;GAMMA SOURCES;ELECTRONS;RADIOISOTOPES;NATURAL RADIOACTIVITY;TISSUE-EQUIVALENT MATERIALS;ENERGY SPECTRA;SCATTERING;COMPUTER CODES;RADIATION PROTECTION

<012012>
TITLE: Electron Transport Calculations with Biomedical Applications
PROJECT NUMBER: 2401437
PRINCIPAL INVESTIGATOR: Berger, M.J.
ADDRESS: Center for Radiation Research, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA). Center for Radiation Research
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.
TELEPHONE: C(301)973-5355
TYPE OF FUNDING: Interagency agreement-ERDA Contract E(49-1)-3800
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: NUCLEAR/General (30%);GENERAL SCIENCE (70%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: To obtain reliable data on the transfer of energy from radiation to biological matter via secondary electrons, in regard to the following aspects: (a) electron energy degradation spectra and yield of primary activations; (b) statistical fluctuations of energy depositions in small sites (e.g., genetic material in cell nuclei); (c) the development of an adequate electron cross-section data base to allow the above-mentioned calculations.
APPROACH: The approach used involved the following steps: (a) the evaluation and systematic compilation of scattering and absorption cross sections; (b) the development of mathematical transport theory methods, numerical as well as analytical; (c) execution of large-scale transport calculations with use of computers; (d) analysis and interpretation of computer results, with emphasis on the statistics of energy deposition and on the yield of various types of primary activations (determined through use of energy degradation spectra).
RESULTS: (a) Development of method for calculating fluctuations of energy deposition in small spherical volumes due to irradiation by electrons and by beta rays from tritium (environmental radiation) and by conversion and Auger electrons from iodine-125 (radiopharmaceutical). (b) Analysis and preparation of cross sections for transport studies, pertaining to differential electron-impact ionization of nitrogen, oxygen, and water vapor.
PROJECT MILESTONES: (a) Preparation of state-of-the-art set of electron interaction cross sections in water (March 1977). (b) Evaluation of electron energy degradation spectra using above-mentioned cross sections, for initial electron energy from 100 eV to 50 keV (July 1977). (c) Preparation of manuscript on fluctuations of energy deposited in small spherical sites by point and distributed electron sources with energies from 1 to 100 keV (September 1977).
KEYWORDS: SECONDARY ELECTRONS;ELECTRONS;MICRODOSIMETRY;ENERGY SPECTRA;NITROGEN;OXYGEN;WATER VAPOR;TISSUE-EQUIVALENT MATERIALS;LET;ENERGY TRANSFER;ELECTRON BEAMS;X RADIATION;GAMMA RADIATION;BREMSSTRAHLUNG;BETA SOURCES;TRITIUM;IODINE 125;RADIATION DOSE DISTRIBUTIONS;SPATIAL DOSE DISTRIBUTIONS;MOLECULAR BIOLOGY;CHARGED PARTICLES;PARTICLE TRACKS;PARTICLE INTERACTIONS;BIOLOGICAL RADIATION EFFECTS;RADIOTHERAPY;RADIONUCLIDE MIGRATION;HEALTH HAZARDS;RADIATION PROTECTION;NUCLEAR MEDICINE

<012013>
TITLE: Neutron Interactions with Biological Tissue
PROJECT NUMBER: 2401470
PRINCIPAL INVESTIGATOR: Caswell, R.S.
ADDRESS: National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hudson, Frank
TELEPHONE: C(301)973-5355
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (30%);NUCLEAR/Fusion Magnetic;NUCLEAR/Fusion Laser (20%);GENERAL SCIENCE (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: To obtain information about neutron interactions with tissue through secondary charged particles using theoretical calculations whose input includes neutron cross section data; range, stopping power, and straggling information; and geometrical properties. This information is basic to radiological physics, radiation biology, neutron radiation protection, neutron therapy, and neutron dosimetry standards.
APPROACH: This program is aimed primarily at understanding the basic picture of the ''physical stage'' in the interaction of neutrons with tissue and biological materials. Quantitative description of the processes and spectra involved in the transfer of energy from neutron radiation to the biological material provides a useful input to the attempt to understand biological effects of neutron radiation. This is carried out through use of a number of computer calculations using nuclear data and stopping power data as input.
RESULTS: (1) Initial and slowing-down spectra of neutron-induced secondary charged particles. (2) Energy deposition distributions and microdosimetry parameters for neutrons. (3) Kerma-to-fluence factors for neutrons of energies up to 30 MeV. (4) Improved theoretical nuclear data for 15 to 60 MeV neutrons.
PROJECT MILESTONES: (1) Kerma-to-fluence factor tables for neutrons January 1977. (2) Initial and slowing-down spectra for neutrons, including multi-particle production cross sections December 1977. (3)

Microdosimetry parameters using new initial and slowing-down spectra June 1978. (4) Improved theoretical nuclear data for energies above 20 MeV December 1978.
KEYWORDS: NEUTRONS;BIOLOGICAL RADIATION EFFECTS;RADIATION DOSE DISTRIBUTIONS;TISSUES;ENERGY SPECTRA;ENERGY TRANSFER;CHARGED PARTICLES;PARTICLE TRACKS;PARTICLE INTERACTIONS;MICRODOSIMETRY;NEUTRON DOSIMETRY;NEUTRON FLUENCE;KERMA;COMPUTER CODES;SAFETY;RBE

<012020>
TITLE: Water Quality Instrumentation
PROJECT NUMBER: D6-E684-79 BCK
PRINCIPAL INVESTIGATOR: Kirchhoff, W.H.
ADDRESS: Office of Air and Water Measurement, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: D'Alessio, G.J.
TELEPHONE: C(202)426-4567
TYPE OF FUNDING: EPA pass-thru funding-IAG D6-E684
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (85%);NUCLEAR/General (10%);GEOTHERMAL/General (5%)
POLLUTANTS: METALS/Multi (18) (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (60%);DEVELOPMENT/Laboratory scale (30%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To provide the means for the accurate measurement of water pollutants likely to occur with energy production. The pollutants of concern include organic substances, suspended particulates and trace elements. Measurements include the determination of concentrations of pollutants in water, sediments, and biota. The trace elements under consideration include Hg, Zn, Cu, Cd, Ag, Al, Be, As, Se, Cr, Co, Ba, Fe, Mn, Pb, Sr, and V. Organics include aliphatic and aromatic hydrocarbons and polar organic compounds.
APPROACH: Marker compounds, organic compounds characteristic of particular sources, will be investigated as a means for characterizing and quantifying the pollution associated with particular sources. Liquid chromatography-mass spectrometry will be investigated as a means of quantifying polar organic pollutants. Ion microprobe techniques will be investigated for applicability to determine the elemental profile of individual suspended particulates.
RESULTS: Demonstration of liquid chromatography-mass spectrometry for the measurement of trace polar organic compounds, demonstration of the measurement of trace element profiles in suspended particulates by ion microprobe analysis, demonstration of techniques for quantifying the chemical species of elements in water.
PROJECT MILESTONES: (a) Determine feasibility of coupling liquid chromatography with electrochemical detection of organometallic compounds, 6/78; (b) determine feasibility of temperature programmed plasma flame emission detection for the determination of chemical species of Cr, As, and Hg in water and sediments, 6/78; (c) development of marker compounds to be used as internal standards for quantitative analysis of organic compounds in water, 1/80; (d) development of methods for coupling liquid-chromatography with mass spectroscopy for the analysis of polar and non-volatile organic compounds in water, 1/78; (e) application of selective detectors to the liquid chromatographic analysis of hydroxylated polynuclear aromatic hydrocarbons and other polar organics, 1/79.
KEYWORDS: INSTRUMENTATION;WATER QUALITY;MEASURING INSTRUMENTS;ENERGY CONVERSION;WATER;SEDIMENTS;MERCURY;ZINC;COPPER;SILVER;ALUMINIUM;BERYLLIUM;ARSENIC;SELENIUM;CHROMIUM;COBALT BARIUM;IRON;MANGANESE;LEAD;STRONTIUM;VANADIUM;POLYCYCLIC AROMATIC HYDROCARBONS;CHROMATOGRAPHY

<012021>
TITLE: Traceability of Nuclear Regulatory Commission Reference Laboratory
PROJECT NUMBER: 2408474
PRINCIPAL INVESTIGATOR: Mann, W.B.
ADDRESS: RM C114, Bldg. 245, Radioactivity Section, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Inspection and Enforcement
MONITOR: Weiss, Bernard
TELEPHONE: C(301)492-7246
TYPE OF FUNDING: Contract No.-2408474
77 FUNDING: Nuclear Regulatory Commission FY77:$82,400
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coastlines;HYDROGRAPHIC AREAS/Other hydrographic areas All waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT;OS
PROJECT DESCRIPTION: Under the terms of the agreement with the Nuclear Regulatory Commission, NBS conducts a measurements assurance program with the Health Services Laboratory (US ERDA), Idaho Falls, to establish the traceability of that laboratory to the National Radioactivity Measurements System.
APPROACH: A formal agreement with the NRC titled ''Testing of NRC Reference Laboratory'' specifies that 13 test samples will be provided annually to HSL and their values determined for these 13 samples must be within predetermined limits of the NBS values.
RESULTS: This is a long-term project designed to insure that measurements by a major laboratory representing a regulatory agency are traceable to the National Measurements System.
PROJECT MILESTONES: The 13 tests required in FY 76 were successfully completed. Calibration standards and services were provided to HSL, and Xenon-133 and Xenon-127 gas standards were supplied to NRC-agreement-state radiological health laboratories.
KEYWORDS: TRACEABILITY;QUALITY CONTROL;RADIOACTIVITY;STANDARDS;CALIBRATION STANDARDS;SAFETY STANDARDS;FEDERAL TEST PROCEDURE;ENVIRONMENT;MEASURING METHODS;MEASURING INSTRUMENTS;TRITIUM;X RADIATION;RADIOACTIVE EFFLUENTS;RADIONUCLIDE MIGRATION;US NRC;RADIATION MONITORING

<0 12022>
TITLE: Surface Analyses and Reactions of Particulate Pollutants
PROJECT NUMBER: 2320456
PRINCIPAL INVESTIGATOR: Powell, C.J.
ADDRESS: Met. B-214, National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: C(301)353-3213
TYPE OF FUNDING: Contract No.-AT(49-2)-1165
77 FUNDING: Energy Research and Development Administration FY77:$74,500
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this program is to apply modern electron-spectroscopic methods of surface analysis to determine the surface composition of particulate pollutants in the atmosphere and to determine the nature and rate of pollutant reactions and transformations that occur on particle surfaces.
APPROACH: We will use a scanning Auger-electron spectrometer system to determine the elements present on the surfaces of selected, individual particles. An x-ray photoelectron spectrometer will be used to determine the chemical environment (i.e., compounds). A gas analyzer will enable us to identify gaseous reaction products when gases are passed over the sample particles. This combination of measurement techniques will give us a unique opportunity to characterize pollutant particles and pollutant transformations.
RESULTS: (1) Determine elements present on the surfaces of individual representative particles and correlate surface composition with particle size. (2) Determine relative concentrations of elements as a function of depth from the surface. (3) Develop measurement procedures to obtain elemental concentrations from observed electron intensities. (4) Determine the solid and gaseous reaction or transformation products when gases such as H/sub 2/S, SO/sub 2/, NO, and NH/sub 3/ interact, singly or together, with well-characterized surfaces and representative particulates.
PROJECT MILESTONES: (1) September 1977 Assemble and test a Scanning Auger-electron Spectroscopy System. (2) March 1978 Install and test x-ray photoelectron spectroscopy components. (3) September 1978 Report measurements of surface compositions of representative particles.
KEYWORDS: INSTRUMENTATION;PARTICLES;AEROSOLS;AIR POLLUTION;BASELINE ECOLOGY;SURFACE CONTAMINATION;ENVIRONMENTAL TRANSPORT;MEASURING METHODS;ENVIRONMENTAL EFFECTS;CHEMICAL ANALYSIS;CHEMICAL PROPERTIES;CHEMICAL REACTION KINETICS;HYDROGEN SULFIDES;SULFUR DIOXIDE;NITROGEN OXIDES;AMMONIA;SPECTRA;AIR

Department of Commerce/National Oceanographic and Atmospheric Admin.

<0 13001>
TITLE: Establish and Service a Project Marine Baseline Data Base for the Alaska MEA Program. (Subcontract under NOAA-BLM Interagency Agreement BLM-D8550-BA5-18)
PROJECT NUMBER: Research Unit No. 362
PRINCIPAL INVESTIGATOR: Law, E.F.
ADDRESS: 2001 Wisconsin Avenue, NW, Washington, DC 20235
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA). Environmental Research Labs.
DIVISION: Outer Continental Shelf Environmental Assessment Program Office (OCSEAP)
MONITOR: Fischer, Wayne J.
TELEPHONE: F323-6531
TYPE OF FUNDING: Interagency agreement-NOAA
77 FUNDING: Bureau of Land Management FY77:$171,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Intertidal
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Establish and service a marine environmental baseline data bank; accession OCS data in computer-compatible formats; provide data products and summaries using computerized data application programs.
APPROACH: Structure all OCS data into a data base that can be effectively searched, manipulated, and retrieved; include NODC historical data and other non-OCS data pertinent to the project; assist the Project and Investigators in development of computer-compatible data formats; maintain an up-to-date inventory of data expected and received.
RESULTS: Computerized inventories of data collected and data products including histograms and other plots, statistical summaries, and information regarding the status of individual data sets.
PROJECT MILESTONES: (1) Accelerate accession techniques November 1975. (2) Structure the data base February 1976. (3) Complete historical data base October 1976. (4) Continue to develop project data formats. (5) Continue to access project data. (6) Continue to supplement the project baseline data base.
KEYWORDS: SEAS;ENVIRONMENT;STATISTICS;COMPUTERS;DATA ACQUISITION;DATA PROCESSING;INFORMATION RETRIEVAL;INFORMATION SYSTEMS;COMPUTER CODES;WATER;AQUATIC ECOSYSTEMS;MAMMALS;BIRDS;FISHES;PLANKTON;CHEMICAL EFFLUENTS;GEOLOGY;METEOROLOGY

<013003>
TITLE: Data Management and Archival Services for Interagency Energy Related Marine Programs
PROJECT NUMBER: I-AP I.D. number77 BEA
PRINCIPAL INVESTIGATOR: Mitchell, P.
ADDRESS: 2001 Wisconsin Avenue, NW, Washington, DC 20235
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Minerals and Industry
MONITOR: Davies, Tudor
TELEPHONE: C(904)932-5311
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement-EPA
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (90%);SOLAR/General (10%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: BIOMES/Marine;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Assess data services of agencies producing marine environmental data in Energy Related Programs. (2) Publish a data management plan for that data. (3) Operate, monitor and define data management system for Energy Related Programs.
APPROACH: Discuss data management plans with each Principal Investigator and publish compiled results.
RESULTS: Reports of what environmental data from Energy Related Programs are being produced and how to obtain them.
PROJECT MILESTONES: August 1976 Report (initial) as in 93c.
KEYWORDS: AQUATIC ECOSYSTEMS;SEAS;DATA COMPILATION;DATA TRANSMISSION;OCEANOGRAPHY;ENVIRONMENT

<013005>
TITLE: Data Archive, OCS Baseline Studies
PROJECT NUMBER: 8E1639/1640/1641/1643
PRINCIPAL INVESTIGATOR: Picciolo, A.R.
ADDRESS: 2001 Wisconsin Avenue, NW, Washington, DC 20235
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Department of the Interior, Washington, D.C. (USA)
DIVISION: Bureau of Land Management
MONITOR: Monastero, Frank
TELEPHONE: C(202)343-6265
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Continental;COASTS/Other coasts U.S.;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The Bureau of Land Management is sponsoring environmental baseline studies in U.S. continental shelf regions where lease areas will be offered to private corporations for oil/gas exploration. Each of these studies is being managed by different federal or non-federal agencies. Besides Alaska, which is reported separately, these studies are presently in the mid-Atlantic, Eastern Gulf of Mexico, off Southeast Texas, off Southern California and the Georges Banks area. The Bureau of Land Management desires that the data from all the OCS studies be centrally archived in a standard fashion to facilitate data retrieval common to the whole program and have specified in each of their contracts that data will be submitted to the NODC in NODC acceptable formats.
APPROACH: NODC is maintaining close contact with the Project Managements in the several areas, distributing common formats to each Project Office, and negotiating new formats where required. In each of these areas there will be considerable biological data collected. Through a grant to the Biological Sorting Center of the University of Alaska, taxonomic coding for all the project data submissions will be controlled.
RESULTS: A common data archive for all OCS lease area baseline environmental data.
PROJECT MILESTONES: This is a continuing task governed by the time and rate of data submitted by the various projects. Milestones are, therefore, not meaningful.
KEYWORDS: LAND USE;ALASKA;GULF OF MEXICO;ATLANTIC OCEAN;DATA;INFORMATION RETRIEVAL;AQUATIC ECOSYSTEMS;FISHES;CONTINENTAL SHELF;AQUATIC ORGANISMS;HYDROCARBONS;WATER;BASELINE ECOLOGY;TEXAS;CALIFORNIA;PACIFIC OCEAN;DATA ACQUISITION;PETROLEUM INDUSTRY

<013008>
TITLE: Summarization and Interpretation of Historical, Physical Oceanographic and Meteorological Information for the Mid-Atlantic Region
PRINCIPAL INVESTIGATOR: Godshall, F.A.;Williams, R.G.
ADDRESS: NOAA/EDS/CEDDA Page Bldg. No. 2, 3300 Whitehaven St., N.W., Washington, DC 20235
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Bureau of Land Management, Washington, D.C. (USA)
DIVISION: Branch of Environmental Studies, Code 733
MONITOR: Beauchamp, Robert G.
TELEPHONE: C(202)343-7744
TYPE OF FUNDING: Interagency agreement-Bureau of Land Management No. AA-550-IA6-12
77 FUNDING: Bureau of Land Management FY77:$52,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To compile the historic meteorological and physical oceanographic data necessary to characterize the Mid-Atlantic region between the coast and the 2000m isobath, and between 36 degrees N and 41 degrees N for the purpose of developing offshore baseline information and to provide input to trajectory prediction models in conjunction with offshore oil and gas developments. To make recommendations for additional physical oceanographic and meteorological field measurements to remedy data deficiencies.
APPROACH: Design and produce required physical oceanographic and meteorological analysis products obtained from available federal sources, and from other selected institutional files. Evaluate the adequacy of

the available observational data base in meeting specific program requirements, such as trajectory predictions. Review on-going and planned observational programs, in light of the historic data base analysis. Formulate specific recommendations for the design and strategy of future observational sampling programs.
RESULTS: Statistics on data amount and distributions together with a statistical analysis of the data itself will be presented, with emphasis on the natural distribution and variability of relevant parameters. The data and analysis products will be given in formats most suitable for user application, such as monthly or seasonal tabulations, histograms, charts, contour plots, etc. Graphic and tabular presentations will be accompanied by interpretive discussions and conclusions, regarding, e.g., surface winds and waves, circulation patterns, and water column structure.
PROJECT MILESTONES: April 1, 1977 Draft final report. September 1977 Final report.
KEYWORDS: SUMMARIZATION;EVALUATION;ATLANTIC OCEAN;CONTINENTAL SHELF;METEOROLOGY;OCEANOGRAPHY;DATA COMPILATION;USA;MAPS;CLIMATES;CHEMICAL EFFLUENTS;OIL SPILLS

<013009>
TITLE: Environmental Assessment of Northern Puget Sound and the Strait of Juan de Fuca
PROJECT NUMBER: VI b 1
PRINCIPAL INVESTIGATOR: Harris, H.S.
ADDRESS: MESA Puget Sound Project, Pacific Marine Environmental Lab/NOAA/ERL, 7600 Sand Point Way, NE, Seattle, WA 98115
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Industry and Minerals
MONITOR: Hall, Clinton W.
TELEPHONE: F426-4567
TYPE OF FUNDING: Interagency agreement-EPA
77 FUNDING: Environmental Protection Agency FY77:$963,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: ORGANICS/Crude oil (90%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Puget Sound
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (A) Determine the existing distributions, sources, and rates of inputs of petroleum contaminants. (B) Describe the processes related to physical and biochemical transformations, fates and effects of petroleum hydrocarbons. (C) Characterize the major marine biological populations, and their role in major ecological processes, most subject to impact by petroleum contamination. (D) Prepare integrated assessment documents on potential petroleum problems in Puget Sound, including impact scenarios and discussion of how alternative strategies might ameliorate problems.
APPROACH: The effort funded by EPA takes advantage of the NOAA Marine Ecosystems Analysis Program in the Puget Sound region to carry out studies relevant to energy development; i.e., intensified transport and refining of petroleum in the Puget Sound region. The project will be implemented by a series of tasks over a five year period using a NOAA project management staff and researchers from NOAA, other Federal agencies, universities, and other private sector organizations.
RESULTS: Monographs, environmental inventories, mathematical models and final reports.
PROJECT MILESTONES: For the Strait of Juan de Fuca and the northern Puget Sound, (1) FY77: Characterize sources and distributions of suspended sediments and their interactions with petroleum. (2) FY78: Determine the hydrocarbon baseline levels in biota and sediments; Determine ability of microbes to degrade petroleum; Characterize planktonic communities; Determine major pathways within food webs. (3) FY79: Complete baseline inventory of biota at risk from oil development; Complete characterization of physical oceanography; Complete mathematical trajectory model for spilled oil; Publish final reports and disseminate information to users.
KEYWORDS: PUGET SOUND;POLLUTION;AQUATIC ORGANISMS;PETROLEUM;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;AQUATIC ECOSYSTEMS;MATHEMATICAL MODELS;REFINING;BIOMASS;HYDROCARBONS;OIL SPILLS;TOXICITY;BASELINE ECOLOGY

<013010>
TITLE: Atmospheric Turbulence and Diffusion
PROJECT NUMBER: 8 AC 43040
PRINCIPAL INVESTIGATOR: Gifford, F.A.
ADDRESS: Director, Atmospheric Turbulence and Diffusion Laboratory, P. O. Box E, Oak Ridge, TN 37830
AFFILIATION: National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. (USA). Atmospheric Turbulence and Diffusion Lab.
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Air Resources Laboratory
MONITOR: Machta, Lester
TELEPHONE: F427-7645
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$101,500
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Any airborne pollutant (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;COASTS/Other coasts Any coastal area
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Through meteorological research, to understand and predict the atmospheric transport and diffusion of heat and other pollution products in the planetary atmospheric boundary layer.
APPROACH: Develop and test mathematical models to characterize momentum and energy exchange processes in the planetary atmospheric boundary layer including such processes as buoyant plume rise, urban pollution, and meteorological conditions in and above forested areas.
RESULTS: Calculation of air parcel trajectories from experimental data including balloon trajectories; prediction of mesoscale air trajectories of pollutant clouds subject to diffusion; development of a model for multiple plume rise and cloud growth for use in the study of the meteorological effects of power parks.
KEYWORDS: AIR;TURBULENCE;DIFFUSION;METEOROLOGY;HEAT;POLLUTION;EARTH PLANET;EARTH ATMOSPHERE;MATHEMATICAL MODELS;URBAN AREAS;PLUMES;TRAJECTORIES;AIR POLLUTION;WEATHER;FORESTS

<0013011>
TITLE: Fate and Effects of Petroleum Hydrocarbons and Selected Toxic Metals in Selected Marine Ecosystems and Organisms
PROJECT NUMBER: VI b 2
PRINCIPAL INVESTIGATOR: Wolfe, D.A.
ADDRESS: Outer Continental Shelf Environmental Assessment Program (Rx4) NOAA/ERL, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA). Environmental Research Labs.
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Industry and Minerals
MONITOR: Hall, Clinton W.
TELEPHONE: P426-4567
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$475,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (90%);TRANSPORTATION (10%)
POLLUTANTS: METALS (20%);ORGANICS/Petroleum hydrocarbons (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Synthesize existing information and identify research gaps on the fate and effects of toxic metals and petroleum hydrocarbons on subarctic marine ecosystems. (2) Develop capability to standardize analytical techniques for hydrocarbons and toxic metals and to provide intercalibration and routine analytical services. (3) Study specific processes controlling the distribution, transport and effects (both physiological and ecological) of petroleum hydrocarbons and selected toxic metals in the subarctic coastal marine ecosystems as an input to the assessment of the impacts of petroleum releases into this type of ecosystem and to development of water quality standards.
APPROACH: In the context of the extensive environmental assessments of the OCS (particularly in Alaska) being conducted by NOAA for BLM, this effort is designed to study intensively those aspects of the marine ecosystem that are related to the responsibilities of EPA (regulation) and to NOAA (environmental monitoring and prediction). The existing capabilities within NOAA will be used primarily, but will be extended in the area of analytical techniques.
RESULTS: Workshops, ecosystem inventories, inputs to site selection policies, final report.
PROJECT MILESTONES: Install analytical equipment. Synthesize existing information and hold planning workshop. Develop site selection criteria and assess potential field site. Characterize baseline ecosystems in experimental and control sites. Conduct experiments and testing at field sites.
KEYWORDS: PETROLEUM;HYDROCARBONS;METALS;AQUATIC ECOSYSTEMS;TOXICITY;ENVIRONMENTAL EFFECTS;POLLUTION;ENVIRONMENTAL TRANSPORT;OIL SPILLS;BIOMASS;SITE SELECTION;BASELINE ECOLOGY

<0013012>
TITLE: Cloud and Precipitation Modification Effects of Pollutants from Energy Production
PROJECT NUMBER: EPA-TAG-E693 (78 BEG)
PRINCIPAL INVESTIGATOR: Pueschel, R.F.
ADDRESS: National Oceanic and Atmospheric Administration/ERL 325 Broadway, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: EPA National Environmental Research Laboratories
MONITOR: McNelis, David
TELEPHONE: P595-2969
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal (65%);FOSSIL FUEL/Oil and Gas (35%)
ENERGY CYCLE: PROCESSING, CONVERSION (25%);ELECTRICITY GENERATION (75%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Site specific Semi-arid regions
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: (1) To develop criteria for assessing the impact on local and lower mesoscale weather of effluents from coal-fired power plants and petroleum refineries. (2) Based on criteria, to assess and recommend measures for minimizing adverse weather modification effects of power-generating and petroleum refining as input to guidelines and strategies for operational use by EPA.
APPROACH: The project consists of making in situ measurements as well as laboratory analyses of aerosols associated with power generating plants near Farmington, New Mexico and Colstrip, Montana and with the petroleum refineries in the Los Angeles, California, basin and of analyzing the effects on weather of the increased atmospheric aerosol content resulting from plant operation. The dispersion, coagulation, sedimentation, and washout determine the atmospheric residence times of the aerosols. The faster the gas-to-particle conversion rate, the shorter the residence times and the more efficiently the particles act as cloud forming nuclei. By combining an Aitken nucleus counter, a diffusion cloud chamber for counting cloud condensation nuclei (CCN), and an ice nucleus counter, it will be possible to determine what fraction of the total aerosol concentration is condensation nuclei and what fraction is ice nuclei. Elemental analysis with the x-ray spectrometer and size analysis with the scanning electron microscope relate the number of active condensation and ice nuclei to the abundance of specific c elements. We have shown that condensation nuclei are generated by means of a gas-to-particle conversion process in the plume for coal-fired powerplants; this process depends primarily upon the SO/sub 2/ to sulfate oxidation. A similar role for NOx in petroleum refinery plumes is postulated and is being investigated. Pollution plumes have been postulated to extend several hundred miles downwind over mostly unpopulated but agriculturally utilized areas. Ecosystems in these sometimes very arid areas would be subject to change if the precipitation pattern changes as a result of increased energy production. An aircraft is being used to trace vertically and horizontally the diffusing pollutants from the selected sources. Their atmospheric residence time and cloud modification potential will be evaluated in connection with the local climatology; namely, water vapor mixing ratio and temperature lapse rate. Cloud drop spectra and other microphysical parameters of clouds will be measured, and the influence of pollutant aerosols and gases appraised. The effects of the pollutants on shortwave and long wave radiation, hence their climatic impact, will be evaluated by absorption and scattering measurements, and calculations based on measured size distributions and elemental composition.
RESULTS: The criteria produced in this study should be available before the large scale increase in usage of fossil fuels. The output, e.g., aerosol concentrations and distributions, will be critical inputs to

ecological and health effects studies and to other weather and climate modification studies.
PROJECT MILESTONES: Complete interim reports on measurements at Colstrip, Farmington and Los Angeles. Complete technology assessment of effects of power plant effluents on weather and climate. Make recommendations on control measures for lessening effects on weather of power plant effluents.
KEYWORDS: COAL;FOSSIL-FUEL POWER PLANTS;COAL GASIFICATION;WEATHER;RECOMMENDATIONS;AEROSOLS;COPPER;SMELTING;AIR POLLUTION;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;SULFUR DIOXIDE;NITROGEN OXIDES;WEATHER;PETROLEUM REFINERIES

<013014>
TITLE: Lidar Techniques for Measuring Particulate Pollutants from Energy Production and Their Transport and Dispersion Processes
PROJECT NUMBER: BAA70930/BAA70932
PRINCIPAL INVESTIGATOR: Derr, V.E.;Schwiesow, R.L.
ADDRESS: Department of Commerce/NOAA/ERL/Wave Propagation Laboratory, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA). Environmental Research Labs.
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: NERL-Las Vegas
MONITOR: Melfi, Harvey
TELEPHONE: FTS 595-2969
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$190,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES (50%);SPECIFIED OTHER POLLUTANTS/Wind measurement (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To develop measurement techniques for tracing and analyzing the pollutants arising from existing and planned sources of pollution, such as fossil fuel development.
APPROACH: Draws on atmospheric science and remote sensing developments of NOAA's Wave Propagation Laboratory to apply new techniques to remotely measuring aerosol characteristics and their transport and diffusion.
RESULTS: (1) Technique development. (2) Specification of ground based and airborne equipment to study and characterize aerosols and their transport properties.
PROJECT MILESTONES: Tasks: (1) Develop lidar techniques for tracing and analyzing pollutants. (2) Develop and test new Doppler lidar techniques for measurement of pollutant transport process. Milestones: (1) 1975 Collect velocity data on atmospheric vortex. (2) 1976 Demonstrate conical scan for profiles; complete 5 wind profiles. (3) 1977 Complete all wind and turbulence profiles (low resolution). (4) 1978 Complete ventilation factor measurement series. (5) 1979 Demonstrate increase profile resolution using FM/CW techniques. (6) 1980 Complete all wind and turbulence profiles (high resolution).
KEYWORDS: FOSSIL FUELS;POLLUTION;AEROSOLS;DIFFUSION;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;AIR POLLUTION;PHYSICAL PROPERTIES;REMOTE SENSING;CHEMICAL PROPERTIES;PLUMES;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;METEOROLOGY;WIND;VELOCITY

<013015>
TITLE: Environmental Assessment Studies
PROJECT NUMBER: NOAA R7120815
PRINCIPAL INVESTIGATOR: Engelmann, R.J.
ADDRESS: NOAA Environmental Research Laboratories, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA). Environmental Research Labs.
MONITORING AGENCY: Bureau of Land Management, Anchorage, Alaska (USA). Alaska Outer Continental Shelf Office
DIVISION: Alaska Outer Continental Shelf Office
MONITOR: Maynard, Nancy
TELEPHONE: C(907)276-2955
TYPE OF FUNDING: Interagency agreement-BLM
77 FUNDING: Bureau of Land Management FY77:$21,100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (95%);TRANSPORTATION (5%)
POLLUTANTS: METALS/Toxic metals (20%);PARTICULATES/Marine suspended material (10%);ORGANICS/Petroleum hydrocarbons (60%);VISUAL AESTHETICS/Petroleum spills (10%)
CHARACTER OF STUDY: RESEARCH/Applied (95%);DEVELOPMENT/Laboratory scale (5%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To provide environmental information necessary to assess the potential impacts of petroleum exploration, development, and production on marine ecosystems of the Outer Continental Shelf of Alaska. This includes pre-developmental environmental characterization for comparison with post-developmental conditions, and characterization of potential sources, trajectories, transformations and effects of pollutants on organisms and ecosystems designed for prediction of impacts.
APPROACH: In-house and contract research projects are conducted on various aspects of chemical and physical oceanography, geological and seismic profiling, reconnaissance of populations of marine mammals, birds, fish, invertebrates, and microorganisms, and laboratory studies on transformations and effects of contaminants.
RESULTS: Knowledge of the nature and magnitudes of contaminant sources and other environmental alterations associated with OCS developments; of transport pathways and efficiencies for contaminants; of the distribution and vulnerability of critical habitats and organisms, seasonally; and of the sensitivity of these organisms and habitats to the projected impacts. These data products will be integrated to provide environmental impact assessments to influence decisions on OCS leasing and stipulations for OCS oil production.

PROJECT MILESTONES: Data reports to BLM for impact assessments in each of 9 Alaska OCS lease areas, and subsequently for design of operating regulations and stipulations.
YWORDS: PETROLEUM INDUSTRY;ENVIRONMENTAL EFFECTS;CONTINENTAL SHELF;ALASKA;TRAJECTORIES;POLLUTION;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;OCEANOGRAPHY;SEAS;ENVIRONMENTAL TRANSPORT;HYDROCARBONS;OIL SPILLS;TOXICITY;BASELINE ECOLOGY

<013016>
TITLE: Meteorological Interpretations and Prediction of Air Quality in the Western United States Related to Energy Activities
PRINCIPAL INVESTIGATOR: (Contract proposals currently being evaluated)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Environmental Research Laboratories/Air Resources Laboratory/Meteorology Laboratory
MONITOR: Viebrock, Herbert J.
TELEPHONE: F629-4543
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$160,000
TECHNOLOGY: FOSSIL FUEL/General (90%);NUCLEAR/General (5%);CONSERVATION/General (5%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/ (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The purpose of the project is the selection, evaluation, verification and application of a long-distance dispersion model to estimate the impact of energy development in the Four Corners area on the regional air quality.
APPROACH: An air quality dispersion model will be used to estimate the effects of various energy development scenarios on the regional air quality. Up to 70 meteorological, emission, plant siting, and plant characteristic scenarios will be tested for the Four Corners region.
RESULTS: An estimation of the effects on regional air quality of 70 development scenarios.
PROJECT MILESTONES: 7/77 Selection and evaluation of dispersion model. 7/78 Completion of test scenarios.
KEYWORDS: AIR QUALITY;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;FUNCTIONAL MODELS;REGIONAL ANALYSIS;EMISSION;METEOROLOGY;SITE SELECTION;AEROSOLS;CLIMATES;WEATHER;NITROGEN OXIDES;SULFUR DIOXIDE

<013017>
TITLE: Air Pollution Studies
PRINCIPAL INVESTIGATOR: Niemeyer, L.E.
ADDRESS: Meteorology Laboratory, EPA, Research Triangle Park, NC 27711
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Research and Development
MONITOR: Gage, Stephen J.
TELEPHONE: C(201)755-2600
TYPE OF FUNDING: Interagency agreement-EPA
77 FUNDING: Environmental Protection Agency FY77:$2,400,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: In order to define and understand the impact of various air pollutants on man's health and welfare, a knowledge of the atmospheric processes affecting the atmospheric transfer cycle from source to receptor.
APPROACH: (1) To develop, evaluate and validate air quality simulation models. (2) Determination and definition of effects of pollutant and thermal emissions on visibility, weather and climate. (3) Participate in a Regional Air Pollution Study.
RESULTS: (1) New concepts with respect to effects of topography, pollutant removal and conversion processes, and complex sources will be developed with regard to air quality simulation models. (2) A plume rise climatology will be prepared for the U.S.
KEYWORDS: AIR POLLUTION;PUBLIC HEALTH;BIOLOGICAL EFFECTS;AIR QUALITY;THERMAL EFFLUENTS;WEATHER;REGIONAL ANALYSIS;FUNCTIONAL MODELS;SIMULATION;ENVIRONMENTAL EFFECTS;EARTH ATMOSPHERE;CLIMATES;WEATHER;METEOROLOGY

<013018>
TITLE: Atmospheric Transport Models
PRINCIPAL INVESTIGATOR: Randerson, D.
ADDRESS: P. O. Box 14985, Las Vegas, NV 89114
AFFILIATION: National Oceanic and Atmospheric Administration, Las Vegas, Nev. (USA). Weather Service Nuclear Support Office
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-4488;C(301)353-4488
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Atmospheric transport of pollutants (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
""OJECT DESCRIPTION: Development of atmospheric transport and diffusion models.
PROACH: Validate model(s) by pollutant concentration measurements and relate to meteorological measurements.
SULTS: Computer code dispersion model.
KEYWORDS: MATHEMATICAL MODELS;AIR POLLUTION;DIFFUSION;DATA;METEOROLOGY;COMPUTER CODES;EARTH ATMOSPHERE;CHEMICAL EFFLUENTS;CLIMATES;WEATHER;ENVIRONMENTAL TRANSPORT

<013019>
TITLE: Atmospheric Turbulence and Diffusion
PRINCIPAL INVESTIGATOR: Gifford, F.A.
ADDRESS: P. O. Box E, Oak Ridge, TN 37830
AFFILIATION: National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. (USA). Atmospheric Turbulence and Diffusion Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3763;C(301)353-3763
TYPE OF FUNDING: Interagency agreement-ERDA/NOAA
77 FUNDING: Energy Research and Development Administration FY77:$499,000; National Oceanic and Atmospheric Administration
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Diffusion of pollutants (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To conduct basic and applied research studies of atmospheric turbulence and diffusion.
APPROACH: Perform stratospheric diffusion studies, planetary boundary layer analyses, numerical studies of turbulent flows, and turbulent heat flux and momentum transfer studies.
RESULTS: Cooling tower drift deposition model. Buoyant lift-off field experiments. Two dimensional potential flow model for the eastern Tennessee River Valley.
KEYWORDS: AIR;TURBULENCE;DIFFUSION;STRATOSPHERE;HEAT FLOW;COOLING TOWERS;FUNCTIONAL MODELS;EARTH ATMOSPHERE;CLIMATES;METEOROLOGY;WEATHER

<013020>
TITLE: Transport, Deposition and Meteorological Experiments
PRINCIPAL INVESTIGATOR: Machta, L.
ADDRESS: 8060 13th Street, Silver Spring, MD 20910
AFFILIATION: National Oceanic and Atmospheric Administration, Silver Spring, Md. (USA). Air Resources Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: C(301)353-3763;F233-3763
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$639,000
TECHNOLOGY: CONSERVATION/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Fate of pollutants (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;OS
PROJECT DESCRIPTION: Modelling regional and global air concentrations and population exposures from pollutants injected into the atmosphere near ground level.
APPROACH: (1) Continue development of trajectory model. (2) Design and conduct of tracer field experiments. (3) Collect, summarize and analyze atmospheric radioactivity data.
RESULTS: (1) Development of new atmospheric tracer system using perfluorocarbons and conduct a full-scale field test. (2) Verify model calculations of long-term Kr-85 concentrations.
KEYWORDS: METEOROLOGY;AIR;HUMAN POPULATIONS;POLLUTION;MATHEMATICAL MODELS;TRAJECTORIES;RADIOACTIVITY;KRYPTON 85;RADIOECOLOGICAL CONCENTRATION;EARTH ATMOSPHERE;CLIMATES;CHEMICAL EFFLUENTS;WEATHER

<013021>
TITLE: Meteorological Transport and Diffusion Studies
PRINCIPAL INVESTIGATOR: Van der Hoven, I.
ADDRESS: 8060 13th Street, Silver Spring, MD 20910
AFFILIATION: National Oceanic and Atmospheric Administration, Silver Spring, Md. (USA). Air Resources Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA); Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Development and Demonstration;Office of Nuclear Regulatory Research
MONITOR: Sherwood, George L.;Abbey, Robert F.
TELEPHONE: F233-3481;C(301)353-3481;C(301)427-4373
TYPE OF FUNDING: Interagency agreement-ERDA/NRC
77 FUNDING: Energy Research and Development Administration FY77:$185,000; Nuclear Regulatory Commission FY77:$240,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Fate of pollutants (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Research in meteorological dispersion, to obtain diffusion parameters for a variety of sites, particularly LMFBR program and potential reactor sites.
APPROACH: Field measurements of downwind tracer gas concentrations and related meteorological parameters over a wide range of distances, terrain, weather conditions and source configurations.
RESULTS: Validated dispersion parameters and improved calculational methods.
PROJECT MILESTONES: (1) Complete building wake effects studies 1978. (2) Complete measurements for long distance atmospheric dispersion parameters 1979. (3) Complete CRBRP site measurements 1980. (4) Complete measurements of concentration profiles in the vertical 1979.
KEYWORDS: METEOROLOGY;DIFFUSION;LMFBR TYPE REACTORS;REACTOR SITES;WEATHER;ENVIRONMENTAL TRANSPORT;CHEMICAL EFFLUENTS;CLIMATES;PLUMES

<013022>
TITLE: Structure and Function of Coastal and Estuarine Ecosystems of the Southeastern United States
PROJECT NUMBER: AEC-003-77-EI-AR-1
PRINCIPAL INVESTIGATOR: Thayer, G.W.
ADDRESS: Beaufort Laboratory, National Marine Fisheries, Beaufort, NC 28516
AFFILIATION: National Marine Fisheries Service, Beaufort, N.C. (USA). Center for Estuarine and Menhaden Research
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA); Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Resource Management (NMFS), Division of Biomedical and Environmental Research (ERDA)
MONITOR: Larsen, Charles M.;Hamilton, D. Heyward
TELEPHONE: C(202)634-7490;C(301)353-4155
TYPE OF FUNDING: Interagency agreement-ERDA-NMFS
77 FUNDING: Energy Research and Development Administration FY77:$68,400; National Oceanic and Atmospheric Administration FY77:$96,700
TECHNOLOGY: FOSSIL FUEL/General (90%);NUCLEAR/General (10%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (10%)
POLLUTANTS: PARTICULATES (20%);HEAT, THERMAL (10%);SPECIFIED OTHER POLLUTANTS/Habitat destruction (70%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (95%);ANALYTICAL (5%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To evaluate natural variability in community structure and flows of energy through coastal and estuarine ecosystems, and to develop a working knowledge of fisheries production in a variety of habitats to establish a data-base upon which to evaluate perturbations.
APPROACH: Microbes are estimated by ATP and acridine orange direct counts; benthic invertebrates from screened samples of sediment cores; nekton from a variety of gears plus estimates of precision and accuracy; and ichthyoplankton using horizontal and oblique bongo net tows. Food utilization is measured using /sup 14/C-labeled and unlabeled substrates and metabolism by respirometry techniques.
RESULTS: A mathematical model to predict impact of thermal discharges on eelgrass beds was completed. Response surfaces of sediment parameters were graphically plotted, thus providing a basis for examination of relationships between the biota and the substrate. Descriptive modeling of the biomass of plants, microbes, invertebrates and fish in eelgrass beds and the estuary was initiated.
PROJECT MILESTONES: (a) Determine seasonal distribution of microbes in estuarine water and sediments. Completion date July 1978. (b) Determine trophic structure of seagrass systems and impact of habitat alteration on system productivity. Completion date May 1979. (c) Evaluate distribution and abundance of fish eggs, larvae, juveniles and adults in estuarine and coastal waters. Completion date September 1978.
KEYWORDS: AQUATIC ECOSYSTEMS;COASTAL WATERS;ESTUARIES;ATLANTIC OCEAN;CONTINENTAL SHELF;NORTH CAROLINA;FISHES;POPULATION DYNAMICS;NUTRIENTS;FOOD;METABOLISM;MEASURING METHODS;AQUATIC ORGANISMS;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;MATHEMATICAL MODELS;BIOMASS;INVERTEBRATES;AGE DEPENDENCE;SEDIMENTS;SAMPLING;BACTERIA;RESPIRATION

<013023>
TITLE: Cycling of Metals in Southeastern Coastal Plain Estuaries
PROJECT NUMBER: AEC-004-79-EI-AR-1
PRINCIPAL INVESTIGATOR: Cross, F.A.
ADDRESS: Beaufort Laboratory, National Marine Fisheries Service, Beaufort, NC 28516
AFFILIATION: National Marine Fisheries Service, Beaufort, N.C. (USA)
MONITORING AGENCY: National Marine Fisheries Service, Beaufort, N.C. (USA); Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Resource Management (NMFS);Division of Biomedical and Environmental Research (ERDA)
MONITOR: Larsen, Charles M. (NMFS);Hamilton, D. Heyward (ERDA)
TELEPHONE: C(202)634-7466;C(301)353-4155
TYPE OF FUNDING: Interagency agreement-ERDA-NMFS
77 FUNDING: Energy Research and Development Administration FY77:$66,000; National Marine Fisheries Service FY77:$66,200
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (60%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (40%);WASTE MANAGEMENT (10%)
POLLUTANTS: METALS/Copper;METALS/Manganese;METALS/Iron;METALS/Zinc (90%);RADIATION/Plutonium (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (95%);ANALYTICAL (5%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to characterize the pathways, rates of transport and fate of trace elements and radionuclides in coastal-plain estuaries and adjacent coastal waters of the southeastern United States.
APPROACH: The research approach is to (1) determine which estuarine components represent major biotic and abiotic reservoirs of individual trace elements and radionuclides, (2) determine the flux of these contaminants among the reservoirs, and (3) measure the effect of environmental variables on this flux. This information is then combined with energy flow data (e.g., biomass estimates, growth rates, feeding rates) obtained by other research programs in the laboratory to develop descriptive models of trace element flux within these ecosytems.
RESULTS: The expected results are a dynamic model of the distribution, chemical speciation, pathways and fate of trace elements in coastal-plain estuaries and adjacent coastal waters of the southeastern United States. An understanding of the flux of these materials will allow prediction of their fate and effects when introduced from anthropogenic sources.
PROJECT MILESTONES: (1) Describe partitioning of trace metals among estuarine food webs, including development of predictive models. Completion date: July 1978. (2) Determine distribution and movement of plutonium and tritium in selected estuaries in North Carolina and Georgia. Completion date: July 1979. (3) Determine turnover rates of trace metals in selected fishery organisms for inclusion into predictive models of trace metal cycling in coastal-plain estuaries. Completion date: July 1979.
KEYWORDS: METALS;ESTUARIES;DIFFUSION;ELEMENTS;TRACE AMOUNTS;RADIOISOTOPES;COASTAL WATERS;CONTAMINATION;DATA;MATHEMATICAL MODELS;RADIONUCLIDE MIGRATION;AQUATIC ECOSYSTEMS;MANGANESE;IRON;COPPER;ZINC;MERCURY;ENVIRONMENTAL TRANSPORT

<013024>
TITLE: Physiological Effects of Arsenic, Cadmium and Copper on Marine Shellfish
PROJECT NUMBER: AEC-015-79-EI-AR-1
PRINCIPAL INVESTIGATOR: Engel, D.W.
ADDRESS: Beaufort Laboratory, National Marine Fisheries Service, Beaufort, NC 28516
AFFILIATION: National Marine Fisheries Service, Beaufort, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: National Institutes of Environmental Health Sciences, Durham, N.C.
MONITOR: Fowler, Bruce A.
TELEPHONE: C(919)549-8411
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$34,300
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (40%);WASTE MANAGEMENT (10%)
POLLUTANTS: METALS/Copper;METALS/Arsenic;METALS/Cadmium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of the research program are to expose large numbers of shellfish to arsenic, cadmium and copper to attain elevated levels of biologically incorporated metals, and to determine the physiological and biochemical effects of these metals on marine shellfish.
APPROACH: This research program is exposing oysters to copper, cadmium and arsenic to achieve high levels of biologically incorporated metals for use in mammalian toxicology programs. Research is also being conducted on the effects of these metals on shellfish survival, metabolism and growth. Tissue ultrastructural changes will be examined using electron microscopy.
RESULTS: Through cooperation with NIEHS, determinations of the toxicity of biologically incorporated metals in shellfish on mammals will be made. Uptake rates of copper, cadmium and arsenic by marine shellfish and the toxicity of these metals to the different developmental stages of the shellfish will be determined. Ability to predict the effect of heavy metal pollution on marine shellfish will be a basic output of this investigation.
PROJECT MILESTONES: (1) Label oyster meats with high concentrations of copper, cadmium and arsenic for use in pharmacokinetic and toxicity experiments at NIEHS. Completion date: July 1978. (2) Measure effects of copper, cadmium and arsenic on oxidative metabolism of molluscan or crustacean tissues. Completion date: July 1980. (3) Establish MATC (maximum acceptable toxicant concentration) for shellfish. Completion date: July 1980.
KEYWORDS: ARSENIC;CADMIUM;COPPER;BIOLOGICAL EFFECTS;CRUSTACEANS;MOLLUSCS;TOXICITY;SURVIVAL TIME;METABOLISM;GROWTH;ELECTRON MICROSCOPY;UPTAKE;TISSUES;RESPIRATION;WATER POLLUTION;STANDARDS;HEALTH HAZARDS

<013025>
TITLE: Impacts Associated with Offshore Power Plants; Transport and Fate of Nickel, Copper, and Zinc in Coastal Waters of North Carolina
PROJECT NUMBER: AEC-014-79-EI-AR-1
PRINCIPAL INVESTIGATOR: Cross, F.A.
ADDRESS: Beaufort Laboratory, National Marine Fisheries Service, Beaufort, NC 28516
AFFILIATION: National Marine Fisheries Service, Beaufort, N.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D. Heyward
TELEPHONE: C(301)353-4155
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$65,600
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (50%)
POLLUTANTS: METALS/Copper;METALS/Nitrogen;METALS/Zinc (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The long-range objectives of this research are to (1) develop a dynamic model of the cycling and fate of copper, nickel and zinc in coastal waters of North Carolina and (2) determine the effects of dissolved organic compounds originating from watersheds and salt marshes on the physical transport and biological availability of copper to marine organisms.
APPROACH: The spatial and temporal distribution of copper, nickel and zinc is being determined in sediments and water of coastal North Carolina. The chelation of copper to dissolved organic matter, including the effect of environmental factors such as salinity and pH on the chelation of copper to organic matter, is being determined in the Newport River and estuary using a specific ion electrode.
RESULTS: (1) An evaluation of the significance of dissolved organic compounds on the transport, biological availability and toxicity of copper to fishery organisms. (2) Development of a dynamic model of the cycling and fate of copper, nickel and zinc in coastal waters of North Carolina.
PROJECT MILESTONES: (1) Characterize role of dissolved organic compounds on the transport of copper through estuaries into coastal waters and determine effect of various salinities on bioavailability and toxicity of copper to biota. Completion date: July 1979. (2) Determine distribution and movement of nickel, copper and zinc in sediment, water and dominant food webs in coastal waters of North Carolina. Completion date: July 1979.
KEYWORDS: NICKEL;COPPER;ZINC;DISTRIBUTION;OFFSHORE SITES;COASTAL WATERS;MATHEMATICAL MODELS;WATERSHEDS;MARSHES;ORGANIC COMPOUNDS;AQUATIC ORGANISMS;SEDIMENTS;POLLUTION;SALINITY;PH VALUE;ENVIRONMENTAL EFFECTS;BIOLOGICAL ACCUMULATION;ENVIRONMENTAL TRANSPORT

<013027>
TITLE: Effects of Contaminants and Environmental Alterations in Southestern Coastal Plain Estuaries and Adjacent Coastal Waters
OJECT NUMBER: AEC-005-79-EI-AR-1
INCIPAL INVESTIGATOR: Hoss, D.E.
ADDRESS: Beaufort Laboratory, National Marine Fisheries Service, Beaufort, NC 28516
AFFILIATION: National Marine Fisheries Service, Beaufort, N.C. (USA)
MONITORING AGENCY: National Marine Fisheries Service, Beaufort, N.C. (USA); Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Resource Management (NMFS); Division of Biomedical and Environmental Research (ERDA)
MONITOR: Larsen, Charles M. (NMFS);Hamilton, D. Heyward (ERDA)
TELEPHONE: C(202)634-7490;C(301)353-4155
TYPE OF FUNDING: Interagency agreement-ERDA-NMFS
77 FUNDING: Energy Research and Development Administration FY77:$79,200; National Marine Fisheries Service FY77:$122,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (60%);WASTE MANAGEMENT (10%)
POLLUTANTS: METALS (30%);HEAT, THERMAL (50%);SPECIFIED OTHER POLLUTANTS/Chlorine (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (95%);ANALYTICAL (5%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this research program is to determine the effects of natural and man-made stress on the metabolism, growth, survival and behavior of marine and estuarine organisms with particular emphasis on fish.
APPROACH: This research program is designed to provide baseline data on estuarine and marine organisms so that the impact on biological productivity of specific environmental alterations associated with increased energy development can be properly evaluated. Determinations of the effects of power plant related stresses, such as entrainment with temperature shock and chlorine exposure and the leaching out of copper, on metabolism and how changes in the thermal environment affects fish growth and feeding.
RESULTS: Describe the effects of temperature, chlorine and copper (including interactions) on fish eggs and larvae resulting from entrainment in power plant cooling systems and make recommendations for site selection and operating criteria that would minimize these effects. Assess importance of ecological factors (temperature, salinity, nutritional quality and availability of food and interspecific competition and predation) on the productivity of Atlantic menhaden in selected nursery habitats along the east coast of the United States.
PROJECT MILESTONES: (1) Determine both lethal and non-lethal effects of increased temperature during simulated entrainment in power plant cooling systems on eggs and larval stages of estuarine and marine fish. Completion date: July 1978. (2) Describe both the effects of chlorine and copper and their interactions with temperature on the growth, metabolism and growth of fish eggs and larvae. Completion date: July 1980. (3) Describe the effects of temperature and salinity on feeding and growth of larval and juvenile stages of fish. Completion date: July 1980.
KEYWORDS: ESTUARIES;SHORES;COASTAL WATERS;AQUATIC ORGANISMS;METABOLISM;GROWTH;SURVIVAL TIME;BEHAVIOR;DATA;PRODUCTIVITY;ENERGY SOURCES;POWER PLANTS;TEMPERATURE EFFECTS;CHLORINE;COPPER;ENVIRONMENTAL EFFECTS;FISHES;POLLUTION;TOXICITY;POPULATION DYNAMICS

<013028>
TITLE: Environmental Assessment of an Active Oil Field in the Northwestern Gulf of Mexico
PROJECT NUMBER: IAP 77 BEO (EPA IAG D5-E693)
PRINCIPAL INVESTIGATOR: Klima, E.J.
ADDRESS: Galveston Laboratory, NMFS, 4700 Avenue U, Galveston, TX 77550
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Gulf Breeze Laboratory, Gulf Breeze, Florida
MONITOR: Duke, Thomas W.
TELEPHONE: F377-5268;C(904)932-5326
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$665,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS/Trace and heavy metals (35%);PARTICULATES/Sedimentology (35%);ORGANICS/Hydrocarbons (30%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To identify, determine and document the extent and types of biological, chemical and physical alterations that occur in a marine ecosystem associated with an area in which an oil and gas field is developed and operated. To determine the specific pollutants, their quantity, and effect on various components of the marine ecosystem. To develop a capability to predict the impact of oil field exploration and development on specific marine ecosystems. To develop a suitable data management system.
APPROACH: To achieve the objective, a number of discrete investigations must be conducted. These investigations are in highly specialized technical fields. Those in which in-house expertise exists, and technically competent personnel can be made available, are being conducted by NMFS. The other investigations are being conducted by various universities under contract. The results will be presented in synthesized semi-annual and annual reports.
RESULTS: The ecosystem changes that occur in an active offshore oil field, in comparison to an undisturbed area, will be determined and documented. The variability, distribution, extent and effect of ecological conditions will be characterized. The type(s), rate and effect of pollutants will be defined. The effects of the structures themselves on the composition of the local biota will be studied. The results will be presented in synthesized reports and the results of individual studies may be published in scientific journals.
PROJECT MILESTONES: (1) Complete pilot study, select work areas, design sampling system. (2) Complete preparation of sediment-type charts. (3) Final summary report of sediment characteristics, distribution and comparison between study areas. (4) Semi-annual and annual summary reports on: benthic organisms and communities, demersal finfish and macro-crustaceans, pelagic and reef fishes, plankton, effects of structures, and hydrography of area.
KEYWORDS: AQUATIC ECOSYSTEMS;GULF OF MEXICO;PETROLEUM;DATA ACQUISITION SYSTEMS;POLLUTION;ENVIRONMENTAL EFFECTS;ENVIRONMENTAL TRANSPORT

<0 13029>
TITLE: Environmental Studies of the South Texas Outer Continental Shelf
PROJECT NUMBER: 08550-IA5-19
PRINCIPAL INVESTIGATOR: Klima, E.J.
ADDRESS: Galveston Laboratory, NMFS, 4700 Avenue U, Galveston, TX 77550
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Department of the Interior, Washington, D.C. (USA)
DIVISION: Bureau of Land Management
MONITOR: Defenbaugh, Richard
TELEPHONE: F682-6541
TYPE OF FUNDING: Interagency agreement-BLM
77 FUNDING: Bureau of Land Management FY77:$310,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (35%);PARTICULATES (35%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/South;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Establish baseline data on the marine fauna and physical features of the waters overlying the continental shelf in the south Texas OCS study area. More specifically, this included determining seasonal variations in plankton, benthic (demersal) and pelagic fish and shellfish populations with particular emphasis on species of commercial and recreational importance; and documenting seasonal variations in temperature, salinity, and current regimes as related to meteorologic and other physical factors.
APPROACH: With one or two major exceptions, the method used has been that of collating and analyzing historical, biological, and physical data available from a variety of sources. Exceptions include the completion of a creel survey and hydroacoustical survey to identify species of recreational importance with their seasonal variations and assess the magnitude of pelagic fish populations.
RESULTS: Definition of plankton and finfish/shellfish communities in the study area and the seasonal and areal variations of the important components of the marine fauna as related to oceanographic and hydrographic features of the area. This information will be released in report form.
PROJECT MILESTONES: (1) Identify major components of the plankton communities from historical samples and document seasonal and areal variations in their distribution and abundance. (2) Determine species composition of the ichthyoplankton, with particular emphasis on king and Spanish mackerel, and their seasonal and areal variations therein. (3) Documentation of species entering the commercial and recreational fisheries and their respective values. (4) Identification of oceanographic features of the area, including extremes and seasonal variations.
KEYWORDS: CONTINENTAL SHELF;SEAS;TEXAS;AQUATIC ORGANISMS;SEASONAL VARIATIONS;PLANKTON;BENTHOS;FISHES;CRUSTACEANS;MOLLUSCS;POPULATIONS;TEMPERATURE EFFECTS;SALINITY;METEOROLOGY;OCEANOGRAPHY;DATA ACQUISITION;BASELINE ECOLOGY;AQUATIC ECOSYSTEMS

<0 13031>
TITLE: Sublethal Biochemical Effects of Petroleum Hydrocarbons
PROJECT NUMBER: 88C2U
PRINCIPAL INVESTIGATOR: Malins, D.C.
ADDRESS: 2725 Montlake Boulevard East, Seattle, WA 98112
AFFILIATION: National Marine Fisheries Service, Seattle, Wash. (USA). Technology Lab.
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$362,400
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: ORGANICS/Hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Puget Sound
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determine classes of metabolites formed in fish from salmon and flatfish; determine some factors that affect activity of aryl hydrocarbon hydroxylases after exposure to aromatics; determine physiological effects of petroleum hydrocarbons on fish and shellfish with emphasis on sensory systems and behavioral patterns.
APPROACH: Determine metabolites from aromatic compounds; effect of aromatics on larval forms; excretion and detoxification of aromatic compounds; evaluate effects of petroleum on chemoreception and concomitant behavioral responses.
RESULTS: Determine naphthalene metabolites in key tissues; determine uptake and depuration rates of naphthalene by larval spot shrimp; adapt methodology to assay livers for metabolizing enzymes in fish; obtain behavioral data for spot shrimp; obtain histopathological information from tissues of exposed fish and shellfish.
PROJECT MILESTONES: Publications on results from individual activities.
KEYWORDS: AQUATIC ECOSYSTEMS;COASTAL WATERS;WATER QUALITY;WATER POLLUTION;FISHES;CHEMICAL EFFLUENTS;POPULATION DYNAMICS;MORTALITY;HYDROCARBONS;PETROLEUM;ENVIRONMENTAL EFFECTS;PHYSIOLOGY;BEHAVIOR;AROMATICS;TOXICITY;NAPHTHALENE;METABOLISM;CRUSTACEANS;LARVAE;MOLLUSCS;SHRIMP;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL EFFECTS;ENZYMES;IN VIVO

<0 13032>
TITLE: Behavioral Measures of Environmental Stress, Marine Fishes and Invertebrates
PROJECT NUMBER: E(49-7)-3045
PRINCIPAL INVESTIGATOR: Olla, B.L.
ADDRESS: NOAA, NMFS, Sandy Hook Laboratory, Highlands, NJ 07732
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D. Heyward
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$77,500
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (5%);HEAT, THERMAL (95%)
CHARACTER OF STUDY: RESEARCH (100%)

REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
OJECT DESCRIPTION: The objective is to observe and quantify patterns of behavior in selected species of marine fishes and invertebrates to use in measuring the effects of sublethal thermal stress. Laboratory studies will concentrate on temperature effects on tautog reproduction; juvenile bluefish activity and feeding; chemosensory mechanisms in hake and blue crabs. Field studies define normal habits and requirements of young and juvenile cunner and tautog.
APPROACH: Establishment of normal activity, feeding, grouping, social behavior for study species at temperatures approximating natural conditions. Change temperature (rate dependent on species to be studied, monitoring behaviors indicated. If sublethal exposure, return temperature to pre-test levels. Field studies utilize SCUBA, tagging, ultrasonic monitoring to establish normal movements and habitat requirements.
RESULTS: (1) The effect of prolonged exposure to elevated, sublethal temperature on courtship and spawning behavior of adult tautog and the viability of eggs and embryological development. (2) Possible avoidance-escape response in juvenile bluefish (comparable to that exhibited by adults). (3) Description of normal chemosensory behavior in hake and blue crabs to use in assessing effects of varying thermal levels. (4) Determination of effects of temperature on normal activity and social behavior of blue crabs.
KEYWORDS: ENVIRONMENTAL REQUIREMENTS;AQUATIC ECOSYSTEMS;ATLANTIC OCEAN;COASTAL WATERS;NEW JERSEY;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;FISHES;INVERTEBRATES;CRUSTACEANS;POPULATION DYNAMICS;REPRODUCTION;TEMPERATURE DEPENDENCE;PHYSIOLOGY;BEHAVIOR;BIOMASS;TEMPERATURE EFFECTS;BIOLOGICAL STRESS

<013034>
TITLE: MARMAP, Ichthyoplankton Studies, New York Bight
PROJECT NUMBER: 332281
PRINCIPAL INVESTIGATOR: Kendall, A.W. Jr.
ADDRESS: U.S. Dept. of Commerce, NOAA, NMFS, Sandy Hook Laboratory, Highlands, NJ 07732
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Brookhaven National Lab., Upton, N.Y. (USA)
DIVISION: Department of Applied Sciences
MONITOR: Manowitz, Bernard
TELEPHONE: C(516)345-3037
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$209,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Provide information and analysis on the distribution (geographic, depth, and temporal) of eggs and larvae of fish of the continental shelf waters of the New York Bight with emphasis on the nearshore region.
APPROACH: Gather historical data and collect field samples in the New York Bight. Analyze these data to demonstrate the use of the New York Bight as an area for early development of fishes of the area.
RESULTS: Scientific papers and reports on our results. Synthesis of these results with those of others working on other portions of the ecosystems of the New York Bight.
PROJECT MILESTONES: Cruise reports. Semi-Annual reports. Data reports. Scientific papers with analysis and synthesis of data.
KEYWORDS: AQUATIC ECOSYSTEMS;ATLANTIC OCEAN;CONTINENTAL SHELF;NEW YORK;FISHES;EGGS;LARVAE;POPULATION DYNAMICS;COASTAL WATERS;PLANKTON;BIOMASS

<013035>
TITLE: Standardization and Intercalibrated Techniques for Marine Monitoring
PROJECT NUMBER: EPA-IAG-D5-E693-EA
PRINCIPAL INVESTIGATOR: Basileo, M.A.
ADDRESS: 6010 Executive Blvd., Rockville, MD 20852
AFFILIATION: National Oceanic and Atmospheric Administration, Rockville, Md. (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Rockville, Md. (USA)
DIVISION: Office of Ocean Engineering
MONITOR: Parland, Robert J.
TELEPHONE: F443-8444
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$250,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop common techniques for the standardization and intercalibration of sampling and sample analysis in the marine environment; and to permit intercomparison of marine environmental samples and the pooling of data from several sources for more reliable predictions/assessments of energy production and its effects on the environment.
APPROACH: In providing a national capability for marine monitoring responsive to national energy needs and to local environmental constraints, a Federal involvement to develop appropriate methodologies is necessary. High priority effort will be expended to establish adequate instrumental evaluation techniques, standards, calibration procedures and methodologies, and intercomparison of measurement capabilities for quality assurance of monitoring instrument systems.
RESULTS: Instrumental and procedural standards for laboratory and field use; assessment and present quality status of methodologies used for characterizing the marine environment; and mechanisms for quantifying instrument and measurement performances.
)JECT MILESTONES: FY 76-FY 79: The prime milestones for the contractual efforts to develop standards, and

the assessment of water quality instrumental measurements are development of appropriate work statements; evaluation of proposals; technical monitoring of contract; evaluation and analyses of end product from contract.
KEYWORDS: SEAS;SAMPLING;MONITORING;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;STANDARDIZATION;CALIBRATION;MEASURING INSTRUMENTS;STANDARDS;POLLUTION;AQUATIC ECOSYSTEMS;WATER QUALITY

<013036>
TITLE: Underway Water Sampling System
PROJECT NUMBER: (EPA)IAG-D6-E693-DX
PRINCIPAL INVESTIGATOR: Ringenbach, M.E.
ADDRESS: 6010 Executive Boulevard, Rockville, MD 20852
AFFILIATION: National Oceanic and Atmospheric Administration, Rockville, Md. (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Rockville, Md. (USA)
DIVISION: Office of Ocean Engineering
MONITOR: Farland, Robert
TELEPHONE: P443-8444
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (50%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);DEVELOPMENT/Pilot plant (40%);FULL SCALE DEMONSTRATION (40%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of the Underway Water Sampling System development project is to provide an effective shipborne system to measure those physical and chemical parameters which determine the identity, concentration, transport, and distribution of pollutants arising from energy activities in the marine environment. The system will be used to characterize background or ambient levels of pollutants from sources such as offshore oil rigs and thermal power plants, as well as dredging or mining activities on the continental shelf.
APPROACH: The overall concept envisions a ship traveling at speeds up to 10 knots while continuously obtaining water samples and oceanographic measurements which are processed in real or quasi-real time. This four-year development effort includes: analysis, subsystem development, system integration, and at-sea testing. The elements or work packages of the program include: (1) The current/depth measurement subsystem; (2) The water sampling and measurement subsystem; (3) Data processing, display and navigation subsystem; (4) System integration, test and techniques development.
RESULTS: The project has been abbreviated as a result of budgetary constraints. Work on all subsystems has been curtailed except for the Development of the Current/Depth Measurement Subsystem. The delivered product will be an engineering model fully tested and evaluated to measure ocean currents to a depth of 100 meters from an underway vessel. This subsystem is expected to provide valuable input to many NOAA programs such as the verification of hydrodynamical numerical models.
PROJECT MILESTONES: (1) Current/depth measurement subsystem acceptance test 9/79. (2) Complete application study report on water sampling and measurement subsystem 9/77.
KEYWORDS: ENERGY SOURCES;POLLUTION;ECOLOGICAL CONCENTRATION;SEAWATER;ENVIRONMENTAL EFFECTS;THERMAL POWER PLANTS;CONTINENTAL SHELF;MINING;SHIPS;MONITORING;OCEANOGRAPHY;MEASURING METHODS;SAMPLING;HYDROCARBONS;OIL SPILLS;WATER POLLUTION;ENVIRONMENTAL TRANSPORT;MEASURING INSTRUMENTS

<013037>
TITLE: Outer Continental Shelf Bathymetric Mapping Program
PROJECT NUMBER: R3230100
PRINCIPAL INVESTIGATOR: Banks, N.E.
ADDRESS: 6010 Executive Blvd. WSC-5/613, Rockville, MD 20852
AFFILIATION: National Ocean Survey, Rockville, Md. (USA)
MONITORING AGENCY: Bureau of Land Management, Washington, D.C. (USA)
DIVISION: Division of Mineral Assessment
MONITOR: Van Horn, William
TELEPHONE: C(202)343-6264
TYPE OF FUNDING: Interagency agreement-BLM
77 FUNDING: Bureau of Land Management FY77:$41,600
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Continental;COASTS/Southeast;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Produce bathymetric maps to support the Bureau of Land Management's Outer Continental Shelf Leasing Program. The area covered by these maps includes the southeast coast of the United States (Georgia Embayment).
APPROACH: Bathymetric contours were compiled from systematic hydrographic/bathymetric surveys. The surveys contained the latest available data of the area, and were collected by NOS or other reliable sources, such as DMAHC.
RESULTS: All 5 1:250,000-scale bathymetric maps were produced. Three maps were overprinted with the BLM Lease Blocks. The bathymetry was compiled with as much detail as the data would allow, in that significant underwater features are shown in detail. Above all, through the use of contours, 100% of the data was used. The basic contour interval was 2 meters to 200 meters; 10 meters to maximum depth, where applicable. Prominent underwater features were named.
PROJECT MILESTONES: FY 1975 10 maps produced. FY 1976 20 maps produced. FY 1977 5 maps produced.
KEYWORDS: BATHYMETRY;ATLANTIC OCEAN;CONTINENTAL SHELF;METEOROLOGY;OCEANOGRAPHY;DATA COMPILATION;USA;MAPS;OIL SPILLS;ECONOMICS

<0013038>
TITLE: Ocean Oil Spill Concentration and Trajectory Forecast
PROJECT NUMBER: BC6902
PRINCIPAL INVESTIGATOR: Barrientos, C.S.
ADDRESS: W427, National Weather Service, NOAA, Silver Spring, MD 20910
AFFILIATION: National Weather Service, Silver Spring, Md. (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: National Weather Service, Techniques Development Lab., Systems Development Office
MONITOR: Barrientos, Celso S.
TELEPHONE: F427-7613
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$170,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);STORAGE (10%);WASTE MANAGEMENT (20%)
POLLUTANTS: ORGANICS (80%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (30%);ANALYTICAL (70%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this program is to develop a numerical model which will predict the concentration of petroleum in the ocean as a function of space and time. Previous models have required the source of this petroleum to be single spill; however, in this model it may be continuous leakage from one or more points, one or more individual spills, or from a spill and a general background level of known variable concentrations. The program also includes provisions for forecasting the local current, wind, and wave fields, forecasts which have not been available previously. Forecasting techniques will be developed for these variables.
APPROACH: The program is divided into seven tasks (or subprograms): (1) surface wind field, (2) ocean currents, (3) direct wind drag effects, (4) wave transport, (5) sea-air pollutant transfer, (6) horizontal diffusion, and (7) model integration. All the tasks, except task 7, can be done concurrently. As soon as individual task results are available, the model integration task will begin. Tasks 1 and 7 are done in-house; all the other tasks will be contracted to universities and private companies. The general approach is to apply physical, statistical, dynamical, and numerical methods to develop a model to predict the dispersion and concentration of contaminants from available oceanographic and meteorological data.
RESULTS: The final product of the program is a comprehensive model to predict the dispersion and concentration of contaminants (oil). The model will be implemented for operational use, such as, forecasting or planning. The model will include techniques for predicting required meteorological variables, compilation of physical and oceanographic data, methods for computing ocean currents, and rate of weathering processes.
PROJECT MILESTONES: (1) Program: Ocean Oil Spill Concentration and Trajectory Forecast; Planning, coordination, and direction FY 75-FY 80. (2) Subprogram 1: Surface wind field; Develop and implement forecast method FY 75-FY 78. (3) Subprograms 2 to 6: Award contracts January 1976-June 1977; Monitor contracts July 1976-June 1979. (4) Subprogram 7: Model integration; Coordinate with related projects FY 75-FY 80; Model integration January 1978-FY 80; Model testing July 1978-FY 80.
KEYWORDS: PETROLEUM;SEAS;FORECASTING;MATHEMATICAL MODELS;OIL SPILLS;ENVIRONMENTAL EFFECTS;TRAJECTORIES;WATER POLLUTION;DIFFUSION;PLANNING;DATA;AIR POLLUTION;METEOROLOGY;POLLUTION;OCEANOGRAPHY

<0013039>
TITLE: Shipboard Environmental Data Acquisition System (SEAS)
PROJECT NUMBER: B6220101
PRINCIPAL INVESTIGATOR: Reynolds, R.R.
ADDRESS: W44, Rm. 215, 8060 13th Street, Silver Spring, MD 20910
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Systems Development Office/Equipment Development Laboratory
MONITOR: Reynolds, Richard R.
TELEPHONE: C(301)427-7815
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$80,000; Department of Commerce
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (90%);GENERAL SCIENCE (10%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: RESEARCH/General (10%);DEVELOPMENT/Pilot plant (40%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop an automated meteorological/oceanographic observation system for ultimate use on board ships cooperating in the international marine environmental observation program.
APPROACH: (1) Develop an engineering model Shipboard Environmental Data Acquisition System (SEAS-1). Operationally test and evaluate SEAS-1 on the NOAA Ship RESEARCHER and a MARAD ship. Develop and integrate with SEAS-1 additional sensors, e.g., automatic expendable bathythermograph. (2) Build a breadboard prototype model, SEAS-2. Prepare procurement specifications for SEAS-2.
RESULTS: A fully automated environmental data observing system for shipboard use.
PROJECT MILESTONES: (1) SEAS-1 assembled June 1976. (2) SEAS-1 tests begin August 1976. (3) Automated XBT assembled July 1977. (4) SEAS-2 Breadboard completed December 1977. (5) SEAS-1 test completed January 1978. (6) SEAS-2 procurement specifications completed January 1979.
KEYWORDS: ENVIRONMENT;MONITORING;DATA COMPILATION;WEATHER;METEOROLOGY;OCEANOGRAPHY;SHIPS;DATA ACQUISITION;SAMPLING;OIL SPILLS;DATA ACQUISITION SYSTEMS

<0130#2>
TITLE: Legal and Institutional Response to Oil and Deep Sea Mineral Exploitation in the Pacific Basin
PROJECT NUMBER: R/OL-01
PRINCIPAL INVESTIGATOR: Craven, J.P.;Bloede, V.C.;Gresser, J.
ADDRESS: Sea Grant Program, University of Hawaii, 2540 Maile Way, Honolulu, HI 96822
AFFILIATION: Hawaii Univ., Honolulu (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Attaway, David
TELEPHONE: C(202)634-4124
TYPE OF FUNDING: Grant No.-04-6-158-44114
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$30,000; Hawaii Univ. FY77:$23,300
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (20%);STORAGE (20%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (10%);WASTE MANAGEMENT (20%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Pacific Basin;COASTS/Other coasts Pacific Basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: (1) To analyze the behavior of multinational enterprise in oil exploitation and deep sea mining in the Pacific in order to develop an effective response in Hawaii. (2) To determine validity of the Craven-Gopalakrishnan hypothesis of ocean resource development. (3) To assess impact assessment procedures and their application to policy formulation and implementation in order to design a useful environmental legal regime for the state. (4) To use this program as a basis for the School of Law to develop ocean and Asian law programs. (5) To continue developing materials and publications in the area of law of the sea, non-living resources, and boundary questions. (6) To develop alternate legal regimes for coping with problems raised by multinational development of ocean resources.
RESULTS: Materials developed will (1) be introduced directly into teaching at Hawaii and Harvard Law Schools; (2) provide technical information for state and federal agencies responsible for developments in ocean law; (3) form the basis of a conference on these questions; and (4) be assembled into a volume of materials used by scholars in the U.S. and also other participant countries for advisory purposes.
PROJECT MILESTONES: The project has concentrated on legal regimes which would permit the state of Hawaii to manage conservation and exploitation of the resources of the Hawaiian Archipelago. A legal regime was postulated as a target for a summer study program. Results of the study program include: (1) A paper on the resources of the Hawaiian Archipelago as related to current legal regimes. (2) An extensive paper on the developing concept of the Archipelago. (3) A paper on criminal jurisdiction in the Hawaiian Archipelago. (4) An essay on community and government leader awareness of the legal problems of the Archipelago. As a result of these studies, the State has been able to formulate an appropriate position on its boundary determination. Also, a number of foreign scholars have been attracted to the project and will begin work this spring.
KEYWORDS: PACIFIC OCEAN;MINERALS;EXPLOITATION;LEGAL ASPECTS;PETROLEUM;HAWAII;ECONOMICS;HYDROCARBONS

<0130#4>
TITLE: Oil and Tar Seeps Off Southern California
PROJECT NUMBER: R/RD-2
PRINCIPAL INVESTIGATOR: Henyey, T.L.;Yen, T.F.
ADDRESS: Sea Grant Program, University Park, Los Angeles, CA 90007
AFFILIATION: University of Southern California, Los Angeles (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: McLellan, Hugh
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44118
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$29,700; University of Southern California FY77:$22,800
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Far West;COASTS/Far West;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) The assessment of existing geologic and chemical information pertinent to seeps. (2) The use of chemical parameters including trace elements, sulfur and nitrogen content, carbon isotopic ratio, and volatile organic components to characterize oil and tar from natural seeps, offshore producing wells, and beaches. Comparisons will be made between these three sources. (3) The investigation of the geochemical breakdown or weathering of oil and tar from natural seeps as it moves in the marine environment. Emphasis will be placed on by-products and rates of chemical decomposition. (4) Relating characterization of oils and tars to the problems of source and the subsequent weathering in the marine environment. (5) The determination of the geologic, geophysical and oceanographic framework of selected oil and tar seeps in Santa Barbara Channel and Santa Monica Bay. Specifically, the relationships of seeps to faults and seismicity will be considered.
RESULTS: The results of this project will be directly applicable to the expressed needs of the State Lands Commission, Division of Mines and Geology, and the California Coastal Zone Conservation Commission in their endeavors to develop comprehensive strategies for the State of California. It will lead toward the establishment of fingerprinting techniques for sources of oil and tar in the marine environment and laboratory methodology for performing baseline studies relevant to petroleum exploitation of the OCS.
PROJECT MILESTONES: (1) Prepared an up-to-date active fault and seismicity map of the coastal zone from Pt. Conception to San Diego utilizing all available seismic data from 1932. (2) Established criteria for the recognition of natural oil and/or gas in Recent and Pleistocene sediments on the near-shore shelves from seismic profiling records. (3) Established that faults and beveled anticlines (in Miocene and Pliocene rocks) are responsible in large part for natural oil and gas seepage on the San Pedro, Santa Monica and Santa Barbara shelves. (4) Recognized an extensive, unreported gas seep province in northern Santa Monica Bay.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;COASTAL WATERS;ENVIRONMENTAL EFFECTS;PETROLEUM DEPOSITS;EXPLORATION;GEOCHEMICAL SURVEYS;OIL WELLS;OIL SPILLS;SHALE OIL;OFFSHORE SITES;WATER POLLUTION;SHORES;CALIFORNIA;SEISMOLOGY;SEDIMENTS;AGE ESTIMATION;HYDROCARBONS;GEOCHEMISTRY

<013047>
TITLE: Effect of Crude Oil on Nitrogen Flux in Salt Marshes
PROJECT NUMBER: R/HSE-3
PRINCIPAL INVESTIGATOR: Patrick, W.H. Jr.
ADDRESS: Sea Grant Program, Center for Wetland Resources, Coastal Studies Building, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Attaway, David
TELEPHONE: C(202)634-4124
TYPE OF FUNDING: Grant No.-04-6-158-44109
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$8,400; Louisiana State Univ. FY77:$7,100
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Gulf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To elucidate and quantify the relationship between primary productivity and microbial nitrogen fixation, (2) to determine the effect of stress on the rate of nitrogen fixation, (3) to determine the effect of stress on the microbial types and numbers which fix nitrogen, (4) to determine the usefulness of nitrogen fixation and/or microbial nitrogen fixers distribution as indicator organisms for Louisiana's CZM effort, (5) to determine effect on uptake of plant nutrients by Spartina alterniflora, (6) to determine effect on the various components of the nitrogen cycle, etc., and (7) to determine the effect of crude oil on biological activity of soil as measured by CO/sub 2/ production.
RESULTS: Most of the primary production in Louisiana coastal marsh can be attributed to Spartina alterniflora. Knowing the effect of oil on the growth of Spartina alterniflora will help determine part of the overall effect of petroleum operations on the ecology and productivity of Louisiana's coastal area. This type of information is essential to agencies charged with decision-making responsibilities in coastal areas, especially the prospective coastal zone management agency. Information derived from this project will be integrated directly into the ecological indicator portion of the CZM program being developed by Sea Grant in Louisiana.
KEYWORDS: PETROLEUM;ENVIRONMENTAL EFFECTS;NITROGEN FIXATION;MICROORGANISMS;SOILS;MARSHES;OIL SPILLS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL INDICATORS;HYDROCARBONS;PHOTOSYNTHESIS

<013048>
TITLE: Hydrocarbon Concentration in Food Chains
PROJECT NUMBER: R/HSE-1
PRINCIPAL INVESTIGATOR: Whelan, T.
ADDRESS: Sea Grant Program, Center for Wetland Resources, Coastal Studies Building, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Attaway, David
TELEPHONE: C(202)634-4124
TYPE OF FUNDING: Grant No.-04-6-158-44109
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$22,000; Louisiana State Univ. FY77:$13,200
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (25%);STORAGE (25%);PROCESSING, CONVERSION (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Gulf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Determine hydrocarbon (aliphatic and aromatic) concentrations in tissues of several resident marine organisms at different trophic levels in a chronically contaminated oil field environment; and (2) establish the geographic limits of petroleum contamination to resident marine organisms living in these environments, based upon levels of petroleum constituents in surrounding sediments and waters (extension of data from previous year's study).
RESULTS: This information will be used to update knowledge about the toxicity of crude marine environment. Understanding biological pathways of crude oil transport and degradation in coastal environments will enable future oil field production, drilling, etc., to minimize risk of environmental damage.
PROJECT MILESTONES: Seasonal and climatic concentrations of hydrocarbon-related compounds in the water bodies of natural and oil-contaminated areas have been determined. Oil field waters contain (yearly average) 30 to 50% more dissolved organic carbon than control sites. The alkane and aromatic fractions of surface sediments from the oil field stations indicate substantial petroleum derived compounds; other extractable sedimentary constituents show no quantitative or qualitative differences between oil field and natural sediments.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;WATER QUALITY;COASTAL WATERS;PETROLEUM;OIL WELLS;ENVIRONMENTAL EFFECTS;HYDROCARBONS;AQUATIC ORGANISMS;TISSUE DISTRIBUTION;FOOD CHAINS;SEDIMENTS;POPULATION DYNAMICS;BIOCHEMISTRY;SOILS;TOXICITY;OIL SPILLS

<013049>
TITLE: Portable Magnetic Recovery Unit for Oil Spill Control Utilizing Ferromagnetic Sorbents
PROJECT NUMBER: R/OE-6
PRINCIPAL INVESTIGATOR: Turbeville, J.E.
ADDRESS: State University System Sea Grant Program, 2001 McCarty Hall, Gainesville, FL 32611
AFFILIATION: Florida Univ., Gainesville (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: McLellan, Hugh
TELEPHONE: C(202)634-4125
PE OF FUNDING: Grant No.-04-7-158-44046
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$28,600; Florida Univ.
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES/0:1 (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)

REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: The objectives of this project are: (1) to develop an oil absorbing ferromagnetic sorbent product which can be used repeatedly through many cycles and (2) to develop a 24-foot companion magnetic recovery unit which is efficient and relatively free of complicated machinery. Together they will provide a useful and economically attractive new technique for rapid oil spill recovery.
RESULTS: The prototype recovery unit will be available locally for oil spill clean-up duty whenever its use is found feasible. The equipment and techniques developed during the course of this project and the data acquired during the final testing will be the subject of a paper to be presented at the next Oil Spill Conference now planned for 1977.
PROJECT MILESTONES: No major accomplishments. Design work and construction of the prototype recovery unit is underway and an optimization study of the ferrofoam product is in progress using available A.S.T.M. test procedures.
KEYWORDS: INSTRUMENTATION;FERROMAGNETIC;SURFACE WATERS;WATER POLLUTION;FUEL OILS;PETROLEUM PRODUCTS;POLLUTION CONTROL EQUIPMENT;MAGNETIC MATERIALS;ACCIDENTS;FOAM SEPARATION;REMOVAL;OIL SPILLS;CLEANING

<013050>
TITLE: Water and Sediment Chemistry
PROJECT NUMBER: R/HSE-2
PRINCIPAL INVESTIGATOR: Ho, C.L.
ADDRESS: Sea Grant Program, Center for Wetland Resources, Coastal Studies Building, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Attaway, David
TELEPHONE: C(202)634-4124
TYPE OF FUNDING: Grant No.-04-6-158-44109
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$13,800; Louisiana State Univ. FY77:$6,200
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (25%);STORAGE (25%);PROCESSING, CONVERSION (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/South;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) To investigate the role of clays and organic matter in oil adsorption and their subsequent precipitation, (2) to find the relative stability of adsorbed hydrocarbon with respect to chemical and biological degradation, (3) to find the level of inorganic nutrient requirements for biodegradation of adsorbed hydrocarbons, and (4) to monitor the secondary chemical changes in surface sediments as a result of chronic oil and waste water discharges.
RESULTS: Attention has been paid primarily in the past to major oil spills. The widespread chronic discharge of sublethal quantities of oils near tank farms, oil wells, ship ports and waste water from petroleum processes has been regarded as being non-significant and has been ignored. This may be true in the short-term, but may have severe effects in the long-term. This problem seems especially pertinent in light of increasing oil imports via the future superports, the possibly increasing number of oil wells in nearshore waters, the demand for new coastal refining capacity, etc. The information obtained in the proposed study would be useful to the superport authority, oil industry and other state agencies (e.g., La. Wildlife and Fisheries Comm.) for developing policies in order to control and/or reduce oil spills, large or small.
KEYWORDS: OIL SPILLS;SEDIMENTS;HYDROCARBONS;DECOMPOSITION;ENVIRONMENTAL EFFECTS;CHEMISTRY;WASTE WATER;SOILS;BIOCHEMISTRY

<013056>
TITLE: Hydrocarbon Effects on Estuarine Carbon Flux
PROJECT NUMBER: R/HSE-4
PRINCIPAL INVESTIGATOR: Turner, R.E.
ADDRESS: Sea Grant Program, Center for Wetland Resources, Coastal Studies Building, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Attaway, David
TELEPHONE: C(202)634-4124
TYPE OF FUNDING: Grant No.-04-6-158-44109
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$19,400; Louisiana State Univ. FY77:$7,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (25%);TRANSPORTATION (25%);STORAGE (25%);PROCESSING, CONVERSION (25%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To estimate the environmental impact of oil recovery operations on in situ aquatic estuarine primary production and salt marsh macrophyte productivity in Louisiana. A firm statistical design for seasonal sampling is essential and a variety of approaches to integrating short-term and long-term effects will be made.
RESULTS: Local, regional and national management officials will be able to use the information to make more intelligent decisions on the feasibility of canal construction, permits for different types of canal design, and the validity of certain types of oil recovery operations in wetlands.
KEYWORDS: LOUISIANA;AQUATIC ECOSYSTEMS;SALINITY;MARSHES;SURFACE WATERS;AQUATIC ORGANISMS;ESTUARIES;PETROLEUM;PRODUCTION;OIL WELLS;ENVIRONMENTAL EFFECTS;SAMPLING;SEASONAL VARIATIONS;MICROORGANISMS;PHOTOSYNTHESIS;BIOMASS;SAMPLING;HYDROCARBONS;CARBON;METABOLISM;HYDROCARBONS;ESTUARIES

<013058>
TITLE: Oil Slick Control in Offshore Environments
PROJECT NUMBER: R/M-1
PRINCIPAL INVESTIGATOR: Milgram, J.H.
ADDRESS: Massachusetts Institute of Technology, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44081
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$20,700; Massachusetts Inst. of Tech. FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Global;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objectives of this proposal are: (1) To delineate via lab experiments the equilibrium oil thickness distribution of a retained slick in a current FY 76. (2) To characterize and quantify via both lab experiments and theoretical studies the instabilities at the oil/water interface of a slick in a current FY 76. (3) To check via lab experiments existing theories on the effect of surface waves on oil slick containment and collection FY 76. (4) To explore via lab experiments the relative importance of turbulence on formation of oil drops by tearing from an oil slick FY 77. (5) To devise system approaches to oil slick control for currents and waves typical of offshore environments FY 77.
RESULTS: This project will for the first time provide reliable data to establish the basis necessary to design effective, efficient oil-boom barriers for containment of oil spills at sea. The project will develop the data and methodology for effective nearshore and offshore clean-up systems. The project will perform a systems analysis to establish the parameters, organizational needs and decision criteria for a practical oil containment and clean-up logistic plan adaptable to any port or area.
KEYWORDS: AQUATIC ECOSYSTEMS;SEAS;COASTAL WATERS;OFFSHORE SITES;OILS;WATER POLLUTION;ACCIDENTS;DIFFUSION;REMOVAL;CONTAINMENT;OIL SPILLS;CLEANING;SYSTEMS ANALYSIS;PETROLEUM;HYDROCARBONS

<013059>
TITLE: Effects of Mixed Petroleum Hydrocarbons in Marine Fishes
PROJECT NUMBER: R/B-5
PRINCIPAL INVESTIGATOR: Stegeman, J.J.
ADDRESS: Woods Hole Oceanographic Institute, Woods Hole, MA 02543
AFFILIATION: Woods Hole Oceanographic Institution, Mass. (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Duane, Dave
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44106
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$71,500; Woods Hole Oceanographic Institution FY77:$1,400
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine for adult and developing marine fish: (1) The nature and extent of effects of low levels of petroleum hydrocarbons on enzymatic processes related to drug or hydrocarbon, hormone, protein, carbohydrate and lipid metabolism. (2) The significance of related cellular and ultrastructural changes which can be detected by light and electron microscopic techniques. (3) How time-dosage relationships and routes of hydrocarbon introduction alter the above effects, and whether these can be reversed by transferring contaminated fish to uncontaminated water. (4) The characteristics of the hydrocarbon metabolizing system in marine fish.
RESULTS: (1) To use biochemical and histological methods for detection of effects of environmental levels of petroleum hydrocarbons in marine fish. (2) To evaluate potential physiological and biochemical effects on fish populations which may result from an increased input of petroleum where there presently is none, i.e., new offshore drilling, coastal refineries, and other industry. (3) To better understand and evaluate the effects of various environmental stresses on growth and reproduction in marine fishes. These data may be of value to aquaculture systems.
PROJECT MILESTONES: (1) We have shown, using in vitro techniques, that chronic and acute exposure to environmental levels of petroleum hydrocarbons alter carbohydrate and lipid metabolism in marine fish. (2) Demonstrated distinct differences in hepatic glucose and acetate metabolism as a function of exposure time to petroleum hydrocarbons. (3) Have shown the exposure to environmental levels of PHC resulted in hepatic ultrastructural changes, reflecting alterations in both protein synthesis and certain aspects of lipid metatclism, at the electron microscopic level.
KEYWORDS: AQUATIC ECOSYSTEMS;FISHES;SEAS;COASTAL WATERS;PETROLEUM;HYDROCARBONS;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;FISHES;AGE DEPENDENCE;METABOLISM;PHYSIOLOGY;QUANTITY RATIO;WATER POLLUTION;OIL SPILLS

<013060>
TITLE: Offshore Pipelines
PROJECT NUMBER: R/SP-1
PRINCIPAL INVESTIGATOR: Lou, Y.K.
ADDRESS: Texas A and M University, College Station, TX
AFFILIATION: Texas A and M Univ., College Station (USA)
ITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44108
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$22,500; Texas A and M Univ. FY77:$11,500
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (50%)
POLLUTANTS: ORGANICS (100%)

CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Global;COASTS/Gulf
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: (1) To determine, through physical modelling, the effect of storm waves on buried pipelines approaching and crossing the shoreline. (2) To determine, through physical modelling, the depth of rock cover, size of rock cover, size of rock and type of inverse filter as a function of wave characteristics, water depth and pipe burial in both the two-dimensional wave tanks. (3) To continue collecting and evaluating data on offshore pipeline failures due to storms or hurricanes. (4) To develop new or improved design criteria to minimize the high failure rate of offshore pipelines.
RESULTS: Since crude oil is found under the continental shelf in the Gulf of Mexico, the study is of particular interest to the states of Texas and Louisiana. Municipalities and industry located in the coastal zone are faced with an increasing volume of waste disposal. Much of it is disposed offshore and the environmental considerations necessitate longer and longer pipelines. Those who will benefit directly are persons responsible for design, construction and operation of effluent outfalls for municipalities and industry, cooling pipes for steam and nuclear power stations, heating pipes for LNG installations and pipelines for transporting oil and gas.
PROJECT MILESTONES: (1) A major effort on the project consisted of a two-dimensional experimental study of scour of beaches above and around offshore pipelines approaching and crossing the shoreline: (a) the experimental study has been conducted in a glass-walled wave tank which is 120 feet long, 3 feet deep and 2 feet wide which permits visual observation of development of ripples and underwater bars and the mechanics of scour around the pipeline, (b) data were collected photographically and video-taped for subsequent analysis which revealed the relationships between scour depth and wave height; scour length and wave length; and wave height and wave length/water depth for a range of wave steepness values. (2) Several contacts were made with industry, notably with Houston and Texas Gas Transmission Corporation and Brown and Root Company which is setting up a committee to help disseminate our research efforts.
KEYWORDS: COASTAL WATERS;PIPELINES;GULF OF MEXICO;TEXAS;LOUISIANA;INDUSTRIAL PLANTS;WASTE DISPOSAL;LIQUID WASTES;MARINE DISPOSAL;ENVIRONMENTAL EFFECTS;MUNICIPAL WASTES;OILS;NATURAL GAS;COOLANTS;NUCLEAR POWER PLANTS;SAFETY ENGINEERING;STORMS;HURRICANES;DEFORMATION;DESIGN;OFFSHORE SITES;SEWAGE

<013061>
TITLE: Monitoring Hydrocarbons on and in Sea Water
PROJECT NUMBER: R/E-8
PRINCIPAL INVESTIGATOR: Brown, C.W.
ADDRESS: University of Rhode Island, Kingston, RI 02881
AFFILIATION: Rhode Island Univ., Kingston (USA). Narragansett Marine Lab.
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44085
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$22,800; Rhode Island Univ.
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The overall objective of this research is to determine the current levels and compositions of organic pollutants in sea water. The immediate objectives are the following: (a) To determine seasonal variations in surface films and dissolved organics in sea water. (b) To determine the variations in surface films and dissolved organics in pleasure craft and commercial harbors, and in the open sea. (c) To determine those components of petroleum that dissolve sea water or are otherwise removed during weathering. (d) To explore new methods for identifying the source of petroleum on sea water.
RESULTS: Information will be given to cognizant state and federal regulatory agencies. Methods will be made available to those doing environmental impact statements. Technical aspects will be published in suitable media.
PROJECT MILESTONES: (1) The types and relative amounts of hydrocarbons have been determined for the following: (a) Beach sands from nine locations along the Rhode Island coast. (b) Over 50 samples of surface and subsurfaces water from a pleasure craft harbor. (c) Surface samples from a commercial fishing harbor and from Narragansett Bay. (2) A new method for fingerprinting petroleum has been developed. (3) Separation of hydrocarbon components in samples of weathered and unweathered petroleum has been initiated.
KEYWORDS: SEAWATER;WATER POLLUTION;AQUATIC ECOSYSTEMS;PETROLEUM;DECOMPOSITION;WATER QUALITY;HYDROCARBONS;ENVIRONMENTAL EFFECTS;SHORES;SAND;COASTAL WATERS;HARBORS;QUANTITY RATIO;DIFFUSION;ENVIRONMENT;OIL SPILLS

<013062>
TITLE: Artificial Upwelling
PROJECT NUMBER: R/A-1
PRINCIPAL INVESTIGATOR: Roels, O.A.
ADDRESS: Lamont-Doherty Geological Observatory, Columbia University, Palisades, NY 10964
AFFILIATION: Columbia Univ., Palisades, N.Y. (USA). Lamont-Doherty Geological Observatory
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Wildman, Robert
TELEPHONE: C(202)634-4028
TYPE OF FUNDING: Grant No.-04-6-158-44117
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$314,000; Texas Univ. FY77:$176,000
TECHNOLOGY: SOLAR/Ocean, wind (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Other coasts Virgin Islands;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives of this project are: (1) to study upwelling under controlled conditions; (2) to establish the most efficient means of protein production in the marine food chain using, as raw materials, sunlight and sea water from the nutrient maximum in the sea; (3) to examine the possibility of utilizing the cold temperature of deep-sea water for air conditioning and other cooling purposes such as its use in conventional desalination processes, etc.; (4) to examine the feasibility of utilizing the temperature differential between warm surface water and cold deep-sea water for the production of

electrical power.
RESULTS: The research will establish the technical feasibility and economic benefits of a combined sea-thermal power station and mariculture plant, leading to the construction and operation of a land-based pilot plant. It is hoped that before the end of 1975 firm plans for the commercial application of this concept will be completed.
PROJECT MILESTONES: Work during the past year centered on optimization of the system for producing food for bivalve molluscs; selection of bivalves with greatest economic importance; construction of a Hatchery Building; and studies of multiple uses of bivalve-tank effluent. The shellfish hatchery is complete and in operation; experimental shellfish area is under construction; pilot shellfish area being planned. Chaetoceros curvisetus maintained nearly unialgal cultures (in 13,000-gal. outdoor pools) for periods up to one month in unenriched deep-sea water from our offshore pipelines. Five species of shellfish were harvested, having achieved market size during the year. Nine species were evaluated for suitability in our St. Croix system.
KEYWORDS: UPWELLING;WATER POLLUTION;AIR CONDITIONING;COOLING;PROTEINS;PRODUCTION;SOLAR ENERGY;SEAWATER;NUTRIENTS;FEASIBILITY STUDIES;ELECTRIC POWER;POWER GENERATION;ECONOMICS;THERMAL EFFLUENTS;USES;OCEAN THERMAL POWER PLANTS;AQUACULTURE

<013063>
TITLE: Applications of Nonlinear Random Sea Simulations for Design of Offshore Structures
PROJECT NUMBER: R/CM-16
PRINCIPAL INVESTIGATOR: Hudspeth, R.T.
ADDRESS: Sea Grant College Program, Administrative Services Building, A320, Oregon State University, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITOR: Attaway, David
TELEPHONE: C(202)634-4124
TYPE OF FUNDING: Grant No.-04-6-158-44094
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$24,200; Oregon State Univ.
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: (1) To provide the National Oceanographic Data Center (NODC) with a magnetic tape of the calibrated continuous wave force data recorded during Hurricane Carla by Wave Force Project II (WPII). (2) To estimate the bispectra of hurricane-generated waves recorded during Hurricane Carla by WPII and determine the appropriate type of smoothing required for these bispectral estimates. (3) To compare the bispectral estimates from measured wave records with bispectral estimates computed from both linear and nonlinear simulations using two types of linear spectral inputs. (4) To compare the nonlinear self interactions with the nonlinear cross-product spectral interactions simulated from the ''raw'' and ''smoothed'' measured spectra and from the Bretschneider and Borgman design simulations. (5) To evaluate the spreading factor from the bispectral estimates of the measured and simulated realizations. (6) To provide training for a graduate student in the stochastic design and analysis of offshore structures for energy-recovery systems. (7) To publish an improved design procedure for the simulations of nonlinear stochastic wave forces needed for the dynamic analysis of offshore structures. (8) To generate nonlinear random waves in the OSU Ocean Wave Research Facility and compare measured realizations with predicted realizations.
RESULTS: Most offshore structures are designed for either linear random waves of nonlinear deterministic waves; however, neither of these wave combinations reflects the natural conditions at sea. Offshore structures should be designed for nonlinear random waves; these waves mimic waves at sea. The procedure for simulating nonlinear random seas in an ocean of finite depth will be used in the stochastic designs and analysis of offshore structures designed for energy-recovery systems. The results of this study will also enable the OSU Wave Research Facility to generate nonlinear random surface waves in an ocean of finite depth.
KEYWORDS: OFFSHORE PLATFORMS;DESIGN;SAFETY ENGINEERING;COASTAL WATERS;TURBULENCE;STORMS;HURRICANES;SEAS;TRAVELLING WAVES;MECHANICAL TESTS;STRUCTURAL MODELS;TESTING;SIMULATORS;HYDROCARBONS;WEATHER;MINING;CONSTRUCTION

<013069>
TITLE: Outer Continental Shelf Supplementary Coastal Zone Management Development Grants
PRINCIPAL INVESTIGATOR: Coastal Zone Management Program Managers in 23 Coastal States

AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Department of Commerce, Washington, D.C. (USA)
DIVISION: Office of Coastal Zone Management
MONITOR: Gardner, Dick
TELEPHONE: F634-4241
TYPE OF FUNDING: Grant No.
77 FUNDING: National Oceanic and Atmospheric Administration
TECHNOLOGY: FOSSIL FUEL/General (10%);FOSSIL FUEL/Oil and Gas (50%);CONSERVATION/General (10%);CONSERVATION/End use (10%);CONSERVATION/Energy storage (10%);GENERAL SCIENCE (10%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All except radiation (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: These Outer Continental Shelf-related studies are funded by Federal cost sharing grants (80% Federal and 20% state) to coastal states. They are supplemental grants for states to develop elements of their coastal zone management programs adequate to deal with impacts of OCS related nearshore and

onshore developments.
APPROACH: Varies state to state.
RESULTS: Provide identification of and solutions to on-shore impacts of outer continental shelf related activities for coastal zone management programs.
PROJECT MILESTONES: Varies state to state.
KEYWORDS: CONTINENTAL SHELF;COASTAL REGIONS;MANAGEMENT;OFFSHORE OPERATIONS;ENVIRONMENTAL IMPACTS;CHEMICAL EFFLUENTS;OIL SPILLS;FISHES

<013075>
TITLE: Analysis of Brine Disposal in the Gulf of Mexico
PRINCIPAL INVESTIGATOR: Brown, D.
ADDRESS: NOAA/EDS/CEDDA Page Bldg number2, 3300 Whitehaven St., N.W., Washington, DC 20235
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Federal Energy Administration, Washington, D.C. (USA)
DIVISION: Salt Dome Storage
MONITOR: Deleplane, Hal
TELEPHONE: C(202)634-5570
TYPE OF FUNDING: Contract No.-FEA CG-13-70040-00;Interagency agreement-Federal Energy Administration
77 FUNDING: Federal Energy Administration FY77:$549,400
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: STORAGE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Brine (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To complete the historic physical oceanographic, meteorological, bathymetric and ecological data necessary to characterize the western shelf waters of the Gulf of Mexico for the region from the coast to about 20 miles offshore along the Texas and Louisiana coast for the purpose of studying the effects of disposal of a saturated brine solution resulting from leaching out oil storage caverns. Also, to provide input to a transient plume pollutant model that would aid in making decisions concerning such a disposal of brine into coastal waters.
APPROACH: Provide a series of reports (5) that investigate various segments of the Texas/Louisiana coast with regard to the impact of brine disposal into coastal waters. List and summarize data sources of oceanographic, meteorological, ecological and bathymetric data. Develop a state-of-the-art model to predict movement of such a pollutant in coastal waters.
RESULTS: Types and sources of data and a data summary is presented along with typical model outputs.
PROJECT MILESTONES: February 1977 Report (1) Bryan Mound Site, March 1977 Report (2) West Hackberry Site, May 1977 Report (3) Capline Sector, July 1977 Report (4) Big Hill Region September 1977 Report (5) Offshore Regions.
KEYWORDS: GULF OF MEXICO;TEXAS;LOUISIANA;COASTAL WATERS;CONTINENTAL SHELF;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;WATER POLLUTION;PETROLEUM PRODUCTS;BRINES;SOLUTIONS;STORAGE FACILITIES;CLEANING;AQUATIC ECOSYSTEMS;OCEANOGRAPHY;ENVIRONMENTAL EFFECTS;MATHEMATICAL MODELS

<013076>
TITLE: Experiments to Measure the Effects of Biofouling and Corrosion on the Performance of Heat Transfer Surfaces
PROJECT NUMBER: EG-77-A-06-1035
PRINCIPAL INVESTIGATOR: Spiehler, F.A.
ADDRESS: NOAA Data Buoy Office, Biloxi, MS 39529
AFFILIATION: National Oceanic and Atmospheric Administration, Biloxi, Miss. (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Rockville, Md. (USA)
DIVISION: Office of Ocean Engineering
MONITOR: Sheppard, William T.
TELEPHONE: P494-2822
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$450,000
TECHNOLOGY: SOLAR/Ocean, wind (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: METALS (10%);ORGANICS (40%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (60%);DEVELOPMENT/Laboratory scale (40%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Gulf of Mexico;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The primary objective of the project is to determine the rate of biofouling and corrosion buildup on OTEC evaporator tube sections at a candidate OTEC site in the Gulf of Mexico and to assess the deterioration of heat transfer through the tube sections as a function of the biofouling and corrosion process. As a secondary objective, initial baseline environmental data will be collected.
APPROACH: A large deep ocean data buoy will be outfitted with experimental OTEC heat exchanger sections for evaluation of the buildup of corrosion and biofouling films in the tubes under various flow conditions of warm oceanic surface water at a candidate OTEC site in the Gulf of Mexico. In addition, monitoring of surface atmospheric conditions and water chemistry will be conducted through use of meteorological and water quality indicator instrument systems installed on the buoy. All data will be collected automatically and relayed ashore for analysis of heat transfer coefficients and assessments of fouling film developments. Macrofouling sample panels will be installed at all levels in the water column and recovered for toxonomy analysis ashore.
RESULTS: A definition of the biofouling and corrosion potential at a candidate OTEC site in the Gulf of Mexico will be obtained. Early testing of mechanisms for cleaning or control of film within the tubes will be possible. Initial data for long term environmental assessment program will be collected.
PROJECT MILESTONES: Completion of Data Buoy Integration, and deployment of Data Buoy at a candidate OTEC site in the Gulf of Mexico 11/77; Completion of first series of in situ biofouling, corrosion, and heat transfer experiments at candidate OTEC site in Gulf of Mexico 2/78; Completion of second series of in situ

biofouling, corrosion, and heat transfer experiments at candidate OTEC site in Gulf of Mexico 6/78; and submission of first year environmental assessment data for baseline study 10/78.
KEYWORDS: BIOFOULING;OFFSHORE SITES;BUOYS;GULF OF MEXICO;HEAT PIPES;HEAT EXCHANGERS;FOULING;AQUATIC ORGANISMS;CORROSION PRODUCTS;CLEANING;TESTING;SEAWATER;WATER CHEMISTRY;BIOMASS;ELEMENTS;CORROSION;HEAT TRANSFER

<013077>
TITLE: National Plan for the Safety and Health of Divers
PROJECT NUMBER: B71613
PRINCIPAL INVESTIGATOR: Wells, J.M.
ADDRESS: 6010 Executive Blvd., Rockville, MD 20852
AFFILIATION: National Oceanic and Atmospheric Administration, Rockville, Md. (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Rockville, Md. (USA)
DIVISION: Office of Ocean Engineering/Manned Undersea Science and Technology Office
MONITOR: Wells, John M.
TELEPHONE: P443-8391
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT;OS
PROJECT DESCRIPTION: To coordinate existing facilities and manpower for the purpose of establishing a network with the capability of rapid and effective response to diving accidents. To train physicians in all aspects of the treatment of diving accidents. To provide specialized services, consultation, reports, and organizing and carrying out workshops which will be designed to address medical and physiological problems relating to diving and diver training.
APPROACH: Existing government and civilian facilities and manpower will be assessed as to their current capabilities and organized to the degree necessary to provide a nation-wide diving accident management network. Physicians will be trained in diving medicine. Workshops will be held and information relating to diving physiology and medicine will be consolidated and organized into a readily usable form.
RESULTS: A clear definition of current U.S. capability to respond to diving accidents on a national level and a plan for organizing a diving accident management network. Physicians trained in diving medicine at key positions throughout the U.S. Published material relating to diving physiology and medicine.
PROJECT MILESTONES: To train 8 physicians from key geographic locations in the U.S. in diving medicine-10/77; to have a working plan for a nationwide diving accident management network-4/78.
KEYWORDS: OCEANOGRAPHY;PERSONNEL;SAFETY;ACCIDENTS;EDUCATION;MEDICAL PERSONNEL;DIVING OPERATIONS

<013078>
TITLE: Boundary Layer Wind and Turbulence Prediction
PROJECT NUMBER: RC2901
PRINCIPAL INVESTIGATOR: Gilhousen, D.B.
ADDRESS: 8060 13th Street, Silver Spring, MD 20910
AFFILIATION: National Weather Service, Silver Spring, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Savannah River Laboratory
MONITOR: Kern, Cliff D.
TELEPHONE: P239-3325
TYPE OF FUNDING: Interagency agreement-ERDA-EY-77-A-09-1007
77 FUNDING: Energy Research and Development Administration FY77:$13,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Savannah River
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: To develop, implement, operate, and evaluate an automated system to predict boundary layer wind and turbulence parameters for an instrumented TV tower near the Savannah River Laboratory's nuclear reactor site.
APPROACH: Use the Model Output Statistics (MOS) technique to develop statistical regression equations to predict winds (u and v components and speed) and turbulence parameters for differing levels on the TV tower. These forecasts will be based on the output from a complicated numerical prediction model and surface weather reports.
RESULTS: Objective wind and turbulence forecasts are produced twice each day for periods of 6, 9, 12, 15, 18, 21, and 24 hours. These are then used at the Savannah River Laboratory to predict the transport of radiation in case of an accident.
PROJECT MILESTONES: (1) December 1977 Prediction equations for the cool season (October-March) are put into operation. (2) April 1978 Prediction equations for the warm season (April-September) are implemented. (3) May 1978 Cool season forecasts are verified. (4) November 1978 Warm season forecasts are verified.
KEYWORDS: METEOROLOGY;WIND;TURBULENCE;VELOCITY;FORECASTING;BOUNDARY CONDITIONS;EARTH ATMOSPHERE;AUTOMATION;WEATHER;MEASURING METHODS

<013079>
TITLE: Oil Shale and Tar Sand Effluent Characterization
PROJECT NUMBER: 001281
PRINCIPAL INVESTIGATOR: Fruchter, J.S.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (45%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (25%)

POLLUTANTS: NOXIOUS GAS/H2S;NOXIOUS GAS/NH3;NOXIOUS GAS/CO and others (10%);METALS/Hg;METALS/As;METALS/F;METALS/Mo;METALS/Se;METALS/Te;METALS/Sb;METALS/Others (35%);ORGANICS/Toxic and carcinogenic (55%)
CHARACTER OF STUDY: RESEARCH/Applied (70%);DEVELOPMENT/Laboratory scale (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Colorado, Utah and Wyoming
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This study will identify potential pollutants which may reach the environment as a result of emissions from oil shale and tar sand retorting operations. Such a study is necessary at the present time because of currently vigorous interest in oil shale and tar sand technology being shown by both private and government sectors.
APPROACH: Effluents from both above-ground and in situ processes will be characterized for a wide spectrum of inorganic, metallorganic and organic compounds and species. A wide variety of analytical methods including gas chromatography-mass spectrometry, neutron activation, x-ray fluorescence, high pressure liquid chromatography, atomic absorption and plasma dc-emission spectroscopy will be used for the characterization measurements. Effluents to be characterized will include raw oil shale, spent shale, crude shale oil, various shale oil boiling fractions, upgraded shale oil, process water, off-gases, as well as tar sand and crude oil from the sand. Priority will be given to those processes which show promise of early commercialization. On analysis, priority will be given to compounds of elements known or suspected as being carcinogenic, toxic or otherwise harmful. A list of such compounds and elements to be looked for will be formulated and reported as part of the project. Source term calculations will be made for each process.
RESULTS: The outputs of this program will be detailed analyses of effluents from oil shale and tar sand pilot retorting operations for inorganic, metallorganic and organic species. The data will be used to make source term calculations. The characterization, data and calculations will be summarized in early reports for each pilot plant discussing the possible environmental problems associated with the commercial operation of each type of process and suggesting the need for abatement procedures where necessary.
KEYWORDS: OIL SHALES;TERRESTRIAL ECOSYSTEMS;ENVIRONMENTAL IMPACTS;CHEMICAL EFFLUENTS;OIL SANDS;CHEMICAL PROPERTIES;CARCINOGENS;COMBUSTION PRODUCTS;TOXICITY;HYDROGEN SULFIDES;CARBON MONOXIDE;SILVER;ARSENIC;FLUORIDES;SELENIUM;MOLYBDENUM;TELLURIUM;ANTIMONY;BASELINE ECOLOGY;CHEMICAL ANALYSIS;HEALTH HAZARDS

<0 13080>
TITLE: Petroleum in the Great Lakes Environment
PROJECT NUMBER: R/MW-10
PRINCIPAL INVESTIGATOR: Steinhart, J.S.;Deillor, J.P.
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AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44103
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$10,600
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: PARTICULATES/Oil (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Great Lakes;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: (1) To compile a description of petroleum transport and spillage on the Great Lakes at U.S. and Canadian ports and assess the risks of spillage from tankers and from harbor terminals. (2) To estimate petroleum inputs to the Great Lakes. (3) To review the available literature on oil spill prevention and clean-up technology, case histories of oil spills and known environmental effects of oil. (4) To prepare recommendations for research on the effects of petroleum on the Great Lakes environment. (5) To recommend appropriate regulatory or legislative action regarding marine terminal, tanker and tank barge operations on the Great Lakes.
RESULTS: Information from this project will be of use to state and federal regulatory agencies, legislative committees and advisory groups concerned with pollution control and the management of the Great Lakes coastal zone. Preliminary information has been provided to the U.S. Army Corps of Engineers, Minnesota Pollution Control Agency and the Wisconsin Coastal Zone Coordinating and Advisory Council. Recommendations for research in this area will guide future research by the U.W. Sea Grant Program, as well as other state and federal agencies.
PROJECT MILESTONES: Although this is a new project, a case history study of a 1975 oil spill in Milwaukee Harbor was completed and a presentation was made to the Advisory Council of the Wisconsin Coastal Zone Management Development Program.
KEYWORDS: GREAT LAKES;USA;CANADA;OIL SPILLS;ENVIRONMENTAL EFFECTS;SURFACE WATERS;AQUATIC ECOSYSTEMS;WATER POLLUTION;HARBORS;WATER POLLUTION ABATEMENT;CLEANING;PETROLEUM PRODUCTS;TRANSPORT;DATA COMPILATION;COASTAL WATERS;AQUATIC ECOSYSTEMS

<0 13081>
TITLE: Oil Spill Transport and Diffusion Prediction
PROJECT NUMBER: R/EQ-16
PRINCIPAL INVESTIGATOR: Williams, G.;Hann, R.W.
ADDRESS: Center for Marine Resources, College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44108
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$33,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: PARTICULATES/Oil (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Gulf;HYDROGRAPHIC AREAS/Other hydrographic areas Gulf

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: (1) To develop a hierarchy of computerized mathematical models for the prediction of oil spill transport and diffusion in offshore areas. (2) To investigate various display techniques for the model outputs and to implement those deemed most effective. (3) To demonstrate the capabilities of the above models as a tool in predicting oil spill trajectories. (4) To document the above models and prepare the dissemination materials for distribution to requesting agencies.
RESULTS: (1) The capability to forecast the trajectory of an oil spill will afford offshore cleanup crews a better estimate of slick location than is now available. (2) The coastal area most likely to be affected by an oil spill can be determined probabilistically, thus more accurately positioning the onshore combative personnel. (3) User communities likely to benefit from the results of this project include federal, state and local government organizations involved in coastal and/or offshore environmental protection, petrochemical companies engaged in offshore drilling operations, and governmental and/or industrial groups concerned with deepwater port facilities.
PROJECT MILESTONES: New project.
KEYWORDS: OIL SPILLS;ENVIRONMENTAL TRANSPORT;FORECASTING;MATHEMATICAL MODELS;COASTAL WATERS;PETROLEUM PRODUCTS;TRAJECTORIES;WATER POLLUTION

<0 13082>
TITLE: Site Selection for Port, Waterway and Pipeline Development in Coastal Louisiana: Legal, Institutional and Policy Aspects
PROJECT NUMBER: R/L-3
PRINCIPAL INVESTIGATOR: Midboe, K.D.;Bockrath, J.
ADDRESS: Center for Wetland Resources, Coastal Studies Building, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Attaway, David
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44109
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$39,300
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);STORAGE (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Gulf;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: (1) To describe procedures by which port commissions and pipeline companies interrelate with their traditional supporting/regulating agencies (COE, CG, BLM, FPC) and with environmental regulating agencies (EPA, CEQ, FWS, NMFS) in selecting sites for development projects; and (2) given current and potentially expanded public interest in land use and environmental management in Louisiana marshes, evaluate procedures for interaction between ports and pipeline companies, state and local interests, and federal supporting/regulating agencies to determine potential for: (a) early planning interaction on design and site selection criteria; (b) streamlining of permit procedures to avoid redundancy; and (c) establishing equitable compensatory/mitigation features as integral parts of project design to offset environmental and social costs attributable to project.
RESULTS: The Port of New Orleans (Pierre Reeh, Chief Planner; Herb Haar, Chief Port Development Officer) have pressing need for information as it is vital to future port development plans. State Planning Office, La. Wildlife and Fisheries Comm., La. Coastal Comm. have need for information as part of federal-state relations in Louisiana's developing coastal management program. Oil and gas pipeline industries need information as expanded OCS development off Louisiana will result in need for considerable transportation development.
PROJECT MILESTONES: This is a two-year project which commenced September 1, 1976. (1) Prepared two papers on the legal aspects of pipeline development in Louisiana. (2) Prepared a bibliography of legal material available for Port of New Orleans.
KEYWORDS: LOUISIANA;LAND USE;MARSHES;HARBORS;AQUATIC ECOSYSTEMS;NATURAL GAS;PETROLEUM PRODUCTS;STORAGE FACILITIES;PIPELINES;SITE SELECTION;ENVIRONMENTAL EFFECTS;LEGAL ASPECTS;DATA COMPILATION;COASTAL REGIONS;PLANNING;SOCIO-ECONOMIC FACTORS;OIL FIELDS;OFFSHORE SITES

<0 13083>
TITLE: Oil Stresses on Wetland Macrofauna
PROJECT NUMBER: R/HSE-6
PRINCIPAL INVESTIGATOR: Bahr, L.M.
ADDRESS: Center for Wetland Resources, Coastal Studies Building, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Attaway, David
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44109
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$11,800
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: PARTICULATES/Oil (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: The objective is to determine the effects of chronic oil pollution on marsh macroconsumers, especially juvenile fish and benthic invertebrates, in terms of species diversity and population density. Also, to identify groups which can serve as index organisms to discriminate between stressed and unstressed areas.
RESULTS: Information will contribute to the scientific basis for regulating activities that have a potential for spillage of oil and oil-soluble compounds.
PROJECT MILESTONES: New project.
KEYWORDS: OIL SPILLS;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;PETROLEUM PRODUCTS;WATER POLLUTION;MARSHES;COASTAL REGIONS;ESTUARIES;SEAWATER;WATER CHEMISTRY;FISHES;INVERTEBRATES;BENTHOS;POPULATION DYNAMICS;TOXICITY;BIOLOGICAL STRESS

<0 13084>
TITLE: Seismic Hazards to the Development of Offshore Oil Resources
PROJECT NUMBER: R/E-15
PRINCIPAL INVESTIGATOR: Prothero, W.A.
ADDRESS: Sea Grant Program, University of California, La Jolla, CA 92093
AFFILIATION: SEE CODE- 1138000 California Univ., La Jolla (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: McLellan, Hugh
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44110
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$79,300
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: The purpose of the proposed research is to study seismic hazards to offshore platforms, pipelines, and wells due to ongoing seismic activity and fault motion. These problems require bottom-mounted instruments close to the area under study. The technology required for these instruments has been developed by W. Prothero at Scripps Institution of Oceanography over the last several years. This work will concentrate initially on microseismicity studies of offshore lease areas. The seismic hazards to offshore oil development include shaking caused by moderate to large (M > 4) earthquakes, deformation of underwater pipelines due to fault motion, and slumping of sea bottom sediments initiated by seismic shaking. Offshore earthquakes have been observed and located with land stations. The first year's work will consist of constructing, testing, and deploying 3 ocean bottom seismometer capsules in the Tanner-Cortes Banks lease tract or (and) the tract south of Santa Rosa Island. The objectives are to (1) determine the level of microseismic activity in the area; (2) accurately locate microearthquakes and relate their locations to faults inferred from acoustic profiling; and (3) work toward a quick response capability for deploying capsules in aftershock zones of M > 5 offshore earthquakes.
RESULTS: The information acquired through this work will be invaluable in localizing zones of seismic risk to offshore oil production facilities. Microearthquake surveys will delineate currently active faults and thus identify areas where particular design constraints might be imposed on pipelines or platforms. State and federal agencies such as the USGS and State Lands Commission will use this work in evaluating possible environmental hazards which could be caused by earthquake damage to offshore facilities. The oil companies will make use of the data to design their structures for endurance and safety to personnel and the environment. If a large earthquake should occur, this work could be important in reducing potentially costly delays in offshore development due to the lack of seismic data in the region.
PROJECT MILESTONES: New project.
KEYWORDS: OIL WELLS;SITE SELECTION;OFFSHORE OPERATIONS;OIL SPILLS;WATER;OFFSHORE PLATFORMS;PIPELINES;SAFETY ENGINEERING;EARTHQUAKES;SEISMIC EFFECTS;SEISMOLOGY;SEISMIC WAVES;SEISMOGRAPHS;SEAS;SEDIMENTS;FORECASTING

<0 13085>
TITLE: Earthquake Loading on Large Offshore Structures in Deep Water: A Study for the Correlation of Analytic and Physical Models
PROJECT NUMBER: R/E-14
PRINCIPAL INVESTIGATOR: Wiegel, R.L.;Gerwick, B.;Penzien, J.
ADDRESS: University of California, Sea Grant Program, La Jolla, CA 92093
AFFILIATION: SEE CODE- 1138000 California Univ., La Jolla (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: McLellan, Hugh
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6158-44110
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$73,700
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: STORAGE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Alaska;COASTS/Northeast;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: The preliminary analytic studies which have been performed on large gravity type offshore structures have indicated that earthquake excitation will be the controlling factor in many offshore areas along the coasts of California and Alaska. Some offshore areas of interest for petroleum resource development must expect earthquakes of magnitude 8.0 or greater during the working life of a structure. Little work has been done to correlate the results of the analytic models which are used to predict earthquake response with the results of physical measurements on gravity type offshore structures. This study will perform this comparison. In particular, it will attempt to define the frequency dependence of the added mass hydrodynamic coefficients in the range of earthquake excitation and to define the degree of coupling between the various coefficients in translation and rotation. The overall objective of this study is to provide the information with which rational designs of such structures as offshore oil storage tanks can be performed for high earthquake risk areas.
RESULTS: This information will be extremely useful to the designers and users of offshore oil storage facilities to those regulatory agencies which must pass judgment on the safety of such facilities.
KEYWORDS: OFFSHORE OPERATIONS;OFFSHORE PLATFORMS;CALIFORNIA;ALASKA;EARTHQUAKES;PACIFIC OCEAN;SEISMIC EFFECTS;SAFETY ENGINEERING;PETROLEUM PRODUCTS;STORAGE FACILITIES;OIL WELLS;FORECASTING;COASTAL REGIONS;COASTAL WATERS;WATER

<0 13086>
TITLE: Power from Salinity Gradients
PROJECT NUMBER: R/E-16
PRINCIPAL INVESTIGATOR: Isaacs, J.D.;Spiegler, K.S.
ADDRESS: University of California, Sea Grant Program, La Jolla, CA 92093
AFFILIATION: SEE CODE- 1138000 California Univ., La Jolla (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: McLellan, Hugh
TELEPHONE: C(202)634-4125

TYPE OF FUNDING: Grant No.-04-6158-44110
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$22,800
TECHNOLOGY: SOLAR/Ocean, wind (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
PROJECT DESCRIPTION: The objective of the program is to develop a new and novel source of energy which exists at the interface between waters of differing salinity. This large untapped source of energy is particularly concentrated where rivers flow into the ocean and into hypersaline lakes and at the numerous salt pans along the semi-arid coasts. The energy is represented by the osmotic pressure difference between fresh and saline water. The extent and character of this energy source will be evaluated. Furthermore, several schemes will be researched. In the first year, we will initiate studies utilizing the direct osmotic pressure difference and vapor pressure difference between fresh and saline water. Other possible methods to be investigated include concentrating the free energy through intermediaries, so that useful heat can be generated.
RESULTS: Considering our present energy shortage, it is necessary to develop new sources of energy. Furthermore, for flexibility, a diversified approach seems to be best. Salinity gradient power is the most concentrated source of power from the oceans. Almost no research has been done on it. Yet it has considerable promise for helping to ease the energy squeeze. Money provided by Sea Grant will give the initial impetus to a line of research that may have important consequences for the state, nation and the planet.
PROJECT MILESTONES: New project.
KEYWORDS: SALINITY GRADIENTS;SALINITY GRADIENT POWER PLANTS

<013087>
TITLE: Onshore Impacts of the Development of Ocean Resources
PROJECT NUMBER: R/CM-10
PRINCIPAL INVESTIGATOR: Richardson, H.W.;Gordon, P.
ADDRESS: Sea Grant Program, University Park, Los Angeles, CA 90007
AFFILIATION: University of Southern California, Los Angeles (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44118
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$38,500
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;COASTS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas Coast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: One of the major stumbling blocks to planning progress under consideration in southern California is the imbalance in available knowledge concerning local economic impacts and location and land use impacts of pending offshore resource development. To rectify this situation, this project intends: (1) to develop and evaluate a framework for analyzing the metropolitan, region-wide economic impacts of offshore ocean resource activities and their onshore, ancillry facilities; (2) to itemize the nature of specific environmental/economic trade-offs; (3) to report on the background of these trade-offs and how they have been deduced; and (4) to make recommendations on offshore policies for the State; these recommendations will be in light of the impacts on income distribution questions and on the location of economic activities.
RESULTS: (1) Data generated by this project will be of benefit to local governments which must create either protective or developmental policy stances regarding offshore resource exploitation. (2) This, in turn, will benefit the affected publics, since decisions made on a broader information base are, hopefully, more realistic. (3) Based on the more informed decisions generated by the local governments, both the pending offshore industry and the established onshore ones will benefit, because clear and reasonable regulations tend to minimize potential areas of conflict.
PROJECT MILESTONES: New project.
KEYWORDS: ENERGY SOURCES;CALIFORNIA;SOCIO-ECONOMIC FACTORS;OFFSHORE OPERATIONS;COASTAL REGIONS;STORAGE FACILITIES;ENVIRONMENTAL EFFECTS;LAND USE;PLANNING;CONTINENTAL SHELF;COASTAL WATERS;WATER POLLUTION;PETROLEUM PRODUCTS;WATER

<013088>
TITLE: Georgia Offshore Oil Spill Experiment
PROJECT NUMBER: R/EE-3
PRINCIPAL INVESTIGATOR: Menzel, D.W.
ADDRESS: 110 Riverbend Road, Athens, GA 30602
AFFILIATION: Georgia Univ., Athens (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Murray, Thomas
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44115
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$107,100
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: PARTICULATES/Oil (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Coast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To gain predictive capability to estimate the probable impact of oil if it is released near coastal marshes. Specific questions asked include: (1) What are the exchange and diffusion rates of water between the near and offshore zones; (2) what are circulation characteristics of the Georgia estuaries; (3) what is the character and gradient of suspensoids in these zones; (4) what are the adsorptive characteristics of petroleum components to these particles; (5) what is the rate of microbial degradation of petroleum components in the water, sediments and biota of the nearshore zone; (6) what are the effects of petroleum components on phytoplankton and zooplankton in this zone; and (7) what are the effects of petroleum components on the flora and benthos in the shoreface, beach and marsh environments.
RESULTS: The information obtained will assist coastal zone management in the following ways: (1) to locate

pipeline corridors in areas of best probable impact if and when petroleum is transported from the OCS to onshore Georgia; (2) to judge maximum probable impacts and recovery times of coastal marshes and estuarine waters if spills occur; (3) to determine rates of natural degradation of petroleum and transport/exchange rates within estuaries and nearshore areas; and (4) to estimate the probability of offshore spills reaching coastal waters/marshes. The State of Georgia's Department of Natural Resources, Office of Planning and Budget and the U.S. Coastal Plains Regional Commission have repeatedly noted the need for the above information for management purposes.
PROJECT MILESTONES: New project.
KEYWORDS: OIL SPILLS;COASTAL WATERS;MARSHES;MIXING;PETROLEUM PRODUCTS;WATER CHEMISTRY;GEORGIA;SEDIMENTS;PARTICLES;ADSORPTION;BIOCHEMICAL REACTION KINETICS;MICROORGANISMS;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;PHYTOPLANKTON;ZOOPLANKTON;BIOMASS;ENVIRONMENTAL EFFECTS;WATER POLLUTION;BENTHOS;PLANTS;SHORES;CONTINENTAL SHELF;ENVIRONMENTAL TRANSPORT

<013089>
TITLE: Dynamic Analysis of Offshore Structures
PROJECT NUMBER: R/T-7
PRINCIPAL INVESTIGATOR: Vandiver, J.K.
ADDRESS: Sea Grant Program, Massachusetts Institute of Technology, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44081
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$24,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: The objectives of this project are to develop an analysis technique that can predict the dynamic response of offshore structures to random ocean waves. The proposed method highlights simply and quickly those aspects of a structural design most likely to need improvement in withstanding design loads, and furthermore, provides a tool for structural optimization. Experimental verification and generalization of the method to a number of structures are the goals of this research.
RESULTS: The development of this model will provide a working tool for the prediction of structural dynamic response to wave excitation. The principal advantages of the model are its very broad range of application, from fixed platforms to floating bodies and oceanographic moorings, and its simplicity of application. For example, valuable upper-bound estimates can be made with a knowledge of nothing more than estimated structural natural frequencies and the prescribed design sea state. Detailed features of the final design of a structure are not required. Therefore, at early design stages, this process will be valuable as a tool for structural optimization, identifying simply and inexpensively those aspects of dynamic response most likely to be important in withstanding design loads.
PROJECT MILESTONES: New project.
KEYWORDS: OFFSHORE PLATFORMS;SAFETY ENGINEERING;SEAS;SEAWATER;WATER CURRENTS;WATER WAVES;MECHANICAL TESTS;MECHANICAL EFFECTS;DESIGN;CONTINENTAL SHELF;MECHANICS

<013090>
TITLE: Assessing Local Government Capacities Related to Onshore Impacts from Mid-Atlantic OCS Development
PROJECT NUMBER: R/P-1
PRINCIPAL INVESTIGATOR: Warren, R.;Jensen, P.
ADDRESS: College of Marine Studies, Newark, DE 19711
AFFILIATION: Delaware Univ., Newark (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44120
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Coast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Provide an inventory and description of the governmental structure at local and regional levels for the regulation of development and/or provision of public goods and services required for onshore support systems for offshore activities. (2) Describe rules and procedures by which decisions are made by these public agents. (3) Assess the present excess capacity of public services in the major municipalities, coastal counties, and special districts and authorities of New Jersey, Delaware, and Maryland. (4) Develop a framework for analysis of response capacity of public agencies to make regulatory decisions. (5) Make an initial evaluation of present response capacities of public agencies to public and private needs in development of support systems. (6) Make recommendations concerning improvements of response capacity and additional research needs.
RESULTS: The process of OCS onshore impact allocation and minimization in the mid-Atlantic area will be facilitated by the information and recommendations. Local planning and management agencies may use the information in evaluating their own planning and managing capacities. This evaluation will also assist in the allocation of federal funds to support expanded local planning and managing capacities. Finally, the study will provide information that can be used by the responsible federal agency for the determination of net adverse impact.
KEYWORDS: OFFSHORE OPERATIONS;CONTINENTAL SHELF;SOCIO-ECONOMIC FACTORS;COASTAL REGIONS;ATLANTIC OCEAN;LAND USE;PLANNING;ENVIRONMENTAL EFFECTS;ENERGY SOURCES;STORAGE FACILITIES

<013091>
TITLE: Hydrodynamic and Engineering Evaluation of an Ocean Wave Energy System
PROJECT NUMBER: R/T-1
PRINCIPAL INVESTIGATOR: Mei, C.C.;Carmichael, A.D.
ADDRESS: Massachusetts Institute of Technology Sea Grant Program, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44081
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$80,000
TECHNOLOGY: SOLAR/Ocean, wind (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The main purpose of the study is to complete a hydrodynamic study and an engineering evaluation of a promising wave energy conversion system, the Salter cam. In order to accomplish this objective it is proposed to carry out the following tasks: (1) review the experimental data on the device; (2) utilize hydrodynamic theory to predict optimum cam characteristics; (3) confirm and extend the experimental data on the Salter cam; (4) obtain engineering design data for the engineering synthesis using the experimental results and other sources; (5) investigate methods of converting the energy of the rocking motion of the cam into usable energy; (6) apply the engineering data to the synthesis of a range of sizes of wave energy converters; (7) estimate the costs of the systems; (8) conduct a preliminary study of the environmental impact of the system; and (9) indicate potentially useful sites for wave energy conversion systems.
RESULTS: The study will provide a theoretical and experimental determination of the technical feasibility of using floating devices to extract appreciable amounts of energy from ocean waves. In addition the economic evaluation of such methods will be available for comparison with conventional and other novel energy sources.
PROJECT MILESTONES: New project.
KEYWORDS: WAVE ENERGY CONVERTERS;HYDRODYNAMICS;ENGINEERING;OPTIMIZATION;PERFORMANCE;COST;ENVIRONMENTAL IMPACTS;SITE SELECTION

<013092>
TITLE: Distribution of Hydrocarbons in Narragansatt Bay Sediments
PROJECT NUMBER: R/ES-10
PRINCIPAL INVESTIGATOR: Cuinn, J.G.
ADDRESS: 210B Woodward Hall, Kingston, RI 02881
AFFILIATION: Rhode Island Univ., Kingston (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Murray, Thomas
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-5-158-44085
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$27,600
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: PARTICULATES/Hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Other hydrographic areas Bays
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To investigate the qualitative and quantitative distribution of hydrocarbons in Narragansett Bay sediment cores.
RESULTS: The information gained from this study will help provide a firm basis to evaluate current petroleum-related activities in Narragansett Bay and will serve as a baseline on which decisions concerning future uses can be made.
KEYWORDS: HYDROCARBONS;ENVIRONMENTAL TRANSPORT;AQUATIC ECOSYSTEMS;WATER POLLUTION;RHODE ISLAND;COASTAL WATERS;BAYS;SEDIMENTS;ENVIRONMENTAL TRANSPORT;ECOLOGICAL CONCENTRATION;SAMPLING;DRILL CORES;BIOCHEMISTRY;WASTES

<013093>
TITLE: Review and Evaluation of Oil Spill Trajectory Models for Use in Risk Assessment Associated with Proposed Deepwater Ports
PROJECT NUMBER: R/PO-3
PRINCIPAL INVESTIGATOR: Stolzenback, K.D.
ADDRESS: Massachusetts Institute of Technology Sea Grant Program, Port Hancock, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44081
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$19,800
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: PARTICULATES/Oil (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Other hydrographic areas Coast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: The objective of the continued project is to perform sensitivity analyses focussing on the interaction between the physical processes affecting the behavior of oil slicks and the probabilistic treatment of potential spills. In particular the study will determine the relative importance of wind field and ocean current variability, oil spreading and dispersion, and weathering rates on the magnitude of oil spill related impacts. The study will also determine modeling and data requirements as a function

of the overall probabilistic framework for oil spill risk assessment.
RESULTS: The information developed during the continued project will be used to (1) improve the design of data collection programs associated with environmental impact evaluations related to deepwater ports and offshore oil development and (2) to develop frameworks for expressing oil spill probabilities that are consistent with the stochastic nature of potential impacts.
PROJECT MILESTONES: A review and evaluation of existing techniques for modeling oil spill behavior was performed. A draft report describing the results of this work was prepared and distributed to outside experts in this field. A workshop was held at MIT to provide a critical evaluation of the report. A final report is currently in preparation.
KEYWORDS: OIL SPILLS;ENVIRONMENTAL EFFECTS;SEAS;WATER POLLUTION;AQUATIC ECOSYSTEMS;BIOLOGICAL EFFECTS;OFFSHORE OPERATIONS;OIL WELLS;DEEP WATER OIL TERMINALS;ENVIRONMENTAL TRANSPORT;WIND;WATER CURRENTS;VELOCITY;MATHEMATICAL MODELS;DATA COMPILATION

<013094>
TITLE: Carbon Flux in a Coastal Marine Bottom Community
PROJECT NUMBER: R/ES-11
PRINCIPAL INVESTIGATOR: Nixon, S.W.;Oviatt, C.A.
ADDRESS: 210 B Woodward Hall, Kingston, RI
AFFILIATION: Rhode Island Univ., Kingston (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Murray, Thomas
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-6-158-44085
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$48,900
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Other hydrographic areas Coast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: Overall objectives: (1) to understand more about the functional coupling of benthic and pelagic communities in coastal marine ecosystems; (2) to measure the rates and pathways of carbon flow in a heterotrophic subtidal marine bottom community that is common in the New England coastal region; (3) to explore the relationship between the amount and nature of organic input from the water column to the bottom and the production of animal biomass in the benthic community; and (4) to begin to understand some of the mechanisms coupling demersal fish production with events in the overlying water. Immediate objective: No. 2 above.
RESULTS: Knowledge of the rates and mechanisms of benthic community dynamics is essential for evaluating the response of bottom communities to perturbations such as dumping anoxic waters, and oil sludge. It is also a basic link in the trophic dynamics of bottom feeding fish and in relating this growth and production to primary productivity and other organic input in the water column.
PROJECT MILESTONES: New project.
KEYWORDS: AQUATIC ECOSYSTEMS;ATLANTIC OCEAN;COASTAL WATERS;CARBON;ENVIRONMENTAL TRANSPORT;SEDIMENTS;BENTHOS;METABOLISM;AQUATIC ORGANISMS;FISHES;PHOTOSYNTHESIS;BIOMASS;ORGANIC COMPOUNDS;BIOLOGICAL WASTES;DEPTH;CHEMICAL COMPOSITION

<013095>
TITLE: Economic Evaluation of Policy Options Directed Toward Enhanced Energy Recovery from the Outer Continental Shelf
PROJECT NUMBER: R/E-3
PRINCIPAL INVESTIGATOR: Kalter, R.J.;Tyner, W.E.
ADDRESS: 99 Washington Avenue, Albany, NY 12210
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-7-158-44009
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$37,100
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil and Gas (50%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: (1) Develop appropriate geologic-economic simulation models incorporating uncertainty to evaluate the impacts of public policy options designed to encourage the use of enhanced (secondary and tertiary) petroleum recovery methods on OCS reservoirs. (2) Collect production costs and geological and engineering data on enhanced petroleum recovery methods available to OCS producers, and utilize these data in conjunction with the simulation models to evaluate the impact of alternative public policy options (such as price subsidies, changes in tax regulations, and investment incentives) from the standpoint of both production profiles and present-value economic impacts. (3) Evaluate the potential costs and benefits of energy from enhanced recovery of known petroleum resources as compared with the costs and benefits of alternative new energy supply sources such as new oil discovery, coal production, and others.
RESULTS: Research results will produce computer techniques and policy-oriented research reports that should be immediately useful to Congress and the executive agencies in formulating a long-range policy regarding enhanced recovery. The implications for supply augmentation will be of special interest. The study will directly complement efforts currently underway in government and industry to research the technical and engineering aspects of the problem.
PROJECT MILESTONES: New project.
KEYWORDS: CONTINENTAL SHELF;OCEANOGRAPHY;GEOLOGY;OFFSHORE OPERATIONS;OIL WELLS;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;PUBLIC OPINION;COST BENEFIT ANALYSIS;ENERGY SOURCES;COMPUTER CALCULATIONS;DATA COMPILATION;GOVERNMENT POLICIES;COMPUTER CODES;PETROLEUM;NATURAL GAS;COAL

<013096>
TITLE: Theoretical Study of the Subsea Permafrost Regime
PROJECT NUMBER: R/22-02
PRINCIPAL INVESTIGATOR: Harrison, W.D.;Osterkamp, T.E.
ADDRESS: O'Neill Resources Building, Fairbanks, AK 99701
AFFILIATION: Alaska Univ., Fairbanks (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Duane, David
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-7-158-44006
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$43,700
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To predict the subsea regime given the geologic and marine setting and the shoreline history. The specific objective to be addressed during this funding period is to develop a quantitative model of the subsea permafrost regime.
RESULTS: Information and data developed under this project will be used by federal, state and industry agencies to evaluate problems associated with development of offshore oil and gas production in the Arctic.
PROJECT MILESTONES: New project.
KEYWORDS: ARCTIC REGIONS;COASTAL WATERS;CLIMATES;ICE;DEPTH;OFFSHORE OPERATIONS;OIL WELLS;NATURAL GAS WELLS;FEASIBILITY STUDIES;SEAS;MATHEMATICAL MODELS

<013097>
TITLE: Personnel Training at Seattle Central Community College for Petroleum Transportation and Handling
PROJECT NUMBER: R/V-2
PRINCIPAL INVESTIGATOR: Dahlgren, H.;Smith, D.W.
ADDRESS: Division of Marine Resources, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Attaway, David
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-7-158-44021
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$33,600
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECT;OS
PROJECT DESCRIPTION: To train marine personnel in petroleum handling, environmental protection, fire fighting, and fire prevention. Various levels of training will be offered for prospective employees as well as for those persons already employed in the industry. This aspect is especially important due to the increase of oil drilling in the Gulf of Alaska, and projected expansion of oil tanker traffic on Puget Sound waters, and to the West Coast ports of the United States.
RESULTS: To expand our curriculum in Petroleum Handling to cover the fire prevention and fire fighting, safety and survival areas, and to offer as much ''hands-on'' practical training as possible.
PROJECT MILESTONES: We have developed curriculum for petroleum handling for barge tankermen, oil terminal operators, shipboard personnel. This program has received U.S. Coast Guard approval. Three classes in this subject have been offered. Almost all students have been able to qualify for U.S. Coast Guard Tankerman's endorsement. In addition, four pilot classes in fire prevention and fire fighting have been offered. More classes will be offered as needed. The college has acquired two surplus Navy vessels, the YO212, a small tanker, and the YTM764, a 100-foot tug for use in the above training program.
KEYWORDS: PETROLEUM PRODUCTS;TRANSPORT;SAFETY;EDUCATION;PERSONNEL;FIRES;HAZARDS;MATERIALS HANDLING;PACIFIC OCEAN;ALASKA;COASTAL WATERS;HARBORS;TANKER SHIPS;BARGES;OIL SPILLS

<013098>
TITLE: Development of Port of Buffalo as Coal Transshipment Center
PROJECT NUMBER: R/E-5
PRINCIPAL INVESTIGATOR: Paaswell, R.E.;Recker, W.W.
ADDRESS: 99 Washington Avenue, Albany, NY 12210
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Kolf, Richard
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-7-158-44009
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$24,600
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Port of Buffalo;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The major goal of the study for the first year is to develop investment formulae and strategies for consumers of coal in the upstate New York area in the development of the Port of Buffalo into a modern coal transshipment port. The specific objectives for achieving this goal are: (1) develop formulae for mixes of eastern and western coal (incorporating environmental constraints on the burning of coal); (2) estimate costs for the development of the Port of Buffalo to handle projected demand, rates of flow, and ship size; (3) develop price ranges for the delivered mix of coal to the users; and (4) develop investment strategies for the users based upon the percent of use by each user (i.e., level of demand), the overall demand by location within the area, and the anticipated long-term savings in energy costs by using such mixes.
RESULTS: Because of the demonstrated need for western coal by northeast states, this study will be significant for: (1) The ultimate user: It will provide estimated costs for delivered future coal mixes based on western coal, and show the rates at which increased demand may prove economic. (2) The Port of Buffalo: It will show what investment strategies may prove most desirable to the user and developer, and

give insight into the best rates of development. (3) The region: The multiplier effect of major development in the area will have a net positive economic effect. It should be noted, however, that the prime significance will be the answer to the problem of whether any investment strategy is agreeable to the users and developer and is developmentally feasible.
PROJECT MILESTONES: New project.
KEYWORDS: COAL;TRANSPORT;NEW YORK;HARBORS;COST;MIXING;GREAT LAKES;SHIPS;BARGES;ENERGY DEMAND

<013099>
TITLE: Interspecies Cross-Validation and Sediment Attachment Study of the Uptake, Accumulation and Loss of Reactor Associated Radionuclides Employing Comparison of Measurements with a Detailed Mathematical Model
PROJECT NUMBER: R/P-11
PRINCIPAL INVESTIGATOR: Hess, C.T.;Smith, C.W.
ADDRESS: Research and Public Services, Coburn Hall, Orono, ME 04473
AFFILIATION: Maine Univ., Orono (USA)
MONITORING AGENCY: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
DIVISION: Office of Sea Grant
MONITOR: Duane, David
TELEPHONE: C(202)634-4125
TYPE OF FUNDING: Grant No.-04-7-158-44034
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (40%);WASTE MANAGEMENT (60%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;GEOGRAPHIC AREAS/Site specific Maine;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT;OS
PROJECT DESCRIPTION: The objectives of this project are: (1) to measure and compare the uptake, accumulation and loss of gamma-ray emitting radionuclides in three species of edible mollusca, C. virginica, M. edulis and M. modiolus, rafted in the effluent of the Maine Yankee Nuclear Power Reactor at three selected sites near the diffuser output and an appropriate control site; (2) to perform an interspecies cross-validation of the single component mathematical model for the radionuclide attachment kinetics for these species based upon a pulsed relaxator mechanism driven by the nuclear reactor radionuclide effluent inventory schedule; (3) to measure and mathematically model the uptake, accumulation and loss of gamma ray emitting radionuclides by marine sediments in the vicinity of the Maine Yankee Nuclear Power Reactor diffuser output and other selected sites in the Montsweag Bay and Bailey Cove, Maine, by employing a detailed study of the attachment and retention mechanisms involved in marine sedimentation; and (4) by utilizing the above studies, to predict the long term radionuclear impact on the marine environment of the Montsweag Bay estuarial system.
RESULTS: Information will be published in scientific journals and conveyed to the public by means of popular bulletins and direct contact using Sea Grant Advisory Services.
PROJECT MILESTONES: New project.
KEYWORDS: NUCLEAR POWER PLANTS;RADIOACTIVE EFFLUENTS;GAMMA SOURCES;ENVIRONMENTAL TRANSPORT;UPTAKE;MOLLUSCS;AQUATIC ECOSYSTEMS;RADIONUCLIDE KINETICS;ENVIRONMENTAL EFFECTS;MATHEMATICAL MODELS;MAINE YANKEE REACTOR;COASTAL WATERS;ESTUARIES;BAYS;SEDIMENTS;ECOLOGICAL CONCENTRATION;RADIOISOTOPES;RADIOECOLOGY;COMPUTER CALCULATIONS;GAMMA RADIATION

Department of Defense

<020009>
TITLE: Effects of Power Plant Peaking on Commercial, Sport, and Indian Fisheries
PROJECT NUMBER: ZTK-827
PRINCIPAL INVESTIGATOR: Mains, E.M.;Gerlach, A.R.
ADDRESS: 210 Custom House, Portland, OR 97209
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Army Corps of Engineers
77 FUNDING: Department of Defense
TECHNOLOGY: HYDROELECTRIC (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
PROJECT DESCRIPTION: The objectives are to determine the effects of power peaking on commercial, sport, and Indian fisheries. Information on the effects of power peaking on these fisheries is needed for environmental impact statements, litigation with Indian groups, and for a better understanding of these matters by the Corps, the fish and game agencies, the fishermen, and the general public. More specifically, we must determine the effects of power peaking on the availability of fish at existing sites, on gill net efficiency, on gill net dropout rates and related mortalities, on fishing costs, on sportsmen access to fishing locations, and on stranding fishermen.
APPROACH: These study needs are highly varied and are complex to study. The existing tagging programs described in the work unit on migration, collection, and passage deal directly with the following aspects of the work unit: (1) Effect of peaking on Indian set net efficiency. (2) Effect on peaking on Indian set net dropout rate. (3) Effect on peaking on sport fishing sites. The conventional, sonic, and radio tagging techniques and creel census and interviews will be utilized in studies of impacts of peaking on the fisheries. Effects of peaking on existing sportsmen access to the river, fishermen success, and on the possible stranding of sportsmen can be accomplished by mapping locations and elevations of areas utilized by sportsmen today and evaluating available tailwater and reservoir surface elevation and rate of change information for a range of future peaking operations. Effects of peaking on fishing costs would be evaluated by survey of specific fishermen after it had been determined if fishing sites, efficiency, or availability of fish had been affected at all.
KEYWORDS: FISHING INDUSTRY;AMERICAN INDIANS;FISHES;POPULATION DYNAMICS;HYDROELECTRIC POWER PLANTS;ENVIRONMENTAL IMPACTS;ENVIRONMENTAL IMPACT STATEMENTS;RECOMMENDATIONS;INVENTORIES;MORTALITY;ECONOMICS;SOCIO-ECONOMIC FACTORS

<020010>
TITLE: Effect of Peaking on Specific Riparian Wildlife Habitat Areas Along the Snake and Columbia Rivers
PROJECT NUMBER: ZTK-802-1
PRINCIPAL INVESTIGATOR: Mains, E.M.;Gerlach, A.R.
ADDRESS: 210 Custom House, Portland, OR 97209
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Army Corps of Engineers
77 FUNDING: Department of Defense
TECHNOLOGY: HYDROELECTRIC (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
PROJECT DESCRIPTION: To determine the impact of project power peaking operations on key wildlife habitat and populations along and in the Snake and Columbia Rivers that were identified in studies described in the work unit on Identification of Habitats and Wildlife Populations. Such habitat areas would include State and Federal wildlife areas and refuges and riparian and island habitats adjacent to the mainstem Columbia and Snake Rivers and key tributaries and aquatic habitats utilized by wildlife in the Columbia and Snake Rivers. Special attention would be devoted to the impact of peaking operations on rare, endangered, and unique species and their habitats.
APPROACH: The approach taken in this work unit will depend on the nature, extent, and location of the habitats and wildlife populations identified in the inventory described in another work unit. Where possible, topographic maps and aerial photographs will be utilized to predict inundations of habitats by peaking operations. Indicated areas of inundation will be identified by ground surveys and potential impacts assessed. In some instances, it may be necessary to employ standard survey instruments to determine elevations of habitat areas for impact assessment. Test peaking operations may also be possible with on-ground assessments of habitat inundation determinable by direct observation. This basic information on inundation, plus the previously collected inventory information on habitats, wildlife forms, and populations, coupled with Corps-provided data on magnitudes, frequencies, rates, and timing of anticipated project discharges and reservoir and tailwater elevation changes, will enable the study teams to determine the relative impact of such operations on the wildlife populations that depend on the riparian habitat.
KEYWORDS: HYDROELECTRIC POWER;WATER REQUIREMENTS;OPERATION;ENVIRONMENTAL IMPACTS;HABITAT;POPULATION DYNAMICS;ENDANGERED SPECIES;INVENTORIES;WILD ANIMALS;TOPOGRAPHY;AERIAL MONITORING;PHOTOGRAPHY;LEVELS;WATER

<020011>
TITLE: Development of Field Data Collection Procedures/Manual for Reservoir/Watershed Ecosystem Modeling
PROJECT NUMBER: 31468
PRINCIPAL INVESTIGATOR: Eley, R.L.;Robey, D.L.
ADDRESS: P.O. Box 631, Vicksburg, MS 39180
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Army Corps of Engineers
77 FUNDING: Department of Defense
TECHNOLOGY: HYDROELECTRIC (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
PROJECT DESCRIPTION: (a) To define field data requirements for mathematical reservoir/watershed ecosystem models. (b) To determine which of the ecosystem modeling data requirements should be incorporated into routine field data collection operations of District offices, and which of the modeling data requirements should be furnished to field offices in the form of an Engineering Manual (EM) of regionalized model coefficients and other data. (c) To develop and evaluate practical techniques and procedures for field office use in collecting data required for ecosystem models. (d) To provide a comprehensive ecosystem modeling data base for a large CE reservoir/watershed system to be used as a basis for developing and evaluating physical and mathematical modeling techniques suitable for use by field offices to address environmental quality problems. (e) To provide CE field offices with guidance in the form of EMs and Miscellaneous Papers (MPs) on recommended ecosystem modeling field data collection requirements and procedures.
APPROACH: During FY 73, the DeGray Lake and Caddo River drainage basin, Arkansas (Vicksburg District), was selected as the initial field prototype for the development, calibration, and verification of ecosystem models being developed by the WES as part of CWIS No. 31063. The DeGray/Caddo ecosystem was chosen because of the existence of good pre- and post-impoundment baseline data, the availability of competent local contractors for field data collection, the existence of an outlet structure allowing multilevel discharge of both base and flood flows, a pumped storage hydroelectric generation facility, and the opportunity for cooperative interagency funding of field data collection. An expanded field data collection effort involving the reservoir, river, and watershed was initiated in FY 74 and continued through FY 75 as part of CWIS No. 31063.
KEYWORDS: WATERSHEDS;WATER RESERVOIRS;MATHEMATICAL MODELS;BIOLOGICAL MODELS;INFORMATION NEEDS;MANUALS;ECOSYSTEMS;RECOMMENDATIONS;ARKANSAS;PUMPED STORAGE POWER PLANTS;HYDROELECTRIC POWER;WATER QUALITY;DATA ACQUISITION

<020012>
TITLE: Effects of Power Plant Peaking on Migration, Collection, and Passage
PROJECT NUMBER: ZTK-690-2
PRINCIPAL INVESTIGATOR: Mains, E.M.;Gerlach, A.R.
ADDRESS: 210 Custom House, Portland, OR 97209
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Army Corps of Engineers
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (60%);NUCLEAR/General (40%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: PARTICULATES (60%);HEAT, THERMAL (40%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
PROJECT DESCRIPTION: The objectives of this work unit are to determine the effects of power plant peaking or daily, weekly, and seasonal flow regulation on the migration, collection, and passage of adult anadromous fish in the Columbia and Snake Rivers. The assumptions are that the effects may be negative, positive, or non-existent. Key items to be studied in making these determinations are migration rates; fish collection efficiency; turbine and spillway discharge distribution patterns; discharge, forebay, and tailwater

fluctuations and rates; fish fallback rates; night passage; survival rates between dams; conditions at the mouths of tributary streams and at artificial collection facilities; and hourly fish count data collected over a period of years.
APPROACH: At this time we are technically limited to essentially 4 methods or tools for making such studies: (1) Conventional tagging where fish are trapped, anesthetized, tagged with spaghetti flag tags, disc tags, or opercle tags, released in different locations, and ultimately recounted upstream and the numbers of various tagged groups compared, (2) Sonic tags where fish are trapped, anesthetized, tagged, released, and tracked with hydrophones through reservoirs and tributaries, (3) Radio tags for similar tracking in the vicinity of spillways and powerhouses where sonic tag signals cannot be heard, and (4) Electronic tunnels which operate on an electrical resistance principle and can be placed in the fishway entrances at dams to count fish as they leave the river.
KEYWORDS: HYDROELECTRIC POWER PLANTS;OPERATION;ENVIRONMENTAL IMPACTS;AQUATIC ECOSYSTEMS;FISHES;BEHAVIOR;POPULATION DYNAMICS;AMERICAN INDIANS;INFORMATION SYSTEMS;LEGAL ASPECTS;IMPLEMENTATION;DATA ACQUISITION;WATER REQUIREMENTS;INVENTORIES;MEASURING METHODS;COLUMBIA RIVER;THERMAL POWER PLANTS

<020013>
TITLE: Thermal Regimes Disturbed by Man
PROJECT NUMBER: 31361
PRINCIPAL INVESTIGATOR: Frankenstein, G.;Ashton, G.D.
ADDRESS: P.O. Box 282, Hanover, NH 03755
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Army Corps of Engineers
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (70%);NUCLEAR/General (30%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
PROJECT DESCRIPTION: To determine the influence of ice covers on the disposition of added heat to water bodies.
APPROACH: The initial effort will consist of analytical examination and identification of the major mechanisms by which an imposed heat supply is disposed, either to the atmosphere, the adjacent water body, or to the melting of the ice cover. Existing turbulent and convective theories will be modified to accommodate typical conditions in large water bodies and to assess the relative uncertainty of quantitative identification of the disposition of the imposed heat.
RESULTS: Studies were conducted on the effects of changing the thermal conditions of water bodies with primary concern related to the effects of ice. Development of a computer program to predict the ice effects has been started and will continue with emphasis on transverse dispersion of thermal effluents and unsteady effects. Data have been obtained of the thermal structure of a large lake during ice conditions. Evaluation of the influence and interaction of the ice cover on the budget of a lake is underway.
KEYWORDS: COAL INDUSTRY;THERMAL POLLUTION;WATER POLLUTION;ICE;HEAT TRANSFER;LAKES;THERMAL EFFLUENTS;ENVIRONMENTAL IMPACTS;ENVIRONMENTAL TRANSPORT;COMPUTER CODES;DIFFUSION;NUCLEAR INDUSTRY

<020014>
TITLE: Identification of Riparian and Island Habitats and Wildlife Populations on the Snake and Columbia Rivers
PROJECT NUMBER: ZTK-483-3
PRINCIPAL INVESTIGATOR: Mains, E.M.;Gerlach, A.R.
ADDRESS: 210 Custom House, Portland, OR 97209
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Army Corps of Engineers
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (70%);NUCLEAR/General (30%)
PROJECT DESCRIPTION: The objective of this work unit is to survey the shorelines and islands of the Columbia River from the Canadian border to the Pacific Ocean and the Snake River from Hells Canyon to its confluence with the Columbia River. Riparian wildlife habitats in this area will be identified and described and the animal types and populations determined. Riparian shoreline areas rendered sterile for wildlife production by highway and railroad fills, rip-rap for protection, etc., will also be quantified.
APPROACH: The contractors will develop a plan of approach after collecting and reviewing available information from the files of Federal and State game agencies, Battelle Northwest, Corps of Engineers, and others; examining maps and aerial photos, etc. This plan of study completed in September 1973 detailed the extent of actual field studies and nature and methods of data collection to meet the stated objectives. A Wildlife Study Guidance Group composed of Corps and four Federal and state game agencies' representatives reviews the contractors' plans to assure achievement of goals and consistency of results from the three major sections of the system being independently studied by each university team.
RESULTS: Preliminary observations on obvious impacts of power peaking operations on habitats and wildlife forms will be made. Similar inventories of key tributary streams will be conducted if such streams are added to the Columbia River and Tributaries Study.
PROJECT MILESTONES: At the conclusion of the 2-1/2 year inventory study, a report detailing the findings will be prepared by each u (Text Truncated - Exceeds Capacity).
KEYWORDS: COLUMBIA RIVER;BASELINE ECOLOGY;INVENTORIES;WILD ANIMALS;HABITAT;COMMUNITIES;ELECTRIC POWER;POWER GENERATION;ROADS;RAILWAYS;DATA ACQUISITION;DATA ANALYSIS

<020015>
TITLE: Coal Utilization Systems
PROJECT NUMBER: DN-687069
PRINCIPAL INVESTIGATOR: Williams, D.E.
ADDRESS: Point Mugu, Port Hueneme, CA 93041
AFFILIATION: Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Naval Facilities Engineering Command (03E)
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/SO/sub x/, NO/sub x/ (100%)
PROJECT DESCRIPTION: Analyze and recommend power systems to utilize coal as an energy source for Naval

facilities.
APPROACH: There are two problem areas associated with the use of coal; first, it is not clean burning and its use will often be at variance with environmental quality goals set forth by both EPA and NAVFAC; second, both fuel and ash handling require additional equipment and manpower as well as an incumbent increase in equipment maintenance efforts. Since Navy combustion hardware is generally both small and diverse, it represents an area where there is considerable potential for development. Emission reduction techniques for particulates, sulfur oxides and nitrogen oxides will be investigated. Advances in fluidized bed boiler technology will be monitored. Retrofitting existing oil and gas fired boilers by distributing clean burning low-BTU gas from a central gas producer will be evaluated. The economics of central steam and power generation will be examined.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;RETROFITTING;AIR POLLUTION CONTROL;SULFUR OXIDES;NITROGEN OXIDES;FLY ASH;COAL;COMBUSTION;CO-GENERATION;FLUIDIZED-BED COMBUSTION;ECONOMICS;WASTE MANAGEMENT

<020016>
TITLE: Existing Steam Generator Modifications
PROJECT NUMBER: DN-687067
PRINCIPAL INVESTIGATOR: Fu, T.T.;Cooper, E.E.
ADDRESS: Point Mugu, Port Hueneme, CA 93041
AFFILIATION: Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Naval Facilities Engineering Command (03E)
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Coal (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS/Organics (100%)
PROJECT DESCRIPTION: Develop operating procedures and modifications to permit existing shore based steam generators to burn synthetic and waste fuels and improve thermal efficiency.
APPROACH: Open air and operational size boiler test facilities will be used to systematically test and evaluate synthetic (shale and coal derived) and waste (used lubricating, reclaimed, and contaminated fuel oils) fuels. To be determined are fuel and mixture properties, fuel handling and safety techniques, necessary modifications to boiler and fuel supply systems, multi-fuel capability requirements, long term effects, emission characteristics, operating procedure for maximum boiler efficiency at minimal pollutions. To be evaluated are boiler efficiency improvement devices, fuel oil additives, atomizing devices, boiler control schemes, and new-burner devices. Technical requirements and procedures will be established.
KEYWORDS: STEAM GENERATORS;RETROFITTING;SYNTHETIC FUELS;WASTE OILS;SHALE OIL;COAL LIQUIDS;THERMAL EFFICIENCY;INTERCHANGEABILITY;OPTIMIZATION

<020017>
TITLE: Test and Evaluation Support to ADTC Aerospace Ground Equipment
PROJECT NUMBER: DF323350
PRINCIPAL INVESTIGATOR: Ryan, R.E.;Ligday, R.C.
ADDRESS: Brooks A.F.B., San Antonio, TX 78235
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: USAF School of Aerospace Medicine VN
77 FUNDING: Department of Defense
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/CO;NOXIOUS GAS/NOx;NOXIOUS GAS/Hydrocarbons (100%)
PROJECT DESCRIPTION: This effort provides expertise and instrumentation to determine the quality and build up of exhaust gases in and around aerospace ground equipment (age) during DT + E at ADTC, Eglin AFB, FL. Human engineering/crew technology support to ADTC is coordinated with AMRL through AMD.
APPROACH: Trace gas analyzers capable of detecting carbon monoxide, nitric oxide, nitrogen dioxide, and hydrocarbons are used to measure exhaust gas concentrations in the most typical operating environments of age.
KEYWORDS: EXHAUST GASES;HEALTH HAZARDS;EQUIPMENT;AIRPORTS;AIR QUALITY;POLLUTION CONTROL;AIR POLLUTION;CARBON MONOXIDE;NITRIC OXIDE;NITROGEN DIOXIDE;HYDROCARBONS;MONITORING;TESTING

<020018>
TITLE: Environmental Fate of Hydrazine Fuels
PROJECT NUMBER: DF408060
PRINCIPAL INVESTIGATOR: MacNaughton, M.
ADDRESS: Civil Engineering Center, Panama City, FL 32401
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: AF Civil Engineering Center EVC
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (40%);FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil Shale (30%)
POLLUTANTS: ORGANICS/Hydrazine;ORGANICS/Organics (100%)
PROJECT DESCRIPTION: Because of the increased use of the hydrazine family of compounds in rocket fuels and in monopropellent generators it is necessary to understand the chemistry of these compounds in the environment subsequent to their release by spills, venting or incomplete combustion. This data is necessary because of the toxic nature of these fuels and the requirement to assess the environmental effect of their use.
APPROACH: The time dependent fate of these fuels will be determined in the atmospheric, aquatic and terrestrial phases. The level of minor components which may be significant will also be determined. Infrared and mass spectral analysis will be used to determine reaction rates and decomposition products.
KEYWORDS: ENVIRONMENTAL TRANSPORT;HYDRAZINE;ORGANIC NITROGEN COMPOUNDS;HYDRAZINE FUEL CELLS;ENVIRONMENTAL IMPACTS;ACCIDENTS;TOXICITY;EARTH ATMOSPHERE;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;ROCKETS;MASS SPECTROSCOPY;AIR POLLUTION

<020019>
TITLE: Acute Fish Bioassay
PROJECT NUMBER: DF320510
PRINCIPAL INVESTIGATOR: Slonim, A.R.
ADDRESS: Wright Patterson A.F.B., Dayton, OH 45433
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Aerospace Medical Research Laboratory
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (40%);FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil Shale (30%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS/Organics;ORGANICS/Hydrazine;ORGANICS/UDMH;ORGANICS/Aerozine-50;ORGANICS/MMH (100%)
PROJECT DESCRIPTION: To determine the water pollution potential of aircraft fuels and lubricants, missile propellants and their exhaust products, and other Air Force materials that, if in sufficient quantity, could result in significant detrimental effects on the environment. Transient physiological changes in organisms and toxic effects up to ''fish kills'' can serve as indices of potential pollution of the aquatic environment.
APPROACH: The approach to this effort utilizes experimental concepts developed in water pollution technology and fisheries biology. The applied conditions of these operational AF compounds and the types of test organisms to be utilized determine the methodology for experimentation. Propellant bioassays accomplished with guppies will be repeated using the fathead minnow currently and other fish species subsequently. The acute toxicity of hydrazine, UDMH, aerozine-50 and MMH, respectively, will be determined. Following the determination of acute toxic levels of these important compounds, the efficacy of various chemicals will be evaluated relative to reversing or reducing the toxicity of fish life.
RESULTS: The results of these studies will serve as a data base upon which environmental impact statements and assessments can be made as they apply to weapon systems using these chemicals, especially where they may possibly enter an aquatic environment.
KEYWORDS: FISHES;BIOASSAY;BIOLOGICAL EFFECTS;EXHAUST GASES;AVIATION FUELS;LUBRICANTS;MISSILES;PROPELLANTS;WATER POLLUTION;WEAPONS;ENVIRONMENTAL IMPACTS;HYDRAZINE;TOXICITY;ORGANIC NITROGEN COMPOUNDS;BIOLOGICAL INDICATORS;COAL INDUSTRY;OIL SHALE INDUSTRY;ENVIRONMENTAL TRANSPORT

<020020>
TITLE: Characterization of Hydrocarbon Emissions from AF Turbine Engines
PROJECT NUMBER: DF320850
PRINCIPAL INVESTIGATOR: Conkle, J.P.;Giannetta, C.L.
ADDRESS: Brooks A.F.B., San Antonio, TX 78235
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: USAF School of Aerospace Medicine VN
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: NOXIOUS GAS/Toxic gases (50%);PARTICULATES/Particulates (50%)
PROJECT DESCRIPTION: The efforts will provide baseline data for assessing the biomedical impact of air force aircraft operations, prior to the advent of regulatory restrictions. The information is required not only for assessing environmental impact but also for evaluating combustor design criteria, smoke suppression additives and engine operational cycles. The work is closely coupled and coordinated with on-going turbine engine emissions measurement at the AFWL and AFAPL.
APPROACH: Chemical characterization of the organic compounds present in turbine engine exhaust will be accomplished for both gaseous and particulate specie. Samples will be obtained from a variety of sources including AF and Navy operational engine test stands and the AFAPL single combustor test rig. Analysis will be performed by a coupled gas chromatograph-mass spectrometer-data system. Results will be screened by AMRL/TH for toxic hazard assessment. Prior progress in this effort has been documented under work unit 7164-16-13. This new work unit implements new technology planning objective alignment as directed by HQ Aerospace Medical Division.
KEYWORDS: TURBINES;EXHAUST GASES;AIRCRAFT;ENVIRONMENTAL IMPACTS;TURBOJET ENGINES;COMBUSTION CHAMBERS;DESIGN;GASEOUS WASTES;PARTICLES;AEROSOLS;CHEMICAL ANALYSIS;GAS CHROMATOGRAPHY;MASS SPECTROSCOPY;TOXICITY;BIOLOGICAL EFFECTS;AIR POLLUTION

<020021>
TITLE: Fuel Dumping by USAF A/C
PROJECT NUMBER: DF407170
PRINCIPAL INVESTIGATOR: Ricco, E.
ADDRESS: Civil Engineering Center, Panama City, FL 32401
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: AF Civil Engineering Center EVC
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: NOXIOUS GAS/Hydrocarbons;NOXIOUS GAS/JP-4 (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
PROJECT DESCRIPTION: To assess the extent and the environmental impact of fuel dumping by USAF aircraft.
APPROACH: Major areas of study are quantification of AF fuel dumping and determination of environmental impact. Quantification will be accomplished by establishment of an AF-wide fuel dump reporting system and tabulation of reports. Impact will be studied in three aspects--chemical, physical, and biological. Chemical aspects--photochemical reactivity of JP-4 in the atmosphere, particularly in the presence of NOx from aircraft engine exhaust, also formation of polynuclear aromatic carcinogens from aromatics in fuel. Studies will be performed in a photochemical reaction chamber. Products will be analyzed by long path infrared absorption spectroscopy, with support from UV-visible spectroscopy, UV-visible fluorescence spectroscopy, gas chromatography, and mass spectrometry. Physical aspects--behavior of dumped fuel: droplet formation, mixing in aircraft wake, droplet fallout and evaporation, aerosol formation, settling to ground, effect of JP-4 and its photochemical products on atmospheric physical processes. Research will include wind tunnel modeling and computational simulation, as well as studies of real dumps if possible.

Biological aspects--effect of JP-4 and its photochemical products on living things.
KEYWORDS: AIRCRAFT;SAFETY;AVIATION FUELS;WASTE DISPOSAL;CARCINOGENS;HEALTH HAZARDS;ECOSYSTEMS;BIOLOGICAL MODELS;MATHEMATICAL MODELS;HYDROCARBONS;BIOLOGICAL EFFECTS;EARTH ATMOSPHERE;REACTION KINETICS;ENVIRONMENTAL TRANSPORT;SIMULATION;DATA ACQUISITION;DATA ACQUISITION SYSTEMS;PHOTOCHEMICAL REACTIONS;ECOLOGICAL CONCENTRATION;AROMATICS

<020022>
TITLE: Bioassay in Soil Microorganisms
PROJECT NUMBER: DF320500
PRINCIPAL INVESTIGATOR: London, S.A.
ADDRESS: Wright-Patterson AFB, Dayton, OH 45433
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: 6570 Aerospace Medical Research Laboratory TH
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: NOXIOUS GAS/Hydrocarbons (30%);SPECIFIED OTHER POLLUTANTS/Aircraft fuels, lubricants (70%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
PROJECT DESCRIPTION: To utilize microbial systems for evaluating the potential environmental impact of various materials used in Air Force operations, such as missile propellants, aircraft fuels and lubricants and other substances used in consequential amounts that could have acute and/or chronic environmental effects. Microbial cultures isolated from soil samples will be investigated concerning their responses to both acute and chronic exposure to potential environmental pollutants. Selection of species will be based upon: (1) applicability of physiological requirements to experimental procedures; (2) relationship of responses to pollutant exposure with ecosystem impact. Microbes will be studied under both closed (batch) system and open (steady-state growth) system conditions to ascertain acute and chronic effects. Responses to be evaluated will include growth kinetics, bacteriocidal/bacteriostatic effect, physiological changes, genetic (mutation) effects, pollutant degradation or accumulation.
RESULTS: The data derived from this effort are considered in conjunction with similar results obtained with other biological indicator and test systems to form a data base upon which scientifically valid environmental impact assessments and statements can be prepared. This effort will establish no-effect levels for single and multiple cultures and will serve as both a laboratory test system and a means of predicting potential environmental consequences of inadvertant intrusion in soil and water of Air Force materials.
KEYWORDS: MICROORGANISMS;BIOLOGICAL INDICATORS;ENVIRONMENTAL IMPACTS;AVIATION FUELS;LUBRICANTS;AIRCRAFT;MISSILES;PROPELLANTS;SOILS;BIOASSAY;PHYSIOLOGY;MUTATIONS;CHRONIC INTAKE;GENETIC EFFECTS;BIOLOGICAL ACCUMULATION;BIODEGRADATION;ENVIRONMENTAL TRANSPORT;HYDROCARBONS

<020023>
TITLE: Sorbent Sampling Systems for N-Nitrosodimethylamine
PROJECT NUMBER: DF320220
PRINCIPAL INVESTIGATOR: Lackey, W.W.;Conkle, J.P.
ADDRESS: Brooks AFB, San Antonio, TX 78235
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: USAF School of Aerospace Medicine VN
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (40%);FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil Shale (30%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Rocket fuel, NdMA (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
PROJECT DESCRIPTION: This work unit will develop, test and evaluate sorbent sampling systems for detection and quantitative measurement of N-nitrosodimethylamine (NDMA) in ambient air. NDMA is an intermediate compound in the industrial synthesis of unsymmetrical dimethyl hydrazine (UDMH) rocket fuel, and is one of the suspected carcinogenic compounds controlled by OSHA.
APPROACH: Several types of chromatographic packing materials will be evaluated for sorption effeciency and recovery using standard, NDMA gas mixtures at low concentrations. Breakthrough volumes will be determined for each material as a function of sample flow rate, temperature, and relative humidity. Comparative analyses will be conducted to standardize each material against a referee method involving cryogenic trapping, with GC-MS, and thermal energy analysis.
RESULTS: The development of a sorbent sampling tube for direct off-gas analysis by GC-MS is a cost-effective field replacement for cold trapping methods currently in use. This effort supports the AFLC (SAALC) directorate of energy management program for Air Force procurement of UDMH rocket fuel.
KEYWORDS: SAMPLING;HYDRAZINE;AVIATION FUELS;ROCKETS;ENVIRONMENTAL IMPACTS;ORGANIC NITROGEN COMPOUNDS;COAL INDUSTRY;OIL SHALE INDUSTRY;NITROSO COMPOUNDS;AIR POLLUTION;COLD TRAPS;ADSORBENTS;RECOVERY;EARTH ATMOSPHERE

<020024>
TITLE: Comparison of Theoretical and Experimental Absorption of Radiofrequency Power
PROJECT NUMBER: DF-318700
PRINCIPAL INVESTIGATOR: Johnson, C.C.;Durney, C.
ADDRESS: 1400 East 2nd Street, Salt Lake City, UT 84112
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: USAF School of Aerospace Medicine RA
TYPE OF FUNDING: Grant No.-F41609-76-C-0025
77 FUNDING: Department of Defense FY77:$41,300
TECHNOLOGY: CONSERVATION/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Magnetic fields, electric fields, radiofrequency (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: The highest priority task in the DOD Triservice Electromagnetic Radiation (EMR) Bioeffects Research Program is to develop better methodology for quantitating EMR energy distribution and measurement. Methods and data are critically needed to extrapolate (via appropriate scaling factors) animal data to man and thus to establish more realistic personnel safety exposure guidelines for AF operations. The specific objectives of this study are (1) to define adequate models, (2) to extend theoretical radiofrequency (RF) power absorption data to assess consequences of man's exposure to 10 khz to 1.5 ghz RF radiation fields, and (3) to develop methods, accounting for size and orientation effects, to extrapolate animal exposures to equivalent human exposures.
APPROACH: Twenty phantoms (models) will be constructed to best represent 3.5 kg monkeys. Absorbed power power

kg will be calculated utilizing this monkey model for exposures in free space, near field and on a ground plane. Experiments will be conducted to measure power absorbed in the phantom and in actual monkeys for six exposure orientations. The best model for man, monkey, rat and mouse will be developed and calculations performed to determine power density to which these animals should be exposed to produce the same average absorbed power as man when exposed to 10 mw/cm 2 at the same frequency. The exposure frequency for animals subjected to the same power density as man to accomplish equivalent average power absorption will also be calculated.
RESULTS: These data will be used to compile a handbook (researcher's guide) for use in selecting appropriate exposure parameters (frequency and power density) for animal studies to simulate bioeffects in man. Power absorption calculations for man and animals will be extended to 1.5 ghz using wave solution, numerical techniques, or other applicable methods.
KEYWORDS: MONKEYS;KIDNEYS;PHANTOMS;ELECTROMAGNETIC RADIATION;RADIOWAVE RADIATION;BIOLOGICAL EFFECTS;DOSE-RESPONSE RELATIONSHIPS;TESTING

<020025>
TITLE: Transport of Water, Dissolved Substances, Heat and Electric Current Through Shales and Clay-Rich Sediments 14207-GS
PROJECT NUMBER: DAOE9254
PRINCIPAL INVESTIGATOR: Graf, D.L.
ADDRESS: School of Liberal Arts and Sciences, Urbana, IL 61801
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Darcom Army Research Office
TYPE OF FUNDING: Grant No.-DAAG29-77-G0011
77 FUNDING: Department of Defense FY77:$14,200
TECHNOLOGY: FOSSIL FUEL/General (30%);FOSSIL FUEL/Oil Shale (20%);GEOTHERMAL/General (50%)
POLLUTANTS: ORGANICS/Dissolved substances (30%);HEAT, THERMAL/Heat (40%);SPECIFIED OTHER POLLUTANTS/Electric current (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (70%);ANALYTICAL (30%)
PROJECT DESCRIPTION: Investigate the transport of water, dissolved substances, heat and electric current across clay membranes under a range of pressures and temperatures. The results of this research are expected to bear directly on Corps of Engineers problems of disposal of waste liquids into the ground, the occurrence of deep water supply, and on strength and expansion of clay shales.
APPROACH: Using specially designed hydraulic presses and temperature controls, two different classes of clays will be compacted into artificial shales, whose membrane transport properties for fluids, slats, heat and electric current will be measured. The laboratory data will be analyzed to determine the mechanisms involved and to provide the basis for a quantitative model.
KEYWORDS: CLAYS;MEMBRANES;SOIL MECHANICS;WASTE DISPOSAL;UNDERGROUND DISPOSAL;FLUID FLOW;LIQUID WASTES;LEACHING;HEAT TRANSFER;SHALES;ELECTRIC CURRENTS;PHYSICAL PROPERTIES;GEOTHERMAL ENERGY;FOSSIL FUELS;OIL SHALE INDUSTRY;WASTE MANAGEMENT

<020026>
TITLE: Direct Exposure of Monolayers of Mammalian Cells to Airborne Pollutants in a Unique Culture System
PROJECT NUMBER: DF-048860
PRINCIPAL INVESTIGATOR: Rasmussen, R.E.
ADDRESS: School of Medicine, Irvine, CA 92664
AFFILIATION: California Univ., Irvine (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
TYPE OF FUNDING: Grant No.-AF-AFOSR-3343-77
77 FUNDING: Department of Defense FY77:$79,800
TECHNOLOGY: FOSSIL FUEL/Coal (60%);FOSSIL FUEL/Oil Shale (40%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO2;NOXIOUS GAS/SO2;NOXIOUS GAS/CO;NOXIOUS GAS/O3 (40%);PARTICULATES/Mutagens (30%);ORGANICS/Vapors (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: This research will measure the cytotoxic effect on cultured mammalian cells of pollutant gases (NO2, SO2, CO, O3) and mixtures of such gases, estimate the mutagenic effect of such gases and mixtures and their comutagenic effect when cells are treated with a known chemical mutagen, determine the effects of gas exposure on subcellular activities such as enzyme induction or inhibition, chromosomal damage and repair, and DNA synthesis and repair, develop methodology for generation and monitoring of mixtures of volatile organic pollutants with the above gases for use in the cell exposure system, develop methodology for generation and monitoring of particulate aerosols and for measurement of the interaction of such aerosols with mammalian cells in vitro.
APPROACH: Biological effects of air pollutants will be measured under conditions which heretofore have not been available which allow direct access of the pollutants to target cells as occurs in vivo. The project may lead to the development of a cell culture exposure system which will have general application to the assessment of potential toxic effects of airborne pollutants and mixtures of such pollutants which may be encountered in the workplace of urban environments.
KEYWORDS: AIR POLLUTION;GASEOUS WASTES;NITROGEN DIOXIDE;SULFUR DIOXIDE;CARBON MONOXIDE;OZONE;BIOLOGICAL EFFECTS;TOXICITY;MUTAGENESIS;ANIMAL CELLS;CELL CULTURES;BIOCHEMICAL REACTION KINETICS;ENZYMES;CHROMOSOMAL ABERRATIONS;BIOLOGICAL REPAIR;DNA;BIOSYNTHESIS;STRAND BREAKS

<020027>
TITLE: Effects of DU on Aquatic Foodchain Base
PROJECT NUMBER: DF-638800
PRINCIPAL INVESTIGATOR: Okelley, J.C.
ADDRESS: Box 1937, University, AL 35486
AFFILIATION: Alabama Univ., University (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
TYPE OF FUNDING: Grant No.-F08635-75-C-0039
77 FUNDING: Department of Defense FY77:$9,300
TECHNOLOGY: NUCLEAR/General (100-Nuclear%)
POLLUTANTS: RADIATION/Radionuclides;RADIATION/Uranium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: The objective is to provide experimental data concerning the effects on the aquatic envircnment caused by the residue left when a depleted uranium (DU) munition functions. This information is in direct support of near- and long-term assessments required for the RDT and E of the GAU-8 Gun System

and any future munitions which require the use of DU. The data will be used throughout DU munition programs of the Air Force, Army, and Navy.
APPROACH: The approach will be to take water samples from streams draining test sites used in testing DU munitions and a control site, and to determine qualitatively and quantitatively the populations of green algae (the base of the aquatic foodchain). This will provide the baseline for later comparisons after the test sites have been in use for various periods of time. Also, the more important species will be subjected to varying concentrations of DU residue under laboratory conditions to ascertain tolerance thresholds.
RESULTS: As this information becomes available it will be used in preparing environmental assessments for the various programs.
KEYWORDS: DEPLETED URANIUM;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;WATER QUALITY;ALGAE;BIOMASS;POPULATION DYNAMICS;BIOLOGICAL EFFECTS;TOXICITY;WATER POLLUTION

<020028>
TITLE: Effects of Depleted Uranium (DU) Testing on Microorganisms
PROJECT NUMBER: DF-641510
PRINCIPAL INVESTIGATOR: Deason, T.R.
ADDRESS: Box 1937, University, AL 35486
AFFILIATION: Alabama Univ., University (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: AF Armament Laboratory
TYPE OF FUNDING: Contract No.-F08635-77-C-0047
77 FUNDING: Department of Defense FY77:$6,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The objective is to characterize the algal community of a stream draining a depleted uranium (DU) munitions test site. Information concerning the effects of DU residues from munitions testing on the aquatic environment will be obtained. This information is in support of near- and long-term assessments required for RDT and E of the GAU-8 gun system and any future munitions using DU.
APPROACH: The approach will be to examine algal samples collected from a stream draining a DU munitions test area. The algae will be identified to a meaningful taxon and the populations will be quantified. General physiology of the algae cells will be determined through productivity studies.
KEYWORDS: DEPLETED URANIUM;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;WATER QUALITY;WATER POLLUTION;ALGAE;BIOMASS;POPULATION DYNAMICS;GENETIC VARIABILITY;BIOLOGICAL EFFECTS;TOXICITY

<020029>
TITLE: Navy Environment-Catalytic Removal of Toxic Gases
PROJECT NUMBER: DN-223249
PRINCIPAL INVESTIGATOR: Vroom, D.A.;Palmer, R.L.
ADDRESS: P.O. Box 80817, San Diego, CA 92138
AFFILIATION: Intelcom Rad Tech, San Diego, Calif. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Office of Naval Research
TYPE OF FUNDING: Contract No.-N00014-72-C-0247
77 FUNDING: Department of Defense FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (50%);METALS/Nickel;METALS/Cobalt;METALS/Iron;METALS/Platinum (50%)
PROJECT DESCRIPTION: The Navy is interested in closed life-support systems which depend upon electrochemical power sources and also upon the removal of waste, toxic gases from the environment. It is the purpose of this investigation to study reactions at surfaces which remove or detoxify waste gases or which reduce the efficiency of electrochemical power sources.
APPROACH: Low energy electron diffraction, auger electron spectroscopy, mass spectrometry, and molecular beam techniques will be used to study surface chemical reactions on single crystals of nickel, cobalt, iron, and platinum.
KEYWORDS: ENVIRONMENT;CONTROLLED ATMOSPHERES;ELECTROCHEMICAL CELLS;POWER SUPPLIES;AIR POLLUTION ABATEMENT;HAZARDOUS MATERIALS;AIR POLLUTION CONTROL;GASEOUS WASTES;CHEMICAL REACTIONS;NICKEL;COBALT;IRON;PLATINUM;HEALTH HAZARDS;MONOCRYSTALS;CHEMICAL REACTIONS;AIR POLLUTION MONITORS;TESTING;SPECTROSCOPY

<020030>
TITLE: Navy Environment: Bacterial Chemotaxis and Marine Pollution
PROJECT NUMBER: DN-923411;N00014-76-C-0262
PRINCIPAL INVESTIGATOR: Mitchell, R.;McKay, G.
ADDRESS: Cambridge Station, Cambridge, MA 02138
AFFILIATION: Harvard Univ., Cambridge, Mass. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Office of Naval Research
77 FUNDING: Department of Defense FY77:$24,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: This research is concerned with the subtle effects of marine pollutants on marine microorganisms. Recent observations indicate that crude oil possesses some limited solubility in seawater and may have an inhibitory effect on chemoreception in marine bacteria.
APPROACH: Laboratory and field studies are being carried out to determine the effect of sub-lethal concentrations of pollutants on marine microbial processes. Inhibition of bacterial chemotaxis by chloramines is being investigated. The relationship between chemoreceptor blockage by pollutants and retardation of organic matter decomposition is being studied. Current field studies are concerned with pollution induced microbial diseases of coral.
KEYWORDS: WATER POLLUTION;SEAS;BIOLOGICAL EFFECTS;BACTERIA;SEAWATER;PETROLEUM PRODUCTS;SOLUBILITY;BIOLOGICAL WASTES;DECOMPOSITION;CORALS;DISEASES;CHEMICAL COMPOSITION

<020031>
TITLE: Nuclear Energy Applications
PROJECT NUMBER: DA0A8115
PRINCIPAL INVESTIGATOR: Hollis, H.D.;Hughes, J.T.
ADDRESS: Fort Belvoir, VA 22060
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: OCE US Army Facilities Engineering Support Agency
77 FUNDING: Department of Defense
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (60%);HEAT, THERMAL (40%)
PROJECT DESCRIPTION: The objective of this work unit is to conduct studies to identify DOD land based applications where the use of atomic energy as an energy source would be advantageous to the military and to develop atomic energy devices for those applications that are cost effective, conserve natural resources, reduce environmental pollution or provide a capability not achievable with other forms of energy.
APPROACH: Work will be accomplished by following technological advances and research and development programs in nuclear energy and energy conversion systems being conducted by industry and government. Current Army requirements, prognosis of future Army requirements, and DOD requirements for power will be reviewed to identify power needs and trends for future power requirements. Areas where nuclear energy can be beneficial to the army will be investigated to determine feasibility and cost effectiveness.
KEYWORDS: MILITARY FACILITIES;POWER SUPPLIES;NUCLEAR ENERGY;USES;COST;RESOURCE CONSERVATION;ENERGY CONSERVATION;ENVIRONMENTAL IMPACTS;ENERGY CONVERSION;POWER GENERATION;THERMAL POWER PLANTS;NUCLEAR POWER PLANTS;FORECASTING;DEMAND FACTORS;FEASIBILITY STUDIES

<020032>
TITLE: Ultraviolet Radiation
PROJECT NUMBER: DF-244820
PRINCIPAL INVESTIGATOR: Hall, L.A.
ADDRESS: Cambridge Research Laboratory, L.G. Hanscom Field, Bedford, MA
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: AF Geophysics Laboratory
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
PROJECT DESCRIPTION: AF function--environmental impact of high-altitude vehicles. Deficiency--effect of aircraft effluents on solar UV absorption and on ozone. Objective--to determine solar, ultraviolet energy deposition rates and ozone concentrations. How research contributes--energy deposition rates and ozone concentrations will improve models used in computation of environmental impact of Air Force vehicles.
APPROACH: Balloon flights of a solar spectrometer will provide data on the solar spectrum in the range 2000 to 3000A, as a function of height in the stratosphere. From these data, energy deposition rates and ozone concentrations will be computed.
KEYWORDS: STRATOSPHERE;AIRCRAFT;CHEMICAL EFFLUENTS;GASEOUS WASTES;AIR POLLUTION;ULTRAVIOLET RADIATION;OZONE;AERIAL MONITORING;BALLOONS;SPECTROMETERS;AIR QUALITY;ENVIRONMENTAL EFFECTS;EXHAUST GASES;ABSORPTION

<020033>
TITLE: Lead as an Indicator of Environmental Quality in Airport Environs
PROJECT NUMBER: DF-281680
PRINCIPAL INVESTIGATOR: Thalken, C.E.;Moran, M.J.
ADDRESS: Chemistry and Biology Science Department, Air Force Academy, Colorado Springs, CO 80840
AFFILIATION: Department of the Air Force, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Frank J. Seiler Research Laboratory, USAF Academy
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
PROJECT DESCRIPTION: AF function--environmental support of base operations (environmental impact of aircraft operations).
APPROACH: Deficiency--no data are available on the concentrations, accumulation rates, or effects of many aircraft-generated pollutants in the environs in and around military installations and air strips. Specifically, there is no data available on the build-up of lead in the air installation compatibility use zone (AICUZ). Build-up of lead and other toxic compounds is under close scrutiny by the EPA and their standards are becoming increasingly more stringent. These standards will limit the boundaries of AICUZs and limit their industrial and agricultural use. Research--techniques will be developed for assaying lead concentrations in the soil, fauna, and flora of the AICUZ of Peterson Field, Colorado Springs, Colo. Data obtained will be correlated to uncontaminated areas (control) to a highly contaminated fossil-fuel-burning power plant area, and to all available EPA standards. How research contributes--techniques developed will allow evaluation of aircraft-generated lead pollution on USAF installations. Data generated from the Peterson Field environ will allow evaluation of possible health problems from lead contamination in and around AICUZ.
RESULTS: Extrapolation of the data can be used to predict lead concentrations on other USAF installations to predict the effects of lead accumulation in the future, and as a management tool for environmental planning.
KEYWORDS: AIR POLLUTION;AIRCRAFT;GASEOUS WASTES;EXHAUST GASES;CHEMICAL EFFLUENTS;AIRPORTS;ENVIRONMENTAL EFFECTS;MONITORING;LEAD;ENVIRONMENTAL TRANSPORT;QUANTITATIVE CHEMICAL ANALYSIS;AEROSOL MONITORING

<020034>
TITLE: Wind Generator Systems
PROJECT NUMBER: DN687066
PRINCIPAL INVESTIGATOR: Pal, D.
ADDRESS: Civil Engineering Lab., Point Mugu, Port Hueneme, CA 93041
AFFILIATION: Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Naval Facilities Engineering Command
77 FUNDING: Department of Defense
TECHNOLOGY: SOLAR/Ocean, wind (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOISE, VIBRATION (100%)
PROJECT DESCRIPTION: Evaluate wind power generation systems integrated with building environmental systems or electrical power grids at Navy bases.
APPROACH: Demonstration of commercial and ERDA developed wind generators ranging from 5 to 500 kw is planned over the next ten-year period for Naval sites determined to have the potential for cost effective wind power. The demonstrations will concentrate on developing and demonstrating hardware for converting wind machines shaft or electrical output to either heat for buildings environmental control or a 60 hz constant voltage electricity. Small wind machines less than 20 kw capacity will generally be dispersed, serving individual buildings. Larger wind machines will be used for demonstrating central base power.
RESULTS: Comprehensive test data and analysis will be used for preparing a handbook on the application of wind power at Naval installations. Economics, reliability, operational data, and noise levels will be carefully documented in the handbook.
KEYWORDS: ELECTRIC GENERATORS;WIND TURBINES;EVALUATION;POWER GENERATION;MANUALS;NOISE POLLUTION;PLANNING;DEMONSTRATION PROGRAMS;COMMERCIALIZATION;COST BENEFIT ANALYSIS;BUILDINGS;SPACE HEATING;ECONOMICS;RELIABILITY;OPERATION;USA;MILITARY FACILITIES;USES

<020035>
TITLE: DN-777315
PROJECT NUMBER: Descriptive Toxicology of JP-5 Fuel Derived From Oil Shale
PRINCIPAL INVESTIGATOR: Jenkins, L.J.;Jones, R.A.
ADDRESS: Toxicology Division, Bethesda, MD 20014
AFFILIATION: Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Naval Medical Research Institute, National Naval Medical Center
77 FUNDING: Department of Defense
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
PROJECT DESCRIPTION: Substance produced by the extraction of petroleum products from shale may cause serious disease. One of the major health hazards associated with shale oil recovery technology is in the exposure incurred from the use of these shale products. Since the U.S. Navy is a predictable user of large quantities of JP-5 aviation fuel obtained from shale, this work unit proposes to determine in suitable animal models the acute and chronic toxicology of these fuels.
APPROACH: Determine in suitable animal models the oral, ocular, and dermal toxicity, and both the acute and chronic (120 day) inhalation toxicity of JP-5 aviation fuel. By biochemical and histopathological analysis of tissues from one-half of the animals exposed to JP-5 determine the target organs(s) of JP-5 and the mechanisms which are responsible for the expression of JP-5 toxicity. Retain the other half of the animals surviving the chronic exposure for lifetime observation to determine if JP-5 causes long-term irreversible effects (significantly decreased life expectancy or carcinogenicity).
KEYWORDS: PETROLEUM PRODUCTS;OIL SHALES;TOXICITY;SHALE OIL FRACTIONS;OIL SHALE INDUSTRY;HEALTH HAZARDS;LABORATORY ANIMALS;TESTING

<020036>
TITLE: Evaluation of Efficiency of Juvenile Bypass Systems
PROJECT NUMBER: 31458
PRINCIPAL INVESTIGATOR: Smith, H.;Mains, E.M.
ADDRESS: 210 Custom House, Portland, OR 97209
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Army Corps of Engineers
77 FUNDING: Department of Defense
TECHNOLOGY: HYDROELECTRIC (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (50%);HEAT, THERMAL (50%)
PROJECT DESCRIPTION: To evaluate effectiveness of turbine-gatewell juvenile bypass systems completed and operating at existing projects. Develop criteria for new bypass systems (Bonneville 2nd powerhouse and McNary 2nd powerhouse).
APPROACH: At the Dallas, McNary, and Ice Harbor projects, holes have been drilled between the turbine intake gatewell slots and the ice-trash sluiceway to permit trapped juvenile salmonids to escape and be passed around the project. At John Day, Lower Monumental, Little Goose, and Lower Granite projects, special conduit systems have been installed to accomplish this same purpose. Evaluation of these systems is required to assure that fish are not retained in them for extended periods and exposed to high concentrations of supersaturated gases and to determine the relative safety of such system to fish passing through them. Work would be accomplished with fin-marked or freeze-branded groups of juvenile salmonids being exposed to various segments of each type of system and compared with a control group that would be exposed only to the recovery trap or gear. This work will often be accomplished in concert with other work unit elements associated with the efforts to improve juvenile survival. In addition to evaluation of the physical aspects of the bypass system, it is most important to determine if the existing location of the outfall of the bypass provides optimum survival.
KEYWORDS: FISHES;JUVENILES;THERMAL POWER PLANTS;COOLING SYSTEMS;AQUATIC ECOSYSTEMS;COLUMBIA RIVER;SURFACE WATERS;WASHINGTON;ENTRAINMENT;IMPINGEMENT;ENVIRONMENTAL EFFECTS;SALMON;SURVIVAL TIME

Department of Health, Education and Welfare

<030001>
TITLE: Skin Metabolism of Drugs, Carcinogens and the PCB's
PROJECT NUMBER: ES CA 01586-01
PRINCIPAL INVESTIGATOR: Bickers, D.R.
ADDRESS: 1230 York Avenue, New York, NY 10021
AFFILIATION: Rockefeller Univ., New York (USA)
MONITORING AGENCY: Georgia Univ., Athens (USA)
TYPE OF FUNDING: Grant No.-ES CA 01586-01
77 FUNDING: Rockefeller Univ. FY77:$62,000
TECHNOLOGY: FOSSIL FUEL/General (100%);GENERAL SCIENCE (100%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: These studies are designed to evaluate the metabolic response of the skin to environmental agents; and to assess the role of cutaneous enzymes in the activation of carcinogens to mutagens and in the binding of carcinogens to DNA.
APPROACH: The effect of skin applications of typical inducers of hepatic drug metabolism such as phenobarbital (PB), 3-methylcholanthrene (3-MC) and a polychlorinated-bipheynl (PCB), Aroclor 1254, on cutaneous drug metabolizing enzymes in rats will be studied. The enzyme aryl hydrocarbon hydroxylase (AHH) will be used as a prototype and it is planned to determine the tissue and subcellular localization of cutaneous AHH and to develop techniques to accurately quantitate the hemeprotein cytochrome P-450 in the skin. In addition, cutaneous ethylmorphine N-demethylase and aniline hydroxylase activity will be evaluated. The effects of selected cutaneous doses of PB, 3-MC, and the PCB on enzymes in skin and other tissues including liver, kidney, lungs and gastrointestinal tract will be compared to ascertain the relative importance of skin as a site of drug metabolism and as a portal-of-entry for environmental inducing agents. The effects of oral and systemic administration of the chemicals on enzyme activity in the skin will be studied to determine the cutaneous enzyme induction response following non-cutaneous exposure to such agents. Using skin AHH preparations, it is planned to assess the possibility that inducible cutaneous AHH may be related to the activation of carcinogens into mutagens and to the binding of carcinogens to DNA. The Ames tester strains of Salmonella typhimurium will be used for mutagenesis studies; calf-thymus DNA in vitro, and skin (epidermal) DNA in vivo will be used for the assessment of AHH-enhanced binding of carcinogens to this macromolecule.
KEYWORDS: AIR POLLUTION;BIOLOGICAL EFFECTS;CHEMICAL EFFLUENTS;DRUGS;CARCINOGENS;BIPHENYL;SKIN ABSORPTION;METABOLISM;CHLORINE COMPOUNDS;POLYCYCLIC AROMATIC HYDROCARBONS;ENZYMES;SKIN;BIOCHEMICAL REACTION KINETICS;CARCINOGENESIS;MUTAGENESIS;LABORATORY ANIMALS;TESTING

Department of Health, Education and Welfare/National Institute for Occupational Safety and Health

<032002>
TITLE: Coal Liquefaction and Gasification, Occupational Health Epidemiological Study
PRINCIPAL INVESTIGATOR: Knowles, D.
ADDRESS: 944 Chestnut Ridge Rd., Morgantown, WV 26505
AFFILIATION: National Inst. for Occupational Safety and Health, Morgantown, W.Va. (USA). Appalachian Lab. for Occupational Safety and Health
MONITORING AGENCY: National Inst. for Occupational Safety and Health, Morgantown, W.Va. (USA). Appalachian Lab. for Occupational Safety and Health
DIVISION: Division of Respiratory Disease Studies
MONITOR: Knowles, Donald
TELEPHONE: C(304)599-7421
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$315,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (30%);PARTICULATES (30%);ORGANICS (30%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Coal liquefaction and gasification is an alternate energy technology which is currently being explored and discussed for possible future use. The technology has been developed and tested in several pilot plant operations within the last twenty years. The health effect on workers from exposures found in this technology have not been well defined, although coal gasification processes involve many of the polycyclic hydrocarbons known to be carcinogenic. These environmental contaminants are closely related to those from coke oven emissions where exposed workers have been shown to have significantly increased risk of lung cancer. Coal liquefaction processes involve pulverization of coal into fine dust; worker exposure to which may result in coal worker's pneumoconiosis or related chest diseases. The purpose of this project is to conduct an epidemiological study of coal liquefaction and gasification workers to identify health risks associated with the multitude of exposures found in the industry.
KEYWORDS: COAL LIQUEFACTION;COAL GASIFICATION;HEALTH HAZARDS;PERSONNEL;HYDROCARBONS;CARCINOGENESIS;COKE;EMISSION;LUNGS;DUSTS;RESPIRATORY SYSTEM DISEASES;EPIDEMIOLOGY;OCCUPATIONAL DISEASES;CARCINOGENS;INHALATION;SYNTHETIC FUELS

<032003>
TITLE: Mineral Wool and Clay Fibers, Occupational Health Epidemiological Study
PRINCIPAL INVESTIGATOR: Dement, J.;Bayliss, D.
ADDRESS: NIOSH, 4676 Columbia Parkway, Cincinnati, OH 45226
AFFILIATION: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
MONITORING AGENCY: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
DIVISION: Division of Surveillance, Hazard Evaluations and Field Studies
MONITOR: Dement, John;Bayliss, David
TELEPHONE: F684-3255
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$190,000
TECHNOLOGY: CONSERVATION/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Fibers (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: In view of the vast quantity of health data demonstrating the carcinogenicity of asbestos fibers, insulation manufacturers and other industries have begun searching for substitute materials to replace asbestos. However, the fibers constituting these substitute materials may be similar in shape and size to that of asbestos. It is felt by many researchers that the morphology of the fibers is the most important factor in the development of malignant and nonmalignant respiratory disease. Little is known of the health effects to man of respirable fibers other than asbestos. It is incumbent upon the National Institute for Occupational Safety and Health to investigate epidemiologically the health consequences to man of respirable fiber exposures and other insulation materials. The study will be approached through environmental surveys and mortality and morbidity studies designed to quantify the risk of exposure to each of the materials used as well as determine the presence of other substances that may promote the development of adverse health effects or act in a synergistic manner.
KEYWORDS: INDUSTRIAL HYGIENE;RESPIRABLE FIBERS;OCCUPATIONAL DISEASES;MAN;CARCINOGENESIS;FIBERS;MINERALS;WOOL;CLAYS;ASBESTOS;INDUSTRY;BIOLOGICAL EFFECTS;MORTALITY;HEALTH HAZARDS;DISEASES;EPIDEMIOLOGY;INHALATION;CARCINOGENS

<032004>
TITLE: Sulfuric and Acid Sulfates, Occupational Health Epidemiological Study
PRINCIPAL INVESTIGATOR: Gambell, J.;Jones, W.
ADDRESS: NIOSH, 944 Chestnut Ridge Rd., Morgantown, WV 26505
AFFILIATION: National Inst. for Occupational Safety and Health, Morgantown, W.Va. (USA). Appalachian Lab. for Occupational Safety and Health
MONITORING AGENCY: National Inst. for Occupational Safety and Health, Morgantown, W.Va. (USA). Appalachian Lab. for Occupational Safety and Health
DIVISION: Division of Respiratory Disease Studies
MONITOR: Gambell, John
TELEPHONE: F923-7476
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$155,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION IN SITU (10%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (30%)
POLLUTANTS: NOXIOUS GAS/Sulfuric acid;NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/SO/sub 3/ (50%);PARTICULATES/Sulfates (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: EPA in its CHESS report (1970-71) studied seven cities for community exposure to different air contaminants. One community had a primary exposure to sulfur oxides and particulates. EPA's epidemiological study has indicated that soluble and insoluble sulfates have a more adverse effect on human health than particulates or SO/sub 2/. The National Air Quality Advisory Committee has suggested that particulates be studied not as total suspended particulate but according to particle size distribution. The findings of the CHESS study strongly suggest that occupational exposures to sulfates and sulfuric acid need further study in terms of exposure levels and mortality experience. The study proposed by FY 76 will determine exposures to a variety of soluble and insoluble sulfates and sulfuric acid in a number of industries. These data will be used to choose populations for mortality studies beginning in FY 77.
KEYWORDS: INDUSTRIAL HYGIENE;AIR POLLUTION;SULFUR OXIDES;AEROSOLS;EPIDEMIOLOGY;HEALTH HAZARDS;PARTICLE SIZE;OCCUPATIONS;PERSONNEL;SULFATES;SULFURIC ACID;MORTALITY;OCCUPATIONAL DISEASES;INHALATION

<032005>
TITLE: Recirculation of Exhaust Air
PRINCIPAL INVESTIGATOR: Hughes, R.T.
ADDRESS: 4676 Columbia Parkway, Cincinnati, OH 45226
AFFILIATION: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
MONITORING AGENCY: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
DIVISION: Division of Physical Sciences and Engineering
MONITOR: Hughes, Robert T.
TELEPHONE: F684-4295
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$65,000
TECHNOLOGY: CONSERVATION/General (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to develop criteria which will permit safe recirculation of exhaust air from industrial processes.
APPROACH: The parameters associated with industrial process contaminant generation, capture, and removal from the exhaust air stream will be identified and quantified with respect to their effect on recirculated air. Criteria will be developed which describe recirculation systems and will provide the necessary analytical tools to evaluate such systems.

RESULTS: The recirculation criteria will be used by industrial personnel to evaluate and quantify contaminant discharges from recirculation systems. This evaluation will permit a decision regarding the suitability of the system for recirculation.
KEYWORDS: RECIRCULATION;PROCESS;EXHAUST GASES;INDUSTRY;PERSONNEL;AIR POLLUTION;ENVIRONMENTAL EFFECTS;CONTROL;ATMOSPHERES;OCCUPATIONS;AIR QUALITY;HEALTH HAZARDS;MONITORING

<032006>
TITLE: Pocket-Sized Gas Chromatographic Analyzer for Chemical Contaminants in Air: A Feasibility Study
PROJECT NUMBER: W36 R4-04
PRINCIPAL INVESTIGATOR: Angell, J.B.
ADDRESS: Stanford Electronics Laboratory, Stanford, CA 94305
AFFILIATION: Stanford Univ., Calif. (USA). Stanford Electronics Labs.
MONITORING AGENCY: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
DIVISION: Division of Physical Sciences and Engineering
MONITOR: McGammon, Charles S.
TELEPHONE: F684-2591
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (80%);ORGANICS (20%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To demonstrate the feasibility of using state of the art miniaturization concepts in gas chromatography for the construction of a multiple gas personal exposure monitor.
APPROACH: To investigate micro-etching and preparation of gas chromatographic columns, valves and detectors on a silicon wafer, to evaluate the layout of the entire gas chromatographic sampling system and to discuss areas that need further experimental investigation to produce a working instrument.
RESULTS: Further testing and development of this instrument will be required to correct deficiencies.
KEYWORDS: PERSONAL SAMPLER;AIR POLLUTION MONITORS;DESIGN;PERSONNEL;WORKING CONDITIONS;MONITORING;MINIATURIZATION;GAS CHROMATOGRAPHY;AIR POLLUTION;CHEMICAL EFFLUENTS;DOSEMETERS

<032007>
TITLE: Development and Fabrication of a Prototype Fibrous Aerosol Monitor
PROJECT NUMBER: W36 R4-04
PRINCIPAL INVESTIGATOR: Lilienfeld, P.
ADDRESS: GCA/Technology Division, Burlington Road, Bedford, MA 01730
AFFILIATION: GCA Corp., Bedford, Mass. (USA). GCA Technology Div.
MONITORING AGENCY: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
DIVISION: Division of Physical Sciences and Engineering
MONITOR: Baron, Paul A.
TELEPHONE: F684-2591
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$75,000; Bureau of Mines
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: PARTICULATES/Asbestos;PARTICULATES/Fibrous particles (100%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);DEVELOPMENT (80%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Construct a portable survey instrument capable of quantitatively measuring asbestos and other fibrous dust concentrations.
APPROACH: Investigate electrostatic, aerodynamic and light scattering properties of fibrous dust and design and build a survey instrument based on electrostatic rotation of the fibers and light scattering detection.
RESULTS: Further development of this instrument will be required to correct deficiencies.
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;AEROSOLS;FIBERS;DUSTS;ASBESTOS;MONITORING

<032008>
TITLE: Portable Microwave Spectrometric Analyzer For Chemical Contaminants in the Air; Design and Prototype Construction
PROJECT NUMBER: W36 R4-04
PRINCIPAL INVESTIGATOR: Morrison, R.
ADDRESS: Lawrence Livermore Laboratory, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
DIVISION: Division of Physical Sciences and Engineering
MONITOR: Baron, Paul A.
TELEPHONE: F684-2591
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$208,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS/Ammonia;NOXIOUS GAS/Carbonyl sulfide (20%);ORGANICS/Acetonitrile;ORGANICS/Acetaldehyde;ORGANICS/Acetone;ORGANICS/Ethanol;ORGANICS/Ethylene oxide;ORGANICS/Isopropyl alcohol;ORGANICS/Propylene oxide (80%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To design and construct an air monitor capable of quantitatively measuring the concentration of 10 specific gases and vapors using microwave spectrometric detection.
APPROACH: To investigate various components to be used in the monitor including microwave source, detection cells and air sampling system, to design an air monitor for 10 specific gases based on these

investigations and to construct the system designed.
RESULTS: Further testing and development of this and other instruments will be required to correct deficiencies.
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;CHEMICAL EFFLUENTS;MONITORING;AIR POLLUTION;ENVIRONMENT;PERFORMANCE TESTING;GASES;MICROWAVE SPECTRA

<032009>
TITLE: Recommended Standards for Coal Gasification Plants
PRINCIPAL INVESTIGATOR: Evans, J.M.
ADDRESS: 11300 Rockville Pike, Rockville, MD 20852
AFFILIATION: Enviro Control, Inc., Rockville, Md. (USA)
MONITORING AGENCY: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
DIVISION: Division of Criteria Documentation and Standards Development
MONITOR: Cohen, Murray L.
TELEPHONE: F443-3053
TYPE OF FUNDING: Contract No.-210-76-0171;EPA pass-thru funding
77 FUNDING: National Inst. for Occupational Safety and Health FY77:$185,000
TECHNOLOGY: FOSSIL FUEL/General (30%);FOSSIL FUEL/Coal Conversion gasification (70%)
ENERGY CYCLE: COMBUSTION IN SITU (10%);STORAGE (10%);PROCESSING, CONVERSION (70%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (10%);PARTICULATES (25%);ORGANICS (25%);RADIATION (5%);NOISE, VIBRATION (5%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Guidelines for good work practices and recommended occupational safety and health standards are being developed for coal gasification pilot plants. Similar guidelines and recommendations will be developed for demonstration and commercial scale coal gasification plants.
APPROACH: Pilot plant guidelines will be based on available world-wide literature, and data that have been generated by federal agencies (EPA, ERDA). Guidelines for larger scale plants will be based on field data collected by NIOSH and extrapolations/predictions from the data used in developing the pilot plant guidelines. If implemented, these guidelines will provide some measure of worker protection from hazardous exposures until such time when formal standards may be developed.
RESULTS: A follow-on document studying the safety problems encountered in pilot plant operation and the transition to commercial production will be required.
KEYWORDS: COAL GASIFICATION PLANTS;STANDARDS;RECOMMENDATIONS;SAFETY;OCCUPATIONS;PILOT PLANTS;HAZARDS;DATA ACQUISITION;CARCINOGENS;HEALTH HAZARDS;HUMAN POPULATIONS;TOXICITY

<032011>
TITLE: Development of a Fibrous Aerosol Monitor
PROJECT NUMBER: 78BDE 04
PRINCIPAL INVESTIGATOR: Baron, P.A.
ADDRESS: National Institute for Occupational Safety and Health; Division of Physical Sciences and Engineering, Cincinnati, OH 45202
AFFILIATION: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals and Industry
MONITOR: D'Alessio, G.J.
TELEPHONE: C(202)426-4568
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$134,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES/Fibrous aerosols (100%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Occupational Safety and Health Administration standards presently require assessment of worker exposure to asbestos aerosol. Exposure to fibrous glass and other fibrous aerosols will have to be monitored in the future. These materials are widely used in the insulation industry and with the current push for energy conservation will be used more extensively. At this time, there is no instrument available to rapidly measure the concentration of fibrous dust in the air. The development of a fibrous aerosol monitor would allow real time measurement of fibrous aerosols for the purpose of accurately detecting areas in the workplace that contain potentially dangerous concentrations of fibrous aerosols. The development of the monitor will be a one year contract effort after which it will be necessary to comprehensively test the monitor for accuracy and suitability under a wide range of field and laboratory conditions. The results of these tests will be used in further development of the fibrous aerosol monitor as a rugged, portable and accurate field survey instrument for the assessment of worker exposure to fibrous aerosols. Laboratory and field testing is continuing.
KEYWORDS: AEROSOLS;ASBESTOS;HEALTH HAZARDS;MONITORING;DUSTS;FIBERS;GLASS;PERSONNEL;WORKING CONDITIONS;AIR POLLUTION MONITORS;DESIGN;SAFETY

<032012>
TITLE: Relationship of Metabolism, Fate and Toxicology of Particulates and Organic Compounds
PROJECT NUMBER: EPA-IAG-05-E773-CW
PRINCIPAL INVESTIGATOR: Bruckner, B.
ADDRESS: NIOSH, Rockville, MD 20852
AFFILIATION: National Inst. for Occupational Safety and Health, Rockville, Md. (USA)
MONITORING AGENCY: Public Health Service, Washington, D.C. (USA)
MONITOR: Bruckner, Benjamin
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$104,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;HEALTH EFFECTS
PROJECT DESCRIPTION: Specific projects within this area will be funded through the grant mechanism. These projects will be designed to explain, interpret, and predict the occupational health effects of

particulates and organic compounds associated with the various coal technologies as well as other primary energy search and utilization proposals being developed in response to the Nation's effort toward energy self-sufficiency.
KEYWORDS: AEROSOLS;HEALTH HAZARDS;FOSSIL FUELS;ORGANIC COMPOUNDS;COAL INDUSTRY;ENERGY;OCCUPATIONAL DISEASES;TOXICITY;METABOLISM;PARTICLES

<032013>
TITLE: Mortality Study of TVA High Risk Workers
PROJECT NUMBER: EPA-IAG-05-E773-CX-6
PRINCIPAL INVESTIGATOR: Ortmeyer, C.
ADDRESS: 944 Chestnut Ridge Rd., Morgantown, WV 26505
AFFILIATION: National Inst. for Occupational Safety and Health, Morgantown, W.Va. (USA). Appalachian Lab. for Occupational Safety and Health
MONITORING AGENCY: Public Health Service, Washington, D.C. (USA)
DIVISION: NIOSH-Division of Respiratory Disease Studies
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$236,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide;NOXIOUS GAS/Nitrogen dioxide (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Pulmonary disease problems, particularly pneumoconioses and airway obstructive diseases, could arise from exposure to pollutant gas emissions such as SO/sub 2/ and NO/sub 2/ from coal burned as fuel for steam-powered electricity generating plants. Pneumoconioses could develop from years of exposures to coal dusts in coal-loading areas or to asbestos fibers in linings of steam pipes. The primary purpose of this study is to measure specified effects (decreased longevity, ''premature'' deaths from pulmonary diseases, and early retirement due to disability attributed to such diseases) on high risk workers in coal-fired steam electricity generating plants who have had exposures to these pollutants that varied in duration and intensity. In the process of collecting information on early disability and on mortality of employees exposed to these air pollutants, data will also be obtained on neoplasms of the respiratory system and on diseases of the heart. This evidence can be analyzed in relation to some hypotheses about carcinogenic effects of pollutants and effects on the heart of lung impairments.
KEYWORDS: HIGH-RISK WORKERS;SULFUR DIOXIDE;NITROGEN DIOXIDE;BIOLOGICAL EFFECTS;PERSONNEL;FOSSIL-FUEL POWER PLANTS;INHALATION;RESPIRATORY SYSTEM DISEASES;MORTALITY;CARCINOGENESIS;RESPIRATORY SYSTEM;NEOPLASMS

<032015>
TITLE: Mortality and Morbidity Among Oil Shale Workers
PROJECT NUMBER: E773-CX-2
PRINCIPAL INVESTIGATOR: Costello, J.
ADDRESS: NIOSH, Div. of Respiratory Disease Studies, Morgantown, WV 26505
AFFILIATION: National Inst. for Occupational Safety and Health, Morgantown, W.Va. (USA). Appalachian Lab. for Occupational Safety and Health
MONITORING AGENCY: Public Health Service, Washington, D.C. (USA)
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$145,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Rifle, CO
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project is a study of approximately 230 persons who worked in a pilot oil shale operation in Rifle, Colorado, through a retrospective mortality study combined with cross-sectional morbidity examination to evaluate the several morbidity aspects that may be associated with oil shale occupations. Mortality due to 21 specific causes of death will be determined after an extensive follow-up effort and the obtaining of death certificates of those determined to be deceased. Observed deaths will be compared to expected deaths to uncover excess deaths due to a particular cause. Numerous indices of health will be assessed through the physical examinations and health questionnaires administered to the living members of the cohort. Further activities tentatively include environmental exposure and medical assessments of workers entering the industry.
KEYWORDS: MORBIDITY;OCCUPATIONAL HEALTH;OIL SHALE INDUSTRY;PERSONNEL;MORTALITY;STATISTICS;HEALTH HAZARDS;CHEMICAL EFFLUENTS;MEDICAL SURVEILLANCE

<032016>
TITLE: Development of Countermeasures to Protect Divers
PROJECT NUMBER: E773-CZ-3
PRINCIPAL INVESTIGATOR: Costello, J.
ADDRESS: NIOSH, Div. of Respiratory Disease Studies, Morgantown, WV 26505
AFFILIATION: National Inst. for Occupational Safety and Health, Morgantown, W.Va. (USA). Appalachian Lab. for Occupational Safety and Health
MONITORING AGENCY: Public Health Service, Washington, D.C. (USA)
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Marine;HYDROGRAPHIC AREAS/Other hydrographic areas Ocean floor
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: While hyperbaric medical research has a history of over 100 years, the recent global energy crisis has added a note of urgency to the need for further research. Since 1954, ten million acres of sea floor have been leased for fossil fuel exploration. Plans are now under way to lease an equivalent amount of acreage in the next 1-3 years. Not only will such plans require a very large increase in the number of divers but the depths of planned leased areas are approaching 2000 feet. The capability to operate safely at such depths exceeds our medical knowledge and at the same time requires the presence of divers to execute tasks which are essential to the recovery of fossil fuels and minerals located on and

beneath the sea floor. Energy-related development of deep-water (super tanker) ports and offshore power plants will also require the extensive use of divers. Other nations have already recognized the need for identifying national priorities, and regulations are currently in effect in the United Kingdom, Australia, and Japan. It is clear that the expanding Federal sea floor leasing program obligates the government to protect the health and safety of divers to the same extent as workers in other occupations. Extensive discussions and communication with representatives of the major diving companies have revealed their interest in cooperating with NIOSH in solving the problems facing the
KEYWORDS: DIVERS;OCCUPATIONAL HEALTH;OCEAN FLOOR;FOSSIL FUELS;UNDERWATER;EXPLORATION;DIVING OPERATIONS;HEALTH HAZARDS;ENERGY;OCCUPATIONAL DISEASES;HEART;LUNGS;OFFSHORE NUCLEAR POWER PLANTS;RECOVERY;UNDERGROUND MINING;PETROLEUM;DEEP WATER OIL TERMINALS;PERSONNEL;PETROLEUM INDUSTRY

<032017>
TITLE: Enumeration of Energy Occupational Health Problems
PROJECT NUMBER: E773-CX-1
PRINCIPAL INVESTIGATOR: Knowles, D.
ADDRESS: NIOSH, Div. of Respiratory Disease Studies, Morgantown, WV 26505
AFFILIATION: National Inst. for Occupational Safety and Health, Morgantown, W.Va. (USA). Appalachian Lab. for Occupational Safety and Health
MONITORING AGENCY: Public Health Service, Washington, D.C. (USA)
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil and Gas (25%);FOSSIL FUEL/Oil Shale (10%);HYDROELECTRIC (5%);GEOTHERMAL/General (10%);SOLAR/General (10%);CONSERVATION/General (10%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The Western Area Occupational Health Laboratory is responsible for developing and maintaining a program designed to identify occupational health problems associated with the extraction, processing, utilization, and conservation of energy resources. This project is to provide technical support necessary to identify and define future NIOSH project areas related to energy. There will be interaction with other NIOSH scientists and scientists in other federal agencies and other institutions associated with energy production. Limited exploratory field investigations will be conducted to evaluate current and proposed processes, potential worker exposures, and availability of records and study populations.
KEYWORDS: OCCUPATIONAL SAFETY;DATA BANK;HEALTH HAZARDS;PERSONNEL;OIL SHALE INDUSTRY;COAL INDUSTRY;OCCUPATIONS;ENERGY SOURCES

Department of Health, Education and Welfare/National Institute of Environmental Health Sciences

<033001>
TITLE: Analysis of Mechanisms of Experimental Emphysema
PROJECT NUMBER: R01 ES00264
PRINCIPAL INVESTIGATOR: Kleinerman, J.I.
ADDRESS: 11311 Shaker Blvd., Cleveland, OH 44104
AFFILIATION: Saint Luke's Hospital of the Methodist Church, Cleveland, Ohio (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00264
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$54,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this research proposal is to evaluate the existing experimental animal models of pulmonary emphysema with respect to the hypothesis of proteolytic antiproteolytic imbalance as the mechanism for production of pulmonary tissue destruction and emphysema. The papain model will be analyzed by first developing a dose-response relationship. The amount of papain delivered will be quantitated by radioactivity labeling the papain molecule. The amount delivered to the lung will be related to the extent of tissue destruction measured by use of quantitative morphometry. This will be done by application of certain principles of Weibel and the use of the semi-automated image analyzing techniques. The effects of variation in dosage of papain controlled by titration of its ''active site'' for proteolysis alteration of its molecular conformation and variation in activity dependent upon complexing with inhibitor substances from serum, from plant or other sources will be evaluated for their potential in producing quantitatively determined emphysema. Elastase will be similarly studied. The combined effects of prolonged nitrogen dioxide (NO/sub 2/) inhalation and papain aerosol exposures will be studied in cats, and physiologic tests performed in an attempt to separate the components which contribute to the physiologically determined airways obstruction. The (NO/sub 2/) induced lesion will be
KEYWORDS: RESPIRATORY SYSTEM DISEASES;PHYSIOLOGY;BIOLOGICAL MODELS;DOSE-RESPONSE RELATIONSHIPS;PAPAIN;NITROGEN DIOXIDE;BIOLOGICAL EFFECTS;BIOCHEMISTRY;INHALATION;LUNGS;PATHOGENESIS;TOXICITY

<033002>
TITLE: Quantitative Genetic Study of Environmental Mutagens
PROJECT NUMBER: R01 ES00320
PRINCIPAL INVESTIGATOR: Lee, W.R.
ADDRESS: Department of Zoology and Physiology, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA). Dept. of Zoology and Physiology
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00320
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$73,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (75%);DEVELOPMENT (25%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To evaluate the genetic hazard of chemicals in our environment and understand their mode of action, it is necessary to place chemical mutagenesis on a quantitative basis in an eukaryote organism that can be thoroughly and economically analyzed genetically. Ethyl methanesulfonate (EMS) was selected as the mutagen for developing a model test system because of its known mutagenic effectiveness and its simple chemical structure which makes it relatively easy to synthesize with radionuclides having high specific activity. The mutagenic action of EMS is considered due to its alkylation of DNA, a point of view supported by previous work on this project using Drosophila in a bioassay of blood plasma from hamsters that had been previously injected with EMS. To place the dosage of EMS on a quantitative basis, total alkylation of DNA in Drosophila melanogaster spermatozoa is measured on a per sperm cell basis and then further divided into alkylation at specific sites such as the 7 position guanine. This dosimetry will then permit the construction of dosage response curves with the dose in terms of alkylation and the response in terms of the extensive mutational spectrum developed with Drosophila. This project differs from previous work with alkylation in that we are studying both alkylation and the genetic consequence within the same germinal tissue of an eukaryote. Results of these tests would
KEYWORDS: MUTAGENS;GENETICS;MUTAGENESIS;EMS;RADIOISOTOPES;SYNTHESIS;DNA;BIOASSAY;BLOOD PLASMA;HAMSTERS;DROSOPHILA;MUTATIONS;ALKYLATION;ALKYLATING AGENTS;HAZARDS;BIOCHEMISTRY;PATHOGENESIS;DOSE-RESPONSE RELATIONSHIPS

<033003>
TITLE: Benzene Toxicity and Metabolism
PROJECT NUMBER: R01 ES00322
PRINCIPAL INVESTIGATOR: Snyder, R.
ADDRESS: 1020 Locust Street, Philadelphia, PA 19107
AFFILIATION: Thomas Jefferson Univ., Philadelphia, Pa. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00322
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS/Benzene (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is our aim to study the biochemical events that lead to the functional and morphological changes characteristic of benzene toxicity and to determine how benzene toxicity might be prevented or alleviated. We will study the metabolic pathway of C-14-benzene in vitro and in vivo and quantitate the metabolites produced, locate them in the animal, and determine to what extent the metabolites are responsible for toxicity. The biochemical studies will be correlated with evaluations of bone marrow function both before and during the appearance of bone marrow disfunction. Erythrocyte and white cell counts, total counts and differential counting of white blood cells will be done as well as reticulocyte counts, Fe-59 uptakes into marrow and circulating RBC's and serum Fe determinations as parameters for monitoring benzene toxicity. At the earliest stage of toxicity we intend to look for interaction between benzene and/or its metabolites with nucleic acids. We will attempt to prevent benzene toxicity by inhibiting its metabolism and will study the role of nutrition in resistance to benzene toxicity.
KEYWORDS: BENZENE;TOXICITY;METABOLISM;BONE MARROW;PHYSIOLOGY;NUTRITION;BLOOD;IN VITRO;IN VIVO;PATHOGENESIS

<033006>
TITLE: Enzymatic Oxygen Fixation into Aromatic Hydrocarbons
PROJECT NUMBER: R01 ES00537
PRINCIPAL INVESTIGATOR: Gibson, D.T.
ADDRESS: Department of Microbiology, Austin, TX 78712
AFFILIATION: Texas Univ., Austin (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00537
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$72,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Aromatic hydrocarbons constitute a major source of raw material for the production of fuels, industrial solvents, drugs, herbicides, pesticides and plasticisers. The parent hydrocarbons are toxic to most forms of life. In several cases it is known that oxygenated products formed enzymatically

from the aromatic hydrocarbon are more harmful than the unsubstituted substrate. Little evidence is available that describes the enzymatic reactions involved in such transformations. The objectives of this research project are to elucidate the mechanisms of oxygen fixation into aromatic hydrocarbons and to define some parameters of biodegradability that relate to the effects of substituents on the benzene nucleus. Pseudomonas putida grows on toluene as sole source of carbon. The enzyme catalyzing the initial oxidation of toluene incorporates two atoms of molecular oxygen into the substrate with the formation of cis-2,3-dihydroxy-1-methylcyclohexa-4,6-diene. This reaction will be investigated in two ways: (1) The enzyme will be purified and the mechansims of substrate-oxygen-enzyme interaction determined. Techniques to be used include salt and solvent fractionation, column chromatography, electrophoresis, electron spin resonance, and spectrophotometry. (2) The enzyme is known to oxidize azulene, a model substrate in which electron densities at different positions of the ring are known. Identification
KEYWORDS: HYDROCARBONS;AROMATICS;ENZYMES;FUELS;PESTICIDES;TOXICITY;OXYGEN;CHEMICAL REACTIONS;BIODEGRADATION;PSEUDOMONAS;TOLUENE;OXIDATION;AZULENE;SPECTROPHOTOMETRY;MASS SPECTROMETERS;NAPHTHALENE;METABOLISM;BIOCHEMISTRY;ECOSYSTEMS;OXIDATION;SOILS;TOXINS

<033007>
TITLE: Response of Alveolar Macrophages to Inhaled Particles
PROJECT NUMBER: R01 ES00583
PRINCIPAL INVESTIGATOR: Brain, J.D.
ADDRESS: 665 Huntington Avenue, Boston, MA 02115
AFFILIATION: Harvard Univ., Boston, Mass. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00583
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$99,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our overall objective is to understand better how the lung responds to inhaled particles. Since clearance of particles and pathogens from the non-ciliated parenchyma of the lungs is the primary function of the alveolar macrophages and since their migratory pathways and behavior may be pivotal events in the pathogenesis of pulmonary disease, we plan to focus our attention on these cells. This investigation has three distinct purposes: We propose (1) to investigate the origin and differentiation of alveolar macrophages. Using the techniques of histochemistry, autoradiography, and organ culture, we hope to trace the movement of macrophages into and/or through the interstitium and to document their differentiation. We also plan (2) to investigate the consequences of particle ingestion by alveolar macrophages. Whether particle ingestion leads to activation of hydrolytic enzymes and to extracellular enzyme release will be investigated as will the migratory behavior of particle-containing macrophages. Finally, we plan (3) to investigate the importance of competitive phenomena following particle challenge using both in vivo and in vitro test systems. Since inhalation is the primary entry route for agents that cause environmental, occupational, and infectious diseases, it is of clear importance to clarify the roles of the macrophages in alveolar defense and identify environmental and
KEYWORDS: MACROPHAGES;LUNGS;PARTICLES;INHALATION;PATHOGENESIS;CELL DIFFERENTIATION;HAZARDS;AEROSOLS;AIR;CHEMICAL EFFLUENTS;IN VITRO;IN VIVO;RESPIRATION;TOXICITY

<033008>
TITLE: Perceived Intensity of Odorants and Irritants
PROJECT NUMBER: R01 ES00592
PRINCIPAL INVESTIGATOR: Cain, W.S.
ADDRESS: 290 Congress Avenue, New Haven, CT 06519
AFFILIATION: John B. Pierce Foundation of Connecticut, Inc., New Haven (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00592
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$75,100
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION IN SITU (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The project concerns the perception of odor intensity. It seeks primarily to specify how odor intensity, and in particular the psychophysical function that relates perceived intensity to concentration, depends upon the physicochemical nature of odorous stimuli and upon various conditions of odor masking and adaptation. The odor stimuli will include odorous pollutants, irritants, and masking agents. Psychophysical procedures to be used are ratio scaling methods such as magnitude estimation (assignment of numbers to reflect ratio relations among perceived magnitudes), magnitude production, and cross-modality matching. Particular experiments aim: (1) to obtain psychophysical functions for various odorous substances and to relate the parameters (e.g., growth rate) of the functions to the physicochemical properties and perceived qualities of the substances; (2) to study observers who lack common chemical sensitivity in one nasal passage in order to isolate thereby the contribution of trigeminal stimulation to overall odor intensity; (3) to formulate a quantitative description of how various masking odors modify the psychophysical function; to specify in particular the masking ability of ozone; (4) to determine how adaptation alters the psychophysical function; to specify the trading relation between intensity and duration of adapting stimuli; and to test further an hypothesis that
KEYWORDS: ODOR;BIOLOGICAL ADAPTATION;OLFACTORY BULBS;PHYSIOLOGY;MAN;AIR;GASEOUS WASTES;WATER

<033009>
TITLE: Distribution and Fate of Inhaled Sulfur Dioxide
PROJECT NUMBER: R01 ES00613
PRINCIPAL INVESTIGATOR: Gunnison, A.F.
ADDRESS: 550 First Avenue, Room 559, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00613
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$96,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Inhaled sulfur dioxide as well as injected or ingested sulfite reacts with certain disulfides in mammalian plasma cleaving S-S bonds and producing S-sulfonate groups. The kinetics of the formation and clearance of plasma S-sulfonate in laboratory primate species will be studied and compared with similar studies on rabbits, mice, and rats. A major aim of the proposed research is to elucidate the mechanism of clearance of protein S-sulfonate from the plasma, especially with regard to the function of diffusible thiol groups. The importance of cysteine S-sulfonate in plasma S-sulfonate clearance and the potential of this system (cysteine + protein S-sulfonate reversible cysteine S-sulfonate) for functional sulfite transport to tissues outside of the blood stream will be investigated by various techniques including the use of S-35 tracer. Identification of plasma proteins affected by in vivo sulfitolysis will be undertaken with the aid of S-35 O/sub 3//sup 2-/. The ultimate objective is the detection of toxic effects due to structural alteration of proteins and possible resultant functional changes. Sulfite oxidase, an enzyme which detoxifies sulfite by oxidation to sulfate, is especially rich in mammalian liver. This enzyme should play a major role in the determination of the availability of sulfite for reacting with disulfide bonds in plasma and other tissues. The correlation between
KEYWORDS: SULFUR DIOXIDE;INHALATION;SULFITES;SULFONATES;BLOOD-PLASMA CLEARANCE;PRIMATES;RABBITS;MICE;RATS;PROTEINS;THIOLS;CYSTEINE;SULFUR 35;TRACER TECHNIQUES;TOXICITY;OXIDASES;OXIDATION;METABOLISM;AIR;LUNGS

<033010>
TITLE: Morphobiochemical Study of Mercury Encephalopathy
PROJECT NUMBER: R01 ES00625
PRINCIPAL INVESTIGATOR: Verity, A.
ADDRESS: Department of Pathology, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00625
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The use of organic mercurial compounds in industry and agriculture has increased the possibility of human toxicity. The primary aim of our research program in this renewal application is the elucidation of the molecular biochemical defect(s) and accompanying changes in morphology occurring in the central nervous system after experimental intoxication with organic mercurial compounds. Our earlier studies have revealed a progressive inhibition of protein synthesis in brain slices and subcellular (synaptosome) fractions isolated from the cerebellum of animals showing early mercurial intoxication. The earliest proximate effect of methyl mercury on synaptosome protein synthesis in vitro seems coupled to the inner mitochondrial membrane where methyl mercury promotes rapid cation translocation with accompanying stimulation of respiration prior to inhibition of oxidative phosphorylation or electron transport. We propose to characterize the cation/anion translocation system across the energy conserving mitochondrial membrane by the use of ion sensitive electrodes, correlate changes in synaptosome respiration with protein synthesis as a function of ionic species, ionophoretic antibiotics, and inhibition of mitochondrial function, and evaluate the role of other partial reactions, including amino acid uptake and divalent cation (Ca/sup ++/) uptake in isolated synaptosome fractions as a function
KEYWORDS: MERCURY;ORGANIC MERCURY COMPOUNDS;INDUSTRY;AGRICULTURE;TOXICITY;MORPHOLOGICAL CHANGES;PROTEINS;BIOSYNTHESIS;BRAIN;METHYLMERCURY;MITOCHONDRIA;RESPIRATION;AMINO ACIDS;CEREBELLUM;ELECTRON MICROSCCPY;CENTRAL NERVOUS SYSTEM;BIOCHEMISTRY;IN VITRO;NEUROLOGY

<033012>
TITLE: Biochemical Effects of Ozone and NO/sub 2/ in the Lung
PROJECT NUMBER: R01 ES00673
PRINCIPAL INVESTIGATOR: Goldstein, B.D.
ADDRESS: 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISICN: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00673
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$38,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub 2/;NOXIOUS GAS/O/sub 3/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
JECT DESCRIPTION: This study will evaluate the effects of inhalation of the oxidant air pollutant ozone on rat and rabbit lung subcellular fractions utilizing a number of potentially sensitive parameters of toxicity. These parameters include: (1) lipid peroxidation; (2) microsomal cytochrome P-450 and benzpyrene hydroxylase levels; (3) protein sulfhydryl levels; (4) native protein fluorescence; and (5) response of 1-anilino-8-naphthalene sulfonic acid fluorescence to divalent cations. Additional studies will assess the biochemical basis for the observed effects and will evaluate the combined effect of ozone and nitrogen dioxide on these parameters. The experimental design will include dose response studies aimed at obtaining information of use in determining appropriate air quality standards for humans breathing these pollutants.
KEYWORDS: OZONE;NITROGEN
OXIDES;LUNGS;BIOCHEMISTRY;TOXICITY;RATS;RABBITS;LIPIDS;MICROSOMES;CYTOCHROMES;HYDROXYLASE;PROTEINS;FLUORES
ENCE;AIR POLLUTION;INHALATION;RESPIRATION;CHEMICAL EFFLUENTS

<033014>
TITLE: Methylmercury Embryopathy
PROJECT NUMBER: R01 ES00677
PRINCIPAL INVESTIGATOR: Mottet, N.K.
ADDRESS: School of Medicine, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). School of Medicine
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES00677
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$173,600
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: There is a progressive increase in the general background level of mercury in our North American environment. Inorganic mercury in the environment can be converted to organic mercurials in the biological food chain and accumulate in food stuffs, principally as methylmercury. Man may directly consume methylmercury as an occupational hazard or may indirectly acquire chronic intoxication as the final predator in the biological chain. Methylmercury in man, unlike inorganic and some other organic mercurials, widely distributed in body tissues, producing a different pattern of clinical findings than inorganic or elemental mercury. The cerebrum and cerebellum are principally altered. Methylmercury freely passes through the placental barrier of man and some experimental animals. In addition to the neurolysis seen in the adult, the fetal brain injury is diffuse. A generalized hypoplasia of the brain and other viscera is seen. Excessive defective mitoses and chromosome breakage has been found in human lymphocytes cultured from patients with methylmercury poisoning. Beyond this fragmentary evidence little is known about the teratogenic effects of mercury on the primate. The investigation is designed to uncover deleterious effects on the fetus at the level of human ''subclinical'' exposure as well as at higher dosage levels. The purpose of this experiment is to determine the threshold level of chronic exposure of
KEYWORDS: METHYLMERCURY;EMBRYOS;POLLUTION;FOOD CHAINS;HAZARDS;BIOLOGICAL
EFFECTS;BRAIN;LYMPHOCYTES;CHROMOSOMAL
ABERRATIONS;PRIMATES;TERATOGENESIS;NEUROLOGY;PATHOGENESIS;TOXICITY;BEHAVIOR;NERVOUS SYSTEM

<033015>
TITLE: Enzymatic Degradation of Aromatic Compounds
PROJECT NUMBER: R01 ES00678
PRINCIPAL INVESTIGATOR: Dagley, S.
ADDRESS: 140 Gortner Laboratory, St. Paul, MN 55101
AFFILIATION: Minnesota Univ., St. Paul (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES00678
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$55,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS/Various (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: We have identified all intermediates formed in the microbial degradation of catechols by meta-fission, and studies of the purified enzymes of this pathway will be continued. The evidence for two types of meta-pyrocatechase will be examined after screening soil organisms that contain the enzyme. Alkyl-substituted phenols were found to be metabolized through alkylgentisic acids by a sequence of reactions of probable general importance in the area of aromatic catabolism. These enzymes, some of which had not been previously reported, will also be purified and their modes of action studied. Methods of purification will involve column chromatography and preparative electrophoresis; and criteria of purity and data for molecular weight and subunit structure will be supplied by the analytical ultracentrifuge and gel electrophoresis. The enzymic degradation of halogen-substituted gentisates and phenylacetates will be studied with special attention to those enzymes that release halogens during the course of the reaction. The hydroxylation of p-hydroxyphenylacetic acid, which appears to involve an ''N.I.H. shift'' will be investigated. Studies of the enzymes that degrade tropic acid and tropine will be completed. We have isolated soil organisms that grow with biphenylmethane and other compounds containing two free benzene rings. We shall investigate the enzymology of the pathways used in
WORDS: AROMATICS;ENZYMES;BIODEGRADATION;PYROCATECHOL;MICROORGANISMS;PHENOLS;METABOLISM;MOLECULAR
WEIGHT;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;SOILS

<033018>
TITLE: Teratogenic Effects of Heavy Metals
PROJECT NUMBER: R01 ES00697
PRINCIPAL INVESTIGATOR: Ferm, V.H.
ADDRESS: Dartmouth Medical School, Hanover, NH 03755
AFFILIATION: Dartmouth Coll., Hanover, N.H. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00697
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$127,300
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Mercury;METALS/Lead;METALS/Cadmium;METALS/Arsenic;METALS/Indium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The central concern of this research program is the effect of biologically non-essential heavy metals on mammalian embryonic development. Certain of these metals (lead, cadmium, arsenic, indium) already are known to exert teratogenic effects on the developing hamster embryo when administered via the maternal system early in gestation. We plan to investigate further these effects by four different but complementary experimental approaches. First, in addition to supplementary studies on those heavy metals which we have previously shown to be teratogenic, we shall investigate the teratogenic potential of mercury compounds, including some commonly used pesticides which contain this metal. As part of this approach we shall also investigate the interaction of several heavy metal combinations (lead-mercury, cadmium-mercury, cadmium-arsenic) on the developing embryo. A second line of approach will be an attempt to detect by electron microscopy and related techniques small concentrations of teratogenic heavy metals within early placental and embryonic tissues. This approach will allow us to identify sites of localization as well as specific cytopathic effects of the heavy metals in these tissues. Thirdly, we shall make comparative studies on limb bud malformations induced by acetazolamide, an inhibitor of carbonic anhydrase, and certain heavy metals which may exert their teratogenic action by
KEYWORDS: DEVELOPMENT;METALS;EMBRYOS;LEAD;CADMIUM;ARSENIC;INDIUM;TERATOGENESIS;MAMMALS;HAMSTERS;MERCURY COMPOUNDS;ELECTRON MICROSCOPY;BIOLOGICAL EFFECTS;POLLUTION;ENZYMES;TOXICITY

<033021>
TITLE: Interaction of Air Pollutants With Liver Function
PROJECT NUMBER: R01 ES00711
PRINCIPAL INVESTIGATOR: Hitchcock, M.
ADDRESS: 290 Congress Avenue, New Haven, CT 06519
AFFILIATION: John B. Pierce Foundation of Connecticut, Inc., New Haven (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00711
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$33,800
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this study are to investigate the interaction of some important airborne environmental pollutants with selected areas of liver metabolism in different species of animals. The first pollutant to be studied will be carbon monoxide. The experiments will be designed to see whether inhaled carbon monoxide can affect the heme containing hepatic cytochrome P-450 and if so whether a correlation with blood COHb can be made. Consequent to an alteration in cytochrome P-450, an alteration in the activities of the cytochrome P-450 dependent microsomal enzymes can be expected. The effects of carbon monoxide will be compared to the effects of lowered blood pO/sub 2/ equivalent to that produced by CO. If changes following acute exposure to CO are observed, then experiments will be designed to study the effect of chronic exposure to see if adaptation takes place. Adaptation as demonstrated by an increase in blood hemoglobin and hematocrit will be expected and will be compared with cytochrome P-450 levels and microsomal activities. The development of a model system showing the interaction of inhaled CO with drug metabolism lends itself to a variety of physiologic conditions from which it can be studied. These may include the effects of exposure to CO under hypoxic conditions (altitude), exposure of the pregnant animal and the subsequent effect on the fetus, and exposure of the newborn.
KEYWORDS: CARBON MONOXIDE;BIOLOGICAL EFFECTS;LIVER;MAN;METABOLISM;CYTOCHROMES;HEMOGLOBIN;BIOLOGICAL ADAPTATION;AIR POLLUTION;BLOOD;ENZYMES;REPRODUCTION;TOXICITY

<033026>
TITLE: Chemical Behavior of Organomercury Compounds
PROJECT NUMBER: R01 ES00761
PRINCIPAL INVESTIGATOR: Bach, R.D.
ADDRESS: 363 Life Science, Detroit, MI 48202
AFFILIATION: Wayne State Univ., Detroit, Mich. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00761
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,300
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS

PROJECT DESCRIPTION: This investigation is principally aimed at studying the exchange reactions of organomercurials. Particular emphasis will be placed upon methylmercury compounds that are bonded to sulfur. The relative rate of alkyl and ligand exchange for R-Hg-SR derivatives will be studied. The study will be extended to include biologically important compounds that contain the -SH and -S-S- functional groups. The mode of reaction of these compounds with RHgX and HgX/sub 2/ will be studied. The relative reactivity of CH/sub 3/Hg/sup +/ to a series of ligands containing /sup -/CR/sub 3/, /sup -/NR/sub 2/, /sup -/OR and /sup -/SR will be determined by nmr and chromatography techniques. The experimental data will te supplemented by theoretical calculations. We will also continue our studies on the cleavage reactions of the C-Hg bond. Our conclusions will be related to the existing ecological problems associated with mercury contamination of the environment.
KEYWORDS: BIOTRANSFORMATION;ORGANIC MERCURY COMPOUNDS;METHYLMERCURY;SULFUR;LIGANDS;BIOCHEMICAL REACTION KINETICS;POLLUTION;ENVIRONMENTAL EFFECTS;ECOSYSTEMS

<033028>
TITLE: Metabolism and Biochemical Actions of Cadmium
PROJECT NUMBER: R01 ES00777
PRINCIPAL INVESTIGATOR: Cousins, R.J.
ADDRESS: Bartlett Hall, Lipman Drive, New Brunswick, NJ 08903
AFFILIATION: Rutgers--the State Univ., New Brunswick, N.J. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00777
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$60,400
TECHNOLOGY: FOSSIL FUEL/General (65%);GEOTHERMAL/General (25%);SOLAR/General (10%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS/Cadmium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The relationship of graded, dietary cadmium intake levels to biochemical parameters associated with cadmium toxicity will be determined in rats and chicks. Cadmium uptake, calcium, copper and zinc concentration changes and enzyme activities will be investigated as a function of dose level in numerous tissues and will be correlated to the degree of toxicity. The mechanisms and factors influencing the synthesis of cadmium binding protein in liver and kidney will be investigated in detail. The mechanisms and factors involved in intestinal cadmium absorption will be studied, in vivo. The influence of calcium and vitamin D at various dietary intake levels will be investigated. The functional significance of cadmium binding to intestinal mucosal cell proteins will be investigated as well. The effect of cadmium on calcium and bone metabolism will be extensively investigated. The intestinal absorption of calcium will be investigated with in situ duodenal loops. The influence of cadmium on the renal mitochondrial enzyme 25-hydroxycholecalciferol-1-hydroxylase and 1.25-dihydroxycholecalciferol synthesis will be extensively investigated.
KEYWORDS:
CADMIUM;METABOLISM;TOXICITY;INGESTION;CALCIUM;COPPER;ZINC;RATS;CHICKENS;PROTEINS;BIOSYNTHESIS;LIVER;KIDNEY;INTESTINAL ABSORPTION;VITAMIN D;BONE TISSUES;MITOCHONDRIA;HYDROXYLASE;ENZYMES;HORMONES

<033029>
TITLE: Toxicity of Organic Fluoro Compounds, Fluoroacetate
PROJECT NUMBER: R01 ES00779
PRINCIPAL INVESTIGATOR: Smith, F.A.
ADDRESS: Department of Radiation Biology and Biophysics, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA). Dept. of Radiation Biology and Biophysics
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00779
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$49,200
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Fluoro compounds (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The proposed research is intended to investigate the in vivo stability of the carbon-fluorine bond as it occurs in various organic fluoro compounds. Initial emphasis will be placed on a study of aliphatic fluoro compounds, using fluoroacetate as the prototype. The extent to which fluoroacetate given in the drinking water is defluorinated by rats will be assayed by measuring the uptake by the bone of the released fluoride. The question of whether this defluorination, which our pilot experiments have shown does occur, takes place through the agency of microsomal enzymes or through enzymes of the intestinal flora, will be explored. The distribution of fluoride between organic and inorganic forms in the bone, blood and urine will be investigated, making use of gas chromatographic analyses and the fluoride ion-specific electrode. Finally, the course of development of the biochemical and morphological effects of fluoroacetate on the testes and the kidney will be determined, as will also the course of recovery from these effects.
KEYWORDS: ORGANIC FLUORINE COMPOUNDS;ACETATES;RATS;BONDING;CARBON;FLUORINE;ENZYMES;MICROSOMES;BONE TISSUES;BLOOD;URINE;TISSUE DISTRIBUTION;STABILITY;TOXICITY;BIOCHEMISTRY;KIDNEYS;PATHOGENESIS;TESTES

<033032>
TLE: Can Vitamin E or Lipid Alter NO/sub 2/ or NO/sub 3/ Toxicity in Lung
OJECT NUMBER: R01 ES00798
RINCIPAL INVESTIGATOR: Menzel, D.B.
ADDRESS: Department of Physiology and Pharmacology, Durham, NC 27710
AFFILIATION: Duke Univ., Durham, N.C. (USA). Medical Center
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.

TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00798;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$59,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Vitamin E appears to protect the rat from NO/sub 2/ and O/sub 3/. Exposure to these oxidant gases probably results in the oxidation of lung polyunsaturate fatty acids (PUFA), in the same manner as found in thin films or emulsions of PUFA. Phenolic antioxidants such as vitamin E retard this reaction in vitro. The more unsaturated the PUFA the more readily it is oxidized. Can dietary alterations of the lung PUFA or lipid antioxidants (vitamin E or synthetic phenolic antioxidants) ameliorate or enhance the deliterious effects of oxidant gases. Based upon experiments in rats, a second species, mice will be fed chemically defined diets that either increase or decrease the ease of oxidation of the lung lipids. Vitamin E will be absent, present at vitamin levels or present at pharmacological levels. The survival, morphological and biochemical alterations of lung on oxidant exposure will be determined to establish if oxidant gases degrade the lung by fatty acid oxidation. The rate of metabolism of vitamin E in the lung, and by autoradiography in endothelial and epithelial cells of the lung, will be assessed to determine if lack of cellular vitamin E results in the susceptibility of lung endothelial cells over epithelial cells. These two cell types will also be selectively removed, and analyzed for lipid contents to determine their relative ease of oxidation. The role of oxidant exposure and
KEYWORDS: NITROGEN OXIDES;TOXICITY;LUNGS;OZONE;VITAMIN E;CARBOXYLIC ACIDS;LIPIDS;BIOCHEMISTRY;METABOLISM;EPITHELIUM;OXIDATION;BIOLOGICAL EFFECTS;RATS;AIR;DISEASES;PATHOGENESIS

<033033>
TITLE: Induction of Metallothionein by Cadmium, Copper, and Mercury
PROJECT NUMBER: R01 ES00802
PRINCIPAL INVESTIGATOR: Bryan, S.E.
ADDRESS: Department of Biological Sciences, New Orleans, LA 70122
AFFILIATION: New Orleans Univ., La. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00802
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$76,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS/Cadmium;METALS/Copper;METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Metals can produce varied effects on biochemical processes and it now appears that induction of (metal binding) proteins should be included among the diversity of responses multivalent metal ions elicit in biochemical systems. The induction of a great many proteins (enzymes) has been studied, yet the mechanisms by which this phenomenon is produced in mammalian systems remain obscure. The proposed study is designed to further ellucidate the induction process initiated by cadmium, copper and mercury (known to bind to metallothionein) and to characterize the proteins induced in response to high levels of the respective metals. Mice will be challenged with chloride salts of copper, cadmium and mercury in drinking water; at specific time intervals following ingestion of metals, tissues will be excised and analyzed by centrifugation, gel filtration, electrophoresis, liquid scintillation, immunological and tissue culture techniques. Highly purified metal binding proteins will be characterized by spectrophotometry, amino acid composition, molecular weight analysis, metal analysis, electrophoretic properties and other parameters. In addition, the mechanism of induction will be explored by analysis of chromosomal material and tissue culture experiments. Hopefully, the study should give insight into molecular events which determine biological tolerance as opposed to toxicity and should contribute to our understanding of the regulation of specific gene expression.
KEYWORDS: METALS;IONS;PROTEINS;BONDING;CADMIUM;COPPER;MERCURY;BIOCHEMICAL REACTION KINETICS;ENZYMES;DRINKING WATER;CENTRIFUGATION;MICE;TISSUES;CHEMICAL ANALYSIS;SPECTROPHOTOMETRY;CHROMOSOMES;TOXICITY

<033034>
TITLE: Selenium Toxicity: Role of Methionyl-tRNA Synthetases
PROJECT NUMBER: R01 ES00807
PRINCIPAL INVESTIGATOR: Shrift, A.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00807
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$60,700
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Selenium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Because a selenium-accumulating plant, Neptunia amplexicaulis, excludes selenium from its proteins, it has been suggested that altered aminoacyl-tRNA synthetases from accumulators are unable to utilize the selenium analogs of the normal substrates, methionine and cysteine. Therefore, to test this hypothesis, plant species (mainly from the genus Astragalus) known to accumulate selenium from seleniferous soils will be treated with 75-Se-labeled selenium compounds and examined to see if they also exclude selenium from their proteins. Methionyl-tRNA synthetases will be isolated and purified from accumulator species and from related species that not only are unable to accumulate the element but are inhibited by traces of selenium compounds. Methionine and selenium methionine will be tested to determine if methionyl-tRNA synthetases from accumulator species differ in their substrate specificities from those

of nonaccumulator species. To characterize the synthetases from the two types of plants, K/sub m/, K/sub i/, and V/sub max/ values will be calculated from Michaelis-Menten kinetic data. Heat stabilities will be studied as well as the influence of substrate and analog on heat inactivation of the synthetases.
KEYWORDS: SELENIUM;TOXICITY;LIGASES;PLANTS;PROTEINS;RNA;METHIONINE;CYSTEINE;SOILS;SELENIUM 75;TRACER TECHNIQUES;METABOLISM;BIOCHEMISTRY;ENZYMES

<033035>
TITLE: Toxicology of Organic Mercury for the Fetus and Newborn
PROJECT NUMBER: R01 ES00820
PRINCIPAL INVESTIGATOR: Reynolds, W.A.
ADDRESS: 1853 West Polk Street, Chicago, IL 60612
AFFILIATION: Illinois Univ., Chicago (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00820
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$99,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Increasing levels of organic mercury in the environment, and consequently in food, could be approaching hazardous levels for human beings in certain locations, especially during fetal life or infancy, since mercury apparently interferes with normal differentiation of the central nervous system. Body burdens of mercury will be estimated from mercury determinations performed on fluid and tissue samples derived from human fetuses, newborns, and mothers. Organic mercury will be measured by means of gas chromatography and total mercury by atomic absorption spectrophotometry during chronic and acute administration of methylmercury. The macaque pregnancy will be used as a model system in which to determine neurotoxic levels and the extent of tissue retention of mercury for the fetus and neonate. Possible pathological effects of mercury upon maturation of the cerebellum and cerebrum will receive close attention. The half-life of methylmercury-203 will be measured in the adult, the fetal and infant monkey. The extent of transmission of methylmercury-203 from mother to fetus via the placenta and from mother to infant monkey by means of suckling will be assayed. Finally, behavioral development of infant monkeys exposed to the methylmercury in utero or during lactation will be assessed.
KEYWORDS: FETUSES;NEONATES;ORGANIC MERCURY COMPOUNDS;FOOD;HAZARDS;CENTRAL NERVOUS SYSTEM;CHEMICAL ANALYSIS;MACACUS;MERCURY 203;METHYLMERCURY;PLACENTA;TOXICITY;POLLUTION;PATHOGENESIS;DISEASES;INGESTION;MEDICINE

<033036>
TITLE: Heavy Metals and the Developing Nephron
PROJECT NUMBER: R01 ES00822
PRINCIPAL INVESTIGATOR: Worthen, H.G.
ADDRESS: Department of Pediatrics, 5323 Harry Hines Blvd., Dallas, TX 75235
AFFILIATION: Texas Univ., Dallas (USA). Southwestern Medical School
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00822
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$29,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The effect of the nephrotoxic metals cadmium, uranium, lead, copper and mercury, on the immature kidney will be evaluated by administering each metal to rats and rabbits at various ages beginning in the newborn period, and analyzing the functional effects and the changes in the enzyme distribution and content and the morphology of the nephron using tubules isolated by microdissection after collagenase treatment. The studies will used to compare the effects of each metal on the immature and mature nephron to determine whether the developing nephron is more susceptible than the mature nephron and to correlate such susceptibility with alterations in enzyme activity and morphology of the proximal tubule. The expected higher susceptibility of the immature nephron may allow detection of an effect of heavy metals which would be missed in the mature animal. The location of enzymes along the proximal tubule will be determined by histochemical staining reactions of dissected nephrons. This should make it possitle to detect both changes in the site or relative concentration of enzymes in various portions of the proximal tubule. The qualitative histochemical changes will be corroborated by quantitative biochemical analysis of both dissected nephrons and homogenates of renal cortex. Electron microscopy will be used to detect structural alterations of the proximal tubule cell produced by each
KEYWORDS: CADMIUM;URANIUM;LEAD;COPPER;MERCURY;RATS;RABBITS;KIDNEYS;AGE GROUPS;BIOLOGICAL EFFECTS;ENZYMES;ELECTRON MICROSCOPY;TOXICITY;GROWTH;DISEASES

<033038>
TITLE: Factor Affecting Irritant Potency of Gases and Aerosols
PROJECT NUMBER: R01 ES00827
PRINCIPAL INVESTIGATOR: Amdur, M.O.
ADDRESS: 665 Huntington Avenue, Boston, MA 02115
AFFILIATION: Harvard Univ., Boston, Mass. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00827;EPA pass-thru funding

77 FUNDING: Environmental Protection Agency FY77:$77,900
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide/sub 2/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The work proposed is part of a long-term program of study of the irritant potency of compounds of interest as contaminants of urban and industrial environments. The unifying thread of the program has been, and will continue to be, the correlation of physical or chemical factors of the exposure environment with observed biological response. Priority is given to two general areas: the effect of particle size on the irritant potency of aerosols and the possible potentiation of irritant gases by aerosols. The biological assay method used is the measurement of the mechanics of respiration of unanesthetized guinea pigs before, during and after exposure to the material or materials being studied. For a certain group of irritants, including sulfur dioxide and sulfuric acid, the increase in flow-resistance is the most sensitive criterion of response and can be related to the concentration of irritant present. Specific areas of investigation will include biological and chemical studies of the conversion of sulfur dioxide to sulfuric acid by oxidizing aerosols and studies of the joint toxic action of sulfur dioxide and sulfuric acid for a range of particle sizes of sulfuric acid. Plans are also being made to study nitrogen dioxide alone and in combination with aerosols and in combination with sulfur dioxide.
KEYWORDS: GASES;AEROSOLS;URBAN AREAS;INDUSTRY;POLLUTION;AEROSOLS;PARTICLE SIZE;BIOASSAY;RESPIRATION;GUINEA PIGS;SULFUR DIOXIDE;SULFURIC ACID;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;AIR;OXIDATION

<033039>
TITLE: ''Metallothionein'' in Physiology and Toxicology
PROJECT NUMBER: R01 ES00830
PRINCIPAL INVESTIGATOR: Coleman, R.L.
ADDRESS: P.O. Box 26901, Oklahoma City, OK 73190
AFFILIATION: Oklahoma Univ., Oklahoma City (USA). Health Sciences Center
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00830
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$48,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This research is planned to study the metabolic interrelationships between three toxic environmental pollutants: cadmium, mercury and lead, along with two essential trace metals, zinc and copper. In the organism all five trace metals are bound to metallothionein, which in turn is synthesized in specific response to cadmium challenge. It is proposed to elucidate the physiological role of this protein; primarily, emphasis will be given to investigate the probable role of metallothionein in the detoxification of cadmium, mercury and lead. Exposure to cadmium is suspected of causing hypertension. The validity of this concept will be tested in animals as well as in human subjects.
KEYWORDS:
CADMIUM;MERCURY;LEAD;METABOLISM;PROTEINS;ANIMALS;MAN;ZINC;COPPER;BIOCHEMISTRY;DISEASES;PATHOGENESIS;TOXICITY

<033040>
TITLE: Rapid Screening for Lead Poisoning
PROJECT NUMBER: R01 ES01825
PRINCIPAL INVESTIGATOR: Colbert, C.
ADDRESS: 1411 N. Monroe Drive, Dayton, OH 45431
AFFILIATION: Green Memorial Hospital, Xenia, Ohio (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: B-R01 ES01825
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$55,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: While the causes and cure of lead poisoning are well known, early detection before effects become irreversible remains one of two major stumbling blocks to eradication of this environmental disease. Diagnostic tests so far devised have limitations and there is need for a practical, reliable and definitive test. We propose to determine whether our quantitative computer/scanner system for rapid screening of radiographs can effectively detect lead poisoning in its early stages. We also intend to evaluate the usefulness of our system in measuring the extraction of lead from bones during treatment. Because of our capability for objective measurement we should be able to detect lead deposits in bones even when they are not visible in radiographs. Our computerized system is wholly independent of subjective visual evidence and largely independent of film taking and processing variables, thus overcoming the drawbacks of traditional radiographic screening methods. We intend to analyze some 300 radiographs of known lead-poisoning cases by two of our standard methods for determining skeletal status: (1) measurement of radiographic bone size, weight and density combined with comparison of findings to normal values; (2) line-scanning of selected bones to establish a mineral distribution profile which may pinpoint dense deposits in growing ends of bones. If, as we expect, definitive patterns
KEYWORDS: LEAD;TOXICITY;COMPUTERS;BONE TISSUES;DIAGNOSTIC TECHNIQUES;BIOMEDICAL RADIOGRAPHY;SKELETAL DISEASES;COMPUTER CODES;EPIDEMIOLOGY

<033050>
TITLE: Respiratory Tract Irritants: Desensitization
JECT NUMBER: R01 ES00872
NCIPAL INVESTIGATOR: Alarie, Y.C.
ADDRESS: Graduate School of Public Health, 130 DeSoto Street, Pittsburgh, PA 15213
AFFILIATION: Pittsburgh Univ., Pa. (USA). Graduate School of Public Health
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00872
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$42,200
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Further development of a technique to evaluate sensory irritation of the upper respiratory tract by airborne chemicals encountered frequently in industrial situations. Quantitative evaluation of species sensitivity (mice, rats, guinea-pigs, rabbits) in short-term exposure with investigation of desensitization following sensory irritation by sulfur dioxide. Evaluation of the development of desensitization with repeated exposure to SO/sub 2/ at low concentrations over a prolonged time period.
KEYWORDS: SULFUR DIOXIDE;INHALATION;RESPIRATORY SYSTEM;INFLAMMATION;TISSUES;TIME DEPENDENCE;MICE;RATS;GUINEA PIGS;RABBITS;TOXICITY;RESPIRATORY SYSTEM DISEASES;PATHOGENESIS

<033051>
TITLE: Regional Deposition of Inhaled Particles in Man
PROJECT NUMBER: R01 ES00881
PRINCIPAL INVESTIGATOR: Lippmann, M.
ADDRESS: 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00881;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$74,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Various (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to provide detailed information on regional particle deposition in the human respiratory tract, and to determine the effects of particle size, respiratory parameters, route of entry, and constitutional variables on the deposition efficiency at the various deposition sites. Ferric oxide microspheres tagged with gamma-emitting isotopes will be inhaled by human adult volunteer normals. Measurements of particle retention in the head and thorax will be made immediately after the exposure, and also 24 hours later, using external collimated scintillation detectors within a low-background chamber. The initial activity in the thorax includes both tracheo-bronchial (T-B) and alvelor deposits, while the 24-hour measurement includes only alveolar. Thus, the inhaled aerosol can be divided into the following components: exhaled, head, T-B and alveolar. The intra-bronchial deposition patterns will be studied using gamma-tagged aerosols deposited in hollow bronchial casts, where deposition can be measured as a function of branching level, and in excised whole lungs, which will be dissected for determining the patterns of deposition within the airways. The correspondence of the cast and excised lung data to the in-vivo situation will be tested by performing cast and excised lung inhalations on specimens taken from donkeys whose in-vivo deposition patterns have previously been tested with the same inhaled aerosols.
KEYWORDS: AEROSOLS;BRONCHI;PATHOLOGICAL CHANGES;HEALTH HAZARDS;AIR POLLUTION;RESPIRATORY SYSTEM DISEASES;INHALATION;DEPOSITION;HEAD;CHEST;LUNGS;PHYSIOLOGY;DOMESTIC ANIMALS;MATHEMATICAL MODELS;FORECASTING;MAN;TOXICITY

<033056>
TITLE: Aqueous Solution Studies of Arsenates and Vanadates
PROJECT NUMBER: R01 ES00894
PRINCIPAL INVESTIGATOR: Rieger, P.H.
ADDRESS: Department of Chemistry, Providence, RI 02912
AFFILIATION: Brown Univ., Providence, R.I. (USA). Dept. of Chemistry
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00894
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$46,000
TECHNOLOGY: FOSSIL FUEL/General (75%);FOSSIL FUEL/Oil Shale (25%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: Arsenates and vanadates are poisons which are thought to operate in some instances by mimicking phosphate in biochemical processes. Arsenate has been extensively used to study the sequence of reactions in the process of oxidative phosphorylation, both to gain further insight into the normal mechanisms and to understand the means by which arsenates uncouple the process. Mechanistic models which have been proposed usually involve arsenate esters and arsenatophosphates, but there has been no chemical study of such species under conditions approaching a biological environment. We propose to study the rates

of hydrolysis of arsenate and vanadate esters and of condensed arsenates and vanadates and arsenatophosphates as well as the rates of oxygen exchange of arsenate and vanadate with water. We also plan to investigate the nature of phosphate-vanadate solutions to examine the possibility of vanadatophosphates. Because of the possible role of V(IV), we hope to characterize V(IV) species in neutral and basic solutions, and also to study V(IV,V) mixed valence species and V(IV)-phosphate species in solution. The results of these studies should be of fundamental importance to biochemists concerned with poisoning by arsenates and vanadates and with the mechanism of oxidative phosphorylation.
KEYWORDS: VANADATES;ARSENATES;HYDROLYSIS;OXYGEN;WATER;CHEMICAL REACTIONS;TOXICITY;PHOSPHORYLATION;AQUEOUS SOLUTIONS;BIOCHEMISTRY;DISEASES;PATHOGENESIS

<033060>
TITLE: Biochemical Effects of Air Pollutant Oxidants
PROJECT NUMBER: R01 ES00917
PRINCIPAL INVESTIGATOR: Mudd, J.B.
ADDRESS: Department of Biochemistry and Statewide Air Pollution Research Center, Riverside, CA 92502
AFFILIATION: California Univ., Riverside (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: P629-3350
TYPE OF FUNDING: Grant No.-R01 ES00917
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$41,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Ozone;NOXIOUS GAS/Peroxyacetyl nitrate (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global;COASTS/Other coasts Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The long-range objective of the proposed research is to elucidate the chemical basis for the toxicity of oxidant air pollutants, ozone and peroxyacetyl nitrate. The specific objectives in the case of ozone are to examine the reactions with glycerolipids which form biological membranes. These studies will be linked to experiments with artificial membranes and to studies of the capability of lungs to repair the damage done by ozone. Another objective will be to discover the effect of ozone on the proteolytic enzymes of lungs under the supposition that release of these enzymes from macrophage to the alveolar sacs may cause autolysis and eventually emphysema. Specific objectives for the study of peroxyacetyl nitrates includes assay of the reaction with sulfur containing amino acids, cysteine, cystine, and methionine both as free amino acids and in proteins. In addition, the basis for differences in toxicity of peroxyacetyl nitrate, peroxypropionyl nitrate, peroxybutyryl nitrate, and peroxybenzoyl nitrate will be studied from three viewpoints: half-life of the pollutants in aqueous environments, penetration of biological membranes, and reversal of toxicity by thioesterase action.
KEYWORDS: AIR POLLUTION;OZONE;NITRATES;TOXICITY;LIPIDS;MEMBRANES;LUNGS;ENZYMES;RESPIRATORY SYSTEM DISEASES;PROTEINS;INJURIES;AEROSOLS;BIOCHEMISTRY

<033063>
TITLE: Design and Development of Chelators for Lead and Mercury
PROJECT NUMBER: R01 ES00942
PRINCIPAL INVESTIGATOR: Roeske, R.W.
ADDRESS: 1100 W. Michigan Street, Indianapolis, IN 46202
AFFILIATION: Indiana Univ., Indianapolis (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: P629-3350
TYPE OF FUNDING: Grant No.-R01 ES00942
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$53,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The goal of the proposed research is to design and synthesize cyclic sulfur-containing compounds that will be chelating agents for lead and mercury ions. By model-building in a computer, derivatives of the enniatin antibiotics, of the ''crown ethers'' and of cyclohexaamylose will be examined for their ability to provide the geometry required of a lead and/or mercury chelator. The most promising compounds will be synthesized and tested for their ability to chelate lead and mercury and to remove these ions from biological tissues.
KEYWORDS: LEAD;MERCURY;SULFUR COMPOUNDS;SYNTHESIS;CHELATING AGENTS;ANTIBIOTICS;DECONTAMINATION;BIOCHEMISTRY;DISEASES;PATHOGENESIS;TOXICITY

<033064>
TITLE: Air Pollutant - Lipid Membrane Interactions
PROJECT NUMBER: R01 ES00944
PRINCIPAL INVESTIGATOR: Smith, L.L.
ADDRESS: University of Texas Medical Branch, Galveston, TX 77550
AFFILIATION: Texas Univ., Galveston (USA). Medical Branch
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward Jr.
TELEPHONE: P629-3350
TYPE OF FUNDING: Grant No.-R01 ES00944
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$47,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is proposed to determine whether certain common air pollutants, such as excited singlet molecular oxygen, be involved in the oxidation of membrane-bound cholesterol in select biological membranes and in model systems. Analysis of the cholesterol hydroperoxides initially formed in such systems upon exposure to the air pollutants can be used to determine whether excited singlet molecular oxygen or ground-state triplet oxygen are involved. The sterol hydroperoxides will be analyzed by means of thin-layer and gas chromatographic methods already developed and by gas chromatography-mass spectral methods to be developed during the study. The nature of the hydroperoxides formed will disclose the nature of the primary oxidant, certain cholesterol hydroperoxides being formed from excited singlet oxygen, certain other hydroperoxides being formed from ground-state oxygen in radical chain reactions. A fundamental study of membrane-bound cholesterol oxidation by other common air pollutants, including ozone, nitrogen dioxide, peroxy-acetyl nitrate, etc., as well as excited singlet oxygen and ground-state oxygen (for control comparisons) will be made. The thermal decomposition and enzymic alteration products of the sterol hydroperoxides will also be analyzed in order to identify the initially formed hydroperoxides with more certainty. Means of controlling or moderating cellular membrane damage from such oxidations will be sought using the fundamental analytical results obtained. Specific human tissues and cell lines most sensitive to air pollutant-moderated oxidations will be determined, and specific cause-and-effect relationships between the primary oxidative events and recognized human disorders will be sought after.
KEYWORDS: AIR POLLUTION;LIPIDS;MEMBRANES;OXYGEN;CHOLESTEROL;CHEMICAL ANALYSIS;CHROMATOGRAPHY;CHEMICAL REACTIONS;PEROXIDES;TISSUES;ANIMAL CELLS;POLLUTION;DISEASES;INHALATION;NITROGEN COMPOUNDS;PATHOGENESIS

<033065>
TITLE: Effect of Lead on the Developing Nervous System
PROJECT NUMBER: R01 ES01631
PRINCIPAL INVESTIGATOR: Chang, L.W.
ADDRESS: Department of Pathology, College of Medicine, Little Rock, AR 72201
AFFILIATION: Arkansas Univ., Little Rock (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01631
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$28,700
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Single (I.P. or S.C.) injections of lead salts, (acetate or nitrate), at dosage levels producing a LD50 response will be given pregnant mice at daily intervals from the 8th to 16th days of gestation. Chick embryos will be treated with predetermined sublethal doses at daily intervals from the 2nd to 8th days of incubation. The pathological effects of such treatment on the morphological development of vertebrate embryos will be investigated. Other avian and mammalian embryos will be exposed to previously determined teratogenic doses of lead and will receive concurrently doses of thymidine H/sup 3/, uridine H/sup 3/ or leucine H/sup 3/. This method will allow us to determine whether or not lead effects biochemical activities such as DNA, RNA and protein synthesis in the developing central nervous system. The quantitative and qualitative distribution of lead in the developing fetus will be studied by atomic absorption spectrophotometry and radioautography.
KEYWORDS: LEAD;BIOLOGICAL EFFECTS;NERVOUS SYSTEM;LEAD NITRATES;LEAD COMPOUNDS;ACETATES;MICE;CHICKENS;EMBRYOS;PATHOLOGY;DNA;RNA;PROTEINS;BIOSYNTHESIS;METABOLISM;POLLUTION;BIOCHEMISTRY;REPRODUCTION;TERATOGENESIS;BRAIN

<033067>
TITLE: Combined Impulse-Continuous Noise: Auditory Effect
PROJECT NUMBER: R01 ES00969
PRINCIPAL INVESTIGATOR: Hamernik, R.P.
ADDRESS: 750 E. Adams Street, Syracuse, NY 13210
AFFILIATION: State Univ. of New York, Syracuse (USA). Upstate Medical Center
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00969
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$57,500
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOISE, VIBRATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Combinations of non-traumatic impulse and continuous noise can produce unusually severe changes in hearing sensitivity and cochlear integrity. The extent of this noise-induced trauma cannot be explained on the basis of addition of the acoustic power of the two noises. The purpose of the proposed research is to systematically study the effects of combined impulse and continuous noise exposure on hearing sensitivity and cochlear anatomy. Three impulses, of variable intensity spanning a temporal range from 40 mu sec to .3 sec will be individually studied in combination with various intensities and band widths of a background continuous noise. Chinchilla will be used as the experimental animal. Noise-induced temporary and permanent threshold shifts will be measured at regular intervals after exposure using the auditory evoked response measure. At thirty days after exposure, the chinchilla will be sacrificed, their cochleas will be infused with Araldite and flat preparations will be dissected. Analysis of the cochlear cell populations will be accomplished using phase microscopy and thin sectioning techniques. At interesting locations, the tissue will be analyzed with the electron-microscope. The final evaluation of the particular noise exposure will depend on a correlation of the noise parameters with the audiological

and histological changes. These data are a necessary prerequisite for the ultimate objective of this research project, namely, the establishment of a Damage Risk Criteria for impulse-continuous noise combinations.
KEYWORDS: NOISE-INDUCED TRAUMA;DAMAGE-RISK CRITERIA;NOISE;AUDITORY ORGANS;INJURIES;BIOLOGICAL EFFECTS;SENSITIVITY;MAMMALS;TISSUES;ELECTRON MICROSCOPY;HISTOLOGY;ANIMAL CELLS

<033068>
TITLE: Effects of Lead on Renal Maturation in Young Animals
PROJECT NUMBER: R01 ES00972
PRINCIPAL INVESTIGATOR: Johnson, D.R.
ADDRESS: Eden and Bethesda Avenues, Cincinnati, OH 45219
AFFILIATION: Cincinnati Univ., Ohio (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES00972
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$52,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This grant proposal is concerned primarily with the extent of renal damage induced in young animals by the ingestion of lead diets. We are particularly interested in the effects of lead on the maturation of renal function in the newborn dog. Maturation of glomerular function, tubular function, and renal hemodynamics will be assessed. Another area to be investigated will be the effects of lead exposure during early development on renal function in adult rats. Finally, blood and kidney levels of lead will be correlated with renal dysfunction as determined from the above experiments.
KEYWORDS: LEAD;KIDNEYS;INJURIES;BIOLOGICAL EFFECTS;INGESTION;DOGS;NEONATES;RATS;BLOOD;POLLUTION;BIOCHEMISTRY;DISEASES;PATHOGENESIS;TOXICITY

<033071>
TITLE: Approaches to Treatments of Methyl Mercury Toxicity
PROJECT NUMBER: R01 ES01005
PRINCIPAL INVESTIGATOR: Carter, D.E.
ADDRESS: College of Medicine, Tucson, AZ 85724
AFFILIATION: Arizona Univ., Tucson (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01005
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$64,900
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The problem of human exposure to methyl mercury will continue as long as mercury is found in our lakes and streams. Recent evidence has indicated that there is potential danger to humans exposed to subtoxic amounts of methyl mercury. A new compound, dehydrodithizone, is proposed for study as a new treatment to clear methyl mercury from the body because of its selectivity for mercury and its having other advantageous properties. Systematic evaluation of present treatments is also proposed with the hope that drugs can be combined to give more effective therapy when their mechanisms of action on methyl mercury toxicity are understood. Study of some of the biochemical actions of methyl mercury on liver microsomes and the developing blood-brain barrier is proposed.
KEYWORDS: METHYLMERCURY;TOXICITY;MICROSOMES;LIVER;BLOOD-BRAIN BARRIER;THERAPY;DRUGS;BIOCHEMISTRY;MAN

<033072>
TITLE: Factors Influencing Deposition of Inhaled Particles
PROJECT NUMBER: R01 ES01016
PRINCIPAL INVESTIGATOR: Brain, J.D.
ADDRESS: 665 Huntington Avenue, Boston, MA 02115
AFFILIATION: Harvard Univ., Boston, Mass. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01016
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$62,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The overall objective is to define more precisely how various factors affect the patterns of particle deposition which occur during inhalation. Specifically we propose (1) to investigate how gravity and pleural pressure gradients influence alveolar deposition. By analyzing small samples of dried or frozen lungs, we plan to measure the amount of alveolar deposition in different lung regions. We also plan (2) to investigate how the various breathing patterns influence the distribution of particle deposition. A servo-pressure control system will be used to produce any desired breathing pattern at any specified lung volume. Finally, we plan (3) to investigate species differences in regard to aerosol deposition and to attempt to apply principles of scaling to our experimental data with the goal of

develcping predictive powers. Since inhalation is the primary entry route for agents that cause environmental, occupational, and infectious disease, it is of clear importance to understand better how and where particles deposit in the lungs. This information will be of value in understanding and controlling environmental hazards.
YWORDS: INHALATION;LUNGS;AEROSOLS;DEPOSITION;TISSUE DISTRIBUTION;HAZARDS;PATHOGENESIS;TOXICITY

<033074>
TITLE: Kinetics of Uptake and Excretion of Vapors in Man
PROJECT NUMBER: R01 ES01029
PRINCIPAL INVESTIGATOR: Thomas, V.
ADDRESS: P.O. Box 875, Biscayne Annex, Miami, FL 33152
AFFILIATION: Miami Univ., Fla. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01029
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$28,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Various solvents (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The overall objective of the research is to define the kinetics of uptake, distribution, metabolism, and excretion of inhaled lipid soluble vapors in man, by a set of differential equations, using predictable constants. The physical, chemical, and biological constants needed will be determined by simple experiments. Solution of the equations will be facilitated by a program for large digital computer. To verify the pharmacokinetic model, the experimental conditions of suitable published studies in man will be simulated, and their results compared with the calculated data. Further verification will be done by animal experiments. The pharmacokinetic model for the rat will be elaborated, and the predicted concentrations of noxious compounds in the tissue compared with the concentrations in rats sacrificed at selected time intervals following exposure. The described pharmacokinetic model will be used to design the proper monitoring of industrial data; to predict the cumulation of inhaled compounds and their metabolites in the body; to explain the role of certain physiological factors (body build, pulmonary ventilation, tissue perfusion); and to formulate guidelines for the prediction of the uptake, distribution, metabolism, and excretion of new noxious compounds introduced in industry. Initial plans are to use toluene, trichloroethylene, carbon disulfide, and methylene chloride in the study.
KEYWORDS: MAN;EXCRETION;LIPIDS;VAPORS;INHALATION;METABOLISM;TISSUE DISTRIBUTION;COMPUTERS;RATS;BIOLOGICAL MODELS;MONITORING;TOLUENE;CARBON SULFIDES;METHYLENE RADICALS;MATHEMATICAL MODELS;HYDROCARBONS;LUNGS;RESPIRATION;TOXICITY

<033075>
TITLE: Damage to Nucleic Acids by Bisulfite (Sulfur Dioxide)
PROJECT NUMBER: R01 ES01033
PRINCIPAL INVESTIGATOR: Shapiro, R.
ADDRESS: Department of Chemistry, New York, NY 10003
AFFILIATION: New York Univ., N.Y. (USA). Dept. of Chemistry
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01033
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$75,900
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Bisulfite ion (the aqueous form of the atmospheric pollutant, sulfur dioxide) has three reaction pathways with the major pyrimidine components of nucleic acids: (1) reversible saturation of uracil, (2) deamination of cytosine to uracil, and (3) transamination of cytosine to N-4-substituted cytosine derivatives (leading to protein-nucleic acid crosslinking). We propose that one or more of these reactions constitute the principal biochemical lesions inflicted by environmental sulfur dioxide, leading to the adverse effects on health associated with this pollutant. To test this hypothesis, we are investigating these reactions at four distinct levels: (a) mechanistic studies with nucleosides; (b) studies on the relation of reactivity to conformation at the polynucleoside level; (c) the effect of bisulfite modification of RNA on protein synthesis, using synthetic messengers, MS2 RNA, and the E. Coli cell-free protein synthesizing systems; and (d) in vivo studies with bacteria, mammalian cells, and eventually mammals, to measure the extent of nucleic acid modification by bisulfite, and its consequences in terms of inhibition of protein synthesis and killing of cells. We hope that this study will provide concrete data as to the adverse biochemical effects of varying degrees of exposure to sulfur dioxide, and that this will be useful in setting rational guidelines for the control of atmospheric levels of sulfur dioxide.
KEYWORDS: TOXICOLOGY;NUCLEIC ACIDS;SULFUR DIOXIDE;AIR POLLUTION;URACILS;DEAMINATION;CYTOSINE;HEALTH HAZARDS;NUCLEOSIDES;RNA;PROTEINS;BIOSYNTHESIS;ANIMAL CELLS;BIOCHEMISTRY;AEROSOLS;BACTERIA;MUTAGENESIS;DNA;SULFITES

<033076>
TITLE: Photosensitivity: Environmental and Other Factors
JECT NUMBER: R01 ES01041
INCIPAL INVESTIGATOR: Harber, L.C.
ADDRESS: 630 West 168 Street, New York, NY 10032
AFFILIATION: Columbia Univ., New York (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.

TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01041
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$110,700
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Various (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Adverse cutaneous photosensitivity reactions following exposure to environmental chemicals and light have been reported with increasing frequency during recent years. The broad objectives of the proposed project are to define more precisely the mechanisms of action of these adverse photoresponses as well as the influence of environmental factors and the biologic differences between individuals which affect these reactions. Our approach to these objectives places particular emphasis on relatively unexplored aspects of this problem. Specifically, we are concerned with the role of temperature and humidity as they relate to photosensitivity reactions and the role of biologic factors of the host resulting in endogenously produced photosensitizers such as porphyrins. Although exogenous photosensitizing substances are well recognized causes of occupational dermatoses due to their primary irritant (''phototoxic'') or allergic (''photoallergic'') properties, little is known regarding the mechanisms of their photosensitizing properties on a molecular and submolecular biologic level. In addition, there presently exists no laboratory model for the study of the disabling photosensitivity in man known as persistent-light-reactors. The development of an experimental laboratory animal model for study of these reactions is a highly desirable goal in order to determine the specific role of light in the
KEYWORDS: PHOTOSENSITIVITY;SKIN;VISIBLE RADIATION;POLLUTION;TEMPERATURE EFFECTS;HUMIDITY;BIOLOGICAL MODELS;BIOLOGICAL EFFECTS;SKIN DISEASES;PATHOGENESIS;TOXICITY

<033078>
TITLE: Effects of Lead on Procaryotic and Eucaryotic Cells
PROJECT NUMBER: R01 ES01047
PRINCIPAL INVESTIGATOR: Tornabene, T.G.
ADDRESS: Department of Microbiology, Fort Collins, CO 80521
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01047
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$34,900
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The research program has the objective of elucidating the primary responses of bacterial cells to lead in an attempt to define trace mechanisms of action. The bacterial study will be used as a model for studying the specific effects of lead on unaltered and unpropagated rabbit alveolar cells. The proposed study is an extension of a recently completed pilot program on the effects of lead on bacterial cells. Lead infected cells result in osmotically sensitive cells with greatly reduced membrane lipid contents. The proposed program concentrates on the effects of lead on lipid metabolism, cellular respiratory pigments, and the creation of cellular leakage. X-ray diffraction and electron probe studies will be conducted to determine the chemical composition of lead-containing aggregates observed in membranes of bacteria. This program will provide valuable information for establishing the physical-chemical modifications of cellular membranes and a reference source of information on the molecular basis of the action of lead.
KEYWORDS: LEAD;TOXICITY;BACTERIA;LIPIDS;METABOLISM;RESPIRATION;PIGMENTS;ANIMAL CELLS;CELL MEMBRANES

<033079>
TITLE: Effect of Ozone on Lung Growth and Development
PROJECT NUMBER: R01 ES01049
PRINCIPAL INVESTIGATOR: Boatman, E.S.
ADDRESS: Department of Environmental Health SC-34, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01049
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$54,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Ozone;NOXIOUS GAS/Oxidants (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Unilateral pneumonectomy in laboratory animals induces a stimulus to the growth of the remaining lung such that lung volume greatly increases above normal. It is proposed to locate the sites at which new growth occurs and compare newly formed tissue with preexisting ''mature'' tissue. The main thrust of the research is to ascertain the effects of air pollutant gases on this accelerated lung development and to determine whether growth is impaired on exposure to pollutants in concentrations found in urban environments. The characterization of this ''stimulated'' lung growth and development in control and in animals exposed to ozone, and other oxidants, will derive from measurements of pulmonary function, from quantitative morphometry and light and electron microscopy and from biochemical analyses. The experimental design offers the advantage of investigating the effects of environmental stress on a

compromised organ that consists of both mature tissue and tissue in a state of development. In this respect, the findings may have particular significance in the areas of neo-natal development and pneumonectomy in the human.
KWORDS: DEVELOPMENT;OZONE;BIOLOGICAL EFFECTS;LUNGS;PHYSIOLOGY;LABORATORY ANIMALS;AIR;BIOCHEMISTRY;RESPIRATION;OXIDIZERS

<033080>
TITLE: Lead and PCB's: Pharmacologic and Toxicologic Studies
PROJECT NUMBER: R01 ES01055
PRINCIPAL INVESTIGATOR: Kappas, A.
ADDRESS: 66th Street and York Avenue, New York, NY 10021
AFFILIATION: Rockefeller Univ., New York (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01055
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$230,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICAL TRANSMISSION (50%)
POLLUTANTS: METALS/Lead (50%);ORGANICS/Various (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The studies proposed examine the nature, mechanisms and consequences of the interactions of two major environmental pollutants, lead and polychlorinated biphenyls (PCBs), on the heme pathway, and on cytochrome P-450 and the mixed function oxidase system coupled to this heme-protein. Heme and P-450 play a central role in detoxification mechanisms for drugs, hormones, carcinogens and many chemically diverse substances derived from the environment. Lead and PCBs are ubiquitously distributed in the ecosystem of man; produce acute and chronic human diseases; and have potent interactions with the heme-P-450 systems. These interactions are of an inhibitory nature with respect to lead; and of a stimulatory nature with respect to the PCBs. Thus, lead and PCBs serve as excellent model substances for defining in chemical terms, the biological impact of many environmental pollutants which inhibit or induce the heme-P-450 complex. Lead and PCB-induced alterations in heme synthesis and in the activities of P-450 coupled enzymes can be expected to have major pharmacological and toxicological consequences, since the biological actions of drugs, hormones, carcinogens and other chemicals are determined to a significant degree by the rates at which they are metabolized. These effects of lead and PCBs on the heme-P-450 systems will be explored in detail, utilizing tissue culture techniques, whole animal preparations
KEYWORDS: LEAD;BIPHENYL;HEME;CYTOCHROMES;OXIDASES;DRUGS;HORMONES;CARCINOGENS;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;TISSUE CULTURES;LIVER;NERVOUS SYSTEM;TOXICITY;AROMATICS;ORGANIC CHLORINE COMPOUNDS;BLOOD;ENZYMES

<033081>
TITLE: The Dynamics of Lead Metabolism in Bone
PROJECT NUMBER: R01 ES01060
PRINCIPAL INVESTIGATOR: Rosen, J.F.
ADDRESS: 111 East 210th Street, Bronx, NY 10467
AFFILIATION: Montefiore Hospital, New York (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01060
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$121,400
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The central purpose of this research plan is to define further the dynamics of lead transport in children. To this end, the primary focus is to clarify factors that determine the movement of lead into and out of bone, where over 90% of endogenous lead is stored. This cardinal phase of the research plan will be carried out in bone organ culture, a convenient and precise way to study the effects of the ionic milieu and hormonal peptides that regulate lead's efflux from bone. Complementary in vitro experiments will examine: (1) the role of chick calcium-binding protein in the intestinal absorption of lead, and (2) the effects of ionized calcium (Ca/sup ++/) and lanthanum (La) on the mechanisms of lead movement from red cell to plasma. Integration of data obtained from in vitro studies will be applied to construct different chelation regimens, for the treatment of lead-intoxicated rats, by adding to such therapy combinations of Ca/sup ++/, calcitonin (CT), and parathyroid hormone (PTH). This comprehensive research plan, focusing on the skeletal metabolism of lead, presumably, will define more clearly the kinetics of lead transport. By so doing, the potential hazards of ''subtoxic'' doses of lead may be understood, and more effective therapy may evolve for the treatment of childhood lead intoxication.
KEYWORDS: LEAD;METABOLISM;BONE TISSUES;CHILDREN;IN VITRO;INTESTINAL ABSORPTION;CALCIUM;LANTHANUM;PROTEINS;CALCITONIN;PARATHORMONE;THERAPY;KINETICS;BIOLOGICAL EFFECTS;BIOCHEMISTRY;DISEASES;PATHOGENESIS;TOXICITY

<033082>
TITLE: Effects of Lead on Fetal and Neonatal Development
PROJECT NUMBER: R01 ES01062
PRINCIPAL INVESTIGATOR: Bowman, R.E.
ADDRESS: 1223 Capitol Court, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01062

77 FUNDING: National Inst. of Environmental Health Sciences FY77:$127,100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objective of the proposed research is to determine the residual effects of low level lead exposure on the fetal and infant rhesus monkey. Pregnant rhesus monkeys will be fed low levels of lead throughout gestation and their infants evaluated biologically and behaviorally during infancy, adolescence, and early adulthood. Similar studies will also be conducted on infant monkeys that are exposed to low levels of lead during the initial year of life. These studies will help to clarify the effects of lead exposure during early life on the subsequent development of the infant. In addition, maximum tolerable levels of lead administered over a given period to fetal (via the mother) and infant monkeys will be established. The methods that will be employed in evaluating these animals will include behavioral studies that will enphasize social interaction and learning capabilities of these animals from birth to adulthood. The clinical studies conducted will be systematic hematological, radiological, and biochemical determinations throughout infancy, adolescence, and adulthood. After the completion of the clinical and behavioral studies histological and ultrastructural studies will be conducted on all of the major organs. In addition, total concentrations of lead in various tissues of the body will be determined.
KEYWORDS: LEAD;FETUSES;NEONATES;MONKEYS;BIOLOGICAL EFFECTS;BEHAVIOR;HEMATOLOGY;HISTOLOGY;TISSUE DISTRIBUTION;INGESTION;INJURIES;BIOCHEMISTRY;INHALATION;PATHOGENESIS;TOXICITY

<033084>
TITLE: Environmental Mutagenesis and DNA Repair
PROJECT NUMBER: R01 ES01101
PRINCIPAL INVESTIGATOR: Smith, P.D.
ADDRESS: Department of Biology, Atlanta, GA 30322
AFFILIATION: Emory Univ., Atlanta, Ga. (USA). Dept. of Biology
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01101
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$26,900
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Various (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Early observations that X-irradiation and nitrogen mustard were mutagenic first raised the concern of geneticists to the potential dangers of physical and chemical agents in the environment and sparked intensive inquiries into the nature of the mutagenesis process. Recent studies of this phenomenon have relied heavily on microbial systems but have been very successful in detailing both the molecular nature of alterations to the genetic material and the enzymatic nature of the genetic control of DNA repair mechanisms. These latter observations have, in large measure, depended upon the use of genetically-altered mutagen-sensitive strains and recent observations with eucaryotes suggest that mutagen-sensitive strains will be similarly useful in advancing our knowledge of these processes in higher organisms. This proposal describes studies aimed at developing and testing new genetic strains of the complex multicellular eucaryote, Drosophila melanogaster, which will be useful tools in the evaluation of environmental chemicals for potential mutagenic activity. The experiments have been designed to assay the entire Drosophila genome in order to isolate mutant strains which exhibit sensitivity or resistance to particular chemical agents, especially mutagens. Such strains will undergo genetic and biochemical characterizations for deficiencies in DNA repair to determine their feasibility as
KEYWORDS: MUTAGENESIS;BIOCHEMICAL REACTION KINETICS;ENVIRONMENT;MUTATIONS;ENZYMES;DNA;BIOLOGICAL REPAIR;HEALTH HAZARDS;VINYL MONOMERS;INSECTICIDES;DROSOPHILA;ANIMAL CELLS;GENETICS

<033085>
TITLE: Size/Chemical Measurements of Atmospheric Particles
PROJECT NUMBER: R01 ES01107
PRINCIPAL INVESTIGATOR: Dahneke, B.E.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01107
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$82,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: PARTICULATES/Various (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The object of this research is to measure the detailed size-chemical nature of atmospheric particulates. These data are desired to evaluate the toxicity of atmospheric particulates which depends on both their inhalability (aerodynamic size) and their chemical composition. The data will be obtained in an aerosol beam device which (1) measures the aerodynamic size or mass of a particle by measuring its time of flight between two focused light beams in a vacuum chamber and (2) measures, by surface ionization mass spectrometry, the abundance of various charge to mass species present in individual particles. The measurements will therefore provide information about the chemical composition of the size subranges of atmospheric particulates. The data of particular interest concern toxic species such as 1,2-benzopyrene, asbestos, and UO/sub 2/, among others. If these data can be obtained in

sufficient detail, it should be possible to identify the major sources of toxic atmospheric particulates. The instrument will be calibrated and the data will be collected and searched with the view of finding unique features of toxic and other aerosols which may serve to specifically identify their sources.
WORDS: AEROSOLS;AIR POLLUTION;TOXICITY;PARTICLE SIZE;INHALATION;MEASURING METHODS;BENZOPYRENE;ASBESTOS;URANIUM DIOXIDE;DATA ACQUISITION;CALIBRATION;MEASURING INSTRUMENTS;RESPIRATION

<033086>
TITLE: Toxicology of Mercury at Cellular-Subcellular Levels
PROJECT NUMBER: R01 ES01115
PRINCIPAL INVESTIGATOR: Gruenwedel, D.W.
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DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01115
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Proposed studies are designed to investigate the toxicological effects of an organomercurial, for instance, methylmercuric hydroxide, on cells and subcellular components. It is hoped that these studies will contribute to a better understanding of the action of certain environmental pollutants at the molecular level: for instance, provide a rationale for the fact that methylmercury has been observed to cause C-mitosis as well as C-meiosis in a variety of plants, mammals, and insects. Specifically, the proposed studies will be concerned (1) with the investigation of the methylmercury-induced inhibition of mitosis in tissue cultures of mammalian cells using cytological characterization techniques with regard to chromosome variations as well as biochemical fractionation and isolation procedures in the case of subcellular components in an attempt to obtain information concerning the ''target'' of the action of the organomercurial; and (2) with the study of the physical and chemical properties of the methylmercury complexes of chromatin and its associated histones using physico-chemical methods such as analytical ultracentrifugation, viscosity measurements, circular dichroism measurements, and other spectrophotometric techniques. The interphage chromosomes serve hereby as models of possible ''target'' molecules of the action of organomercurials at the molecular level. These studies constitute
KEYWORDS: MERCURY;TERRESTRIAL ECOSYSTEMS;METHYLMERCURY;ORGANIC COMPOUNDS;TOXICITY;HEALTH HAZARDS;METABOLISM;CYTOLOGY;PHYSICAL PROPERTIES;CHEMICAL PROPERTIES;BIOLOGICAL EFFECTS;ANIMAL CELLS;GENETICS;MUTAGENESIS

<033087>
TITLE: Human Radioactivity Dose Study
PROJECT NUMBER: R01 ES01120
PRINCIPAL INVESTIGATOR: Pasternack, B.S.
ADDRESS: 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA). Medical Center
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01120
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$39,100
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to provide detailed dose estimates to the critical cells in tumor formation from the important radionuclides expected to be prevalent in our environment within the next decade. Two groups of nuclides are to be studied, the alpha emitters which predominate in spent nuclear fuel, namely Pu-238, Pu-241, Am-241, Cm-242, Cm-244 and the beta emitting fission product Kr-85. Estimates are that by 1985 4 x 10 to the 9 power Curies of the transuranics will be reprocessed per year, while atmospheric Kr-85 levels could be as high as 10 to the 4 power pCi/m-cubed by the turn of the century. Release of transuranics to the environment can result in human exposures by ingestion or inhalation. Soluble forms of these nuclides are bone seekers and critical cells on bone surfaces are irradiated. Inhalation of less soluble particulates irradiates critical cells in the lower lung over long time intervals. Krypton-85 is very soluble in body fat and 13% of body storage fat is located in yellow bone marrow in bone shafts. It is thus capable of producing an important beta dose to bone cells adjacent to bone marrow as well as a dose to critical basal cells in bronchial epithelium upon inhalation. There is no human experience with high levels of these emitters to indicate their absolute toxicity. Whether the exposure is from inhaled or ingested material, the distribution of the transuranic nuclides in the
KEYWORDS: HUMAN POPULATIONS;DOSIMETRY;RADIATION MONITORING;BIOLOGICAL RADIATION EFFECTS;DOSE-RESPONSE RELATIONSHIPS;NEOPLASMS;TRANSURANIUM ELEMENTS;RADIOISOTOPES;RADIONUCLIDE MIGRATION;RADIOECOLOGICAL CONCENTRATION;PLUTONIUM 238;PLUTONIUM 241;AMERICIUM 241;CURIUM 242;CURIUM 244;KRYPTON 85;AIR POLLUTION;NUCLEAR FUELS;SPENT FUELS;HEALTH HAZARDS;GAMMA RADIATION;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;DNA;MUTAGENESIS;PATHOGENESIS

<033088>
TLE: Pre- and Postnatal Effects of Microwave Irradiation
OJECT NUMBER: R01 ES01121
NCIPAL INVESTIGATOR: Jensh, R.P.
ADDRESS: 920 Chancellor Street, Philadelphia, PA 19107
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DIVISION: Extramural Program
MONITOR: Owens, Robert G.

TELEPHONE: P629-3350
TYPE OF FUNDING: Grant No.-R01 ES01121
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$106,800
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: RADIATION/Microwaves (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this investigation are to further develop techniques and instrumentation for the determination of exposure and dosimetric parameters, at 915 mHz and 2450 mHz, and the influence of pulsed and continuous exposure, and peak power and average power (pulsed irradiation), and to refine the dosage and monitoring procedures through refinement of techniques and instrumentation for quantitative measurement of modulated and pulsed transmission of 2450 +- mHz and 915 +- 25 mHz and power ranges at or near those currently considered acceptable and to determine the effects of low dose chronic prenatal microwave irradiation on (a) embryonic and fetal development in the rat, (b) postnatal development in the rat, (c) the reproductive capacity of the rat, and (d) the central nervous system of the exposed adult offspring. The procedure will include 3 power ranges at 2 transmissions and 2 frequencies (2450 mHz and 915 mHz) at 4 time periods in the rat pregnancy plus paired controls.
KEYWORDS: MICROWAVE RADIATION;HEALTH HAZARDS;REPRODUCTION;AIR POLLUTION;LAND POLLUTION;BIOLOGICAL REPAIR;MEASURING INSTRUMENTS;MONITORING;CHRONIC INTAKE;EMBRYOS;FETUSES;RATS;REPRODUCTIVE DISORDERS;CENTRAL NERVOUS SYSTEM;DOSE-RESPONSE RELATIONSHIPS;TOXICITY

<033089>
TITLE: Asbestos and Cancer
PROJECT NUMBER: R01 ES01122
PRINCIPAL INVESTIGATOR: Warnock, M.L.
ADDRESS: 950 E. 59th Street, Chicago, IL 60637
AFFILIATION: Chicago Univ., Ill. (USA)
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DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: P629-3350
TYPE OF FUNDING: Grant No.-R01 ES01122
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$26,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Although exposure to asbestos has been definitely associated with the development of lung cancer, the magnitude of the risk has not been defined in persons who are exposed to relatively minute doses of asbestos. Even small amounts of asbestos together with cigarette smoking, have been shown to have a synergistic effect in producing lung cancer (1). In a preliminary study, we have found large numbers of asbestos bodies more frequently in our lung cancer patients than in a control population without cancer. This occurs in cases where asbestos bodies are easily overlooked on routine histologic sections. We now propose to confirm this finding by quantitating the number of asbestos fibers in the lungs of more patients with and without lung cancer in a population with low asbestos exposure. Quantitation of fibers will be performed at both light and electron microscopic levels, and specific identification of fibers as asbestos will be carried out by morphology, electron diffraction, and microprobe analysis. It is hoped that quantitative criteria of ''significant'' exposure to asbestos can be determined, and the magnitude of the problem of increasing evidence of asbestos in the environment clarified.
KEYWORDS: ASBESTOS;CARCINOGENESIS;HEALTH HAZARDS;NEOPLASMS;ETIOLOGY;BIOLOGICAL REPAIR;MORPHOLOGICAL CHANGES;DNA;INHALATION;LUNGS;MUTAGENESIS

<033090>
TITLE: Studies on the Pancreotoxic Effects of Cadmium
PROJECT NUMBER: R01 ES01123
PRINCIPAL INVESTIGATOR: Hennear, J.H.
ADDRESS: School of Pharm. and Pharm. Sciences, Lafayette, IN 47907
AFFILIATION: Purdue Univ., Lafayette, Ind. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: P629-3350
TYPE OF FUNDING: Grant No.-R01 ES01123
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$53,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/Cadmium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Environmental contamination with cadmium (Cd) represents a potential health hazard. While this metal is accepted as being extremely toxic in cases of acute exposure, little is known of the potential consequences of chronic exposures to low levels. Cadmium is known to accumulate in several organs of mammals, including the pancreas. Further, decreased pancreatic function has been reported to be a feature of chronic Cd intoxication in humans. The objective of the proposed research will be to extend our preliminary studies on the influence of Cd on carbohydrate metabolism. Earlier results of these laboratories have shown that Cd inhibits insulin secretion from the rat pancreas (in vivo and in vitro). The results of these studies suggest that inhibition of calcium uptake by the pancreatic beta cell may play a part in this inhibition. Isolated pancreatic islets will be employed to assess the effects of Cd on ion fluxes across the pancretic beta cell membrane. Also, the effects of Cd on beta cell uptake and metabolism of glucose will be studied. A chronic feeding study will be conducted to determine the sensitivity of rat carbohydrate metabolism to dietary Cd. Rats will be fed Cd-containing diets for up to

24 months. Parameters of carbohydrate metabolism, accumulation of Cd in tissues and histopathological changes will be assessed in members of each treatment group at three month intervals. Studies will also be conducted to determine means of
WORDS: CADMIUM;ENVIRONMENT;POLLUTION;HEALTH HAZARDS;BIOLOGICAL REPAIR;FOSSIL FUELS;METABOLISM;CHRONIC INTAKE;PANCREAS;PHYSIOLOGY;RATS;CARBOHYDRATES;BIOCHEMISTRY;ANIMAL CELLS;HORMONES;TOXICITY

<033091>
TITLE: Characterization of Organoarsenic Compounds in Nature
PROJECT NUMBER: R01 ES01125
PRINCIPAL INVESTIGATOR: Irgolic, K.J.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01125
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$46,800
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Arsenic (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this research is to isolate and identify chemical species containing arsenic, as they occur in living organisms. Initially, algae and crayfish will be used as the experimental organisms from which arsenic compounds will be isolated. This is because techniques have already been developed for the separation of arsenic-containing compounds from these organisms. As knowledge concerning the chemical nature of the arsenic species is aquired, it will become feasible to extend this study to include higher animals. The ultimate goal of this work is to determine the manner in which arsenic becomes incorporated in the mammal. Such knowledge may make it possible to begin to learn about the true toxicity of arsenic and its compounds, and whether arsenic may, in fact, be an essential trace element. Initially, crayfish and algae will be cultivated in an environment which contains arsenate and/or arsonite traced with As-74 (t/sub 1/2/ 18d). The cells will be homogenized and subjected to classical biochemical separation procedures. Protein, lipid, carbohydrate and nucleic acid fractions will be separated. The fractions will be subjected to chromatographic purification. Arsenic rich fractions will be identified by way of their As-74 activity. The arsenic-containing fractions will be subjected to additional chromatographic and electrophoretic methods. Initial characterization of the arsenic compounds will utilize mass spectroscopy, as well as Laser Raman, infrared, photoelectron spectroscopy, and gas chromatography. This will be followed by proof-of-structure studies by chemical means.
KEYWORDS: ORGANIC COMPOUNDS;ARSENIC COMPOUNDS;FRESH WATER;ABUNDANCE;BIOLOGICAL EFFECTS;BIOCHEMICAL REACTION KINETICS;METABOLISM;UPTAKE;TOXICITY;NUTRIENTS;ALGAE;ARSENIC 74;TRACER TECHNIQUES

<033092>
TITLE: Chemically Induced Heritable Chromosome Defects
PROJECT NUMBER: R01 ES01136
PRINCIPAL INVESTIGATOR: Miller, R.C.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01136
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$96,600
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this proposal is to utilize the recently developed ''Giemsa-trypsin'' chromosome banding procedure for enhanced resolution and characterization of chemically induced chromosome aberrations in the newborn offspring of experimental rats and mice. This will be accomplished by the injection of known doses of clastogenic compounds such as Mitomycin-C, triethylenemelamine or 2,3,5-triethylene-iminobenzoquinone-1,4(t) into both male and female rats and mice prior to mating with untreated control animals of the opposite sex. The effects of both drug and sham treatments on the banded chromosomes of offspring will be compared with the sensitive ''translocation heterozygote screening procedure'' in order to evaluate the relative merits of the two techniques as in vivo assays for the detection of permanent genetic damage to the offspring of animals exposed to chemical agents. Should the chromosome banding assay prove to be both effective and efficient it would serve as a basis for similar testing of additional chemical compounds and also for the investigation of the role of biologicals and viruses in the production of heritable genetic defects.
KEYWORDS: RATS;MICE;NEONATES;CHROMOSOMAL ABERRATIONS;MUTAGENS;GENETIC EFFECTS;TESTING;CARCINOGENS;DISEASES;MUTAGENESIS

<033093>
TITLE: Lead: Its Renal Handling, Renin and Erythropoietin
PROJECT NUMBER: R01 ES01141
PRINCIPAL INVESTIGATOR: Mouw, D.R.
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ITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01141
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Lead (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The over-all purpose is to elucidate interactions between lead and renal function in terms of three questions: what are the mechanisms and determinants of renal lead excretion; what is the effect of chronic lead poisoning on renal sodium handling, and the renin-angiotensin system; and what is the effect of chronic lead-poisoning on plasma concentration of erythropoietin. Experiments will be performed on normal and chronically lead-poisoned dogs and rats, using renal clearance techniques and stop-flow analysis. We will determine how much plasma lead is ultrafilterable, and what combination of glomerular filtration, tubular reabsorption, and secretion account for lead excretion. We will determine whether the pattern changes with the degree and duration of lead-poisoning, and how it is changed by alterations of dietary calcium, parathormone, thyrocalcitonin, and vitamin D. The effect of lead on tubular sodium reabsorption during low-sodium and normal diets and during a saline load will be measured. The responses of renin secretion, various components of the renin-angiotensin-aldosterone system, and plasma erythropoietin to a variety of stresses (Sodium depletion, hypotension, hypoxia) will be evaluated in chronically lead-poisoned animals. We hope to establish the minimal dose-time required for the appearance of observable changes in these parameters.
KEYWORDS: KIDNEYS;PHYSIOLOGY;LEAD;TOXICITY;RENAL CLEARANCE;ERYTHROPOIETIN;DOGS;RATS;CALCIUM;PARATHORMONE;THYROCALCITONIN;VITAMIN D;RENIN;SECRETION;BLOOD;DISEASES;ENZYMES

<033094>
TITLE: Cadmium Toxicology
PROJECT NUMBER: R01 ES01142
PRINCIPAL INVESTIGATOR: Klaassen, C.D.
ADDRESS: Rainbow Blvd. at 39th Street, Kansas City, KS 66103
AFFILIATION: Kansas Univ., Kansas City (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01142
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$44,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Cadmium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Cadmium is an environmental pollutant which has been shown to be toxic to a number of tissues in mammalian systems. These studies will make clear what dose is necessary to produce injury to the various tissues, which tissue is most sensitive to cadmium, and if there is a marked difference in the toxic sign between animals that receive one high single dose and those that receive multiple low doses over a long time. Information will be gained on the importance of metallothionein on the toxicity of cadmium. Does metallothionein alter the distribution of cadmium. Do metallothionein and cadmium levels in the tissues continue to rise with prolonged administration at different doses, or is a plateau achieved. What is the mechanism by which cadmium is excreted into the bile. Can it be enhanced by treatment with microsomal enzyme inducers. Will interruption of the enterohepatic circulation increase the elimination of cadmium from the body. If we can answer these very basic questions, then we should be able to treat cadmium poisoning on a more informed basis.
KEYWORDS: CADMIUM;METABOLISM;TOXICITY;ANIMALS;DOSE-RESPONSE RELATIONSHIPS;BIOCHEMISTRY;DISEASES;PATHOGENESIS

<033095>
TITLE: Ozone: Physiological and Psychophysiological Effects
PROJECT NUMBER: R01 ES01143
PRINCIPAL INVESTIGATOR: Horvath, S.M.
ADDRESS: Institute of Environmental Stress, Santa Barbara, CA 93106
AFFILIATION: California Univ., Santa Barbara (USA). Environmental Stress Inst.
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01143
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$115,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/O/sub 3/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Previous studies on carbon monoxide have shown that both physiologic and psychophysiologic effects occur consequent to exposure to even low levels of this contaminant of our environment. Suggestive information that ozone also has the potentialities of producing similar complex responses in man forms the basis of this proposed investigation. It is proposed to expose subjects to increasing levels of ambient ozone and at different levels of ventilation (induced by different levels of exercise) resulting in increased dosages of ozone for similar time units. The resultant functional changes being measured (physiological and psychophysiological) will be quantified in relation to the dosage of ozone and used to empirically derive a dose response nomogram (as was done for carbon monoxide). Ultimately is is hoped to more clearly delineate the physiological responses and adaptations of man to ozone. On the practical side, the data and evaluations of the processes involved in the responses to this substance may lead to more precise delineation of air quality standards and threshold limit values.
KEYWORDS: OZONE;PHYSIOLOGY;HEALTH HAZARDS;AIR POLLUTION;DOSE-RESPONSE RELATIONSHIPS;MAN;AIR QUALITY;STANDARDS;BIOLOGICAL REPAIR;BEHAVIOR;INHALATION;RESPIRATION;TOXICITY;BIOLOGICAL ADAPTATION

<033096>
TITLE: Carcinogenic Intermediates of Vinyl Chloride and Analogs
PROJECT NUMBER: R01 ES01150
PRINCIPAL INVESTIGATOR: Van Duuren, B.L.
ADDRESS: 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES01150
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$51,100
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This proposal is concerned with the study of the metabolism of the carcinogens vinyl chloride (VC) and trichloroethylene (TCE). The primary objective is to isolate and characterize the activated carcinogenic intermediates of these two compounds, to determine the carcinogenic activity of such intermediates, and to study their covalent binding to tissue constituents. It is suggested that epoxide intermediates of both compounds are the activated carcinogens. These epoxide intermediates are alpha-chloro ethers; compounds of the latter type are known to be potent carcinogens. Studies on the metabolism of VC and TCE will be conducted on rat liver homogenates and intracellular fractions and components derived from it. The malignant transformation of primary rat embryo cells in vitro by the parent compounds, their epoxides and their rearrangement products will be studied. The carcinogenic activity of the activated intermediates will be determined by rat feeding experiments and by cocarcinogenesis experiments on mouse skin. These studies will lead to new insights concerning occupational and environmental carcinogens and their mechanism of action in animals and man.
KEYWORDS: CARCINOGENESIS;VINYL MONOMERS;POLYVINYLS;PVC;HEALTH HAZARDS;OCCUPATIONAL DISEASES;ENVIRONMENT;RATS;EMBRYOS;BIOCHEMICAL REACTION KINETICS;TOXICITY;METABOLISM;PATHOGENESIS

<033097>
TITLE: Regulation of Neural Distribution of Lead
PROJECT NUMBER: R01 ES01151
PRINCIPAL INVESTIGATOR: O'Tuama, L.A.
ADDRESS: 321 Biological Sciences Research Center, NC Memorial Hospital, Chapel Hill, NC 27514
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES01151;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$74,100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Factors regulating the entry and distribution of inorganic lead in the nervous system will be studied under control and selected abnormal conditions. In the guinea pig, in vivo CSF perfusion will quantitate the disappearance rate of Pb-210 and Ca-45 across the blood-CSF barrier. The uptake of Pb-210 and Ca-45 across the blood-brain barrier will be measured by an indicator dilution technique. These measurements will be correlated with levels of lead and calcium attained in brain, meninges, choroid plexus and ependyma. These indices will be determined for control animals and for animals acutely and chronically lead-poisoned, and for calcium deficient animals. The affinity of the neural tissues for lead and calcium in the absence of an intact barrier will be assessed by measuring in vitro uptake and release of Pb-210 and Ca-45. This will be determined under control conditions; after inhibition of general, oxidative and glycolytic metabolism; after changes in medium electrolyte composition and after exposure to reagents that act as ligands. An effort will be made to distinguish solute accumulation due to binding within neural tissue from that due to movement across the tissue using excised bullfrog choroid plexus and meninges which can be mounted as ''polar'' membranes, allowing direct measurements of transepithelial flux. This parameter will be studied in control and acutely poisoned frogs and contrasted with
KEYWORDS: LEAD;METABOLISM;CENTRAL NERVOUS SYSTEM;GUINEA PIGS;LEAD 210;CALCIUM 45;TRACER TECHNIQUES;BRAIN;HEALTH HAZARDS;TOXICITY;PATHOLOGICAL CHANGES;NEUROLOGY;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;ENVIRONMENT;BLOOD-BRAIN BARRIER

<033103>
TITLE: Lead Toxicity and Energy Metabolism in Immature Brain
PROJECT NUMBER: R01 ES01197
PRINCIPAL INVESTIGATOR: Holtzman, S.D.
ADDRESS: Department of Neurology, Stanford, CA 94305
AFFILIATION: Stanford Univ., Calif. (USA). Dept. of Neurology
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES01197;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$70,500
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Lead is a ubiquitous toxic pollutant. The most serious manifestation of pediatric lead poisoning is an acute encephalopathy. In addition, the rising burden of environmental lead may be

producing significant brain damage, without overt encephalopathy, in young children, in the unborn fetus, and the neonate. Pathologic studies suggest that lead produces edema and capillary changes at a ''critical'' time in the immature brain of the human and in a rat model of lead encephalopathy. This ''critical'' period in the rat contains many age-dependent changes in energy metabolism including activities of the electron transport chain (ETC) as described by this investigator and others. Lead does act on the ETC in other tissues. However, there are no studies in immature brain of lead effects on the ETC, a probable basic step in the pathogenesis of lead encephalopathy. Preliminary results are presented on effects of lead on oxidative phosphorylation in immature rat brain mitochondria. Within 2 days of feeding lead to 2-week old animals, respiration with NAD-linked substrates is uncoupled, reflecting an increased state 4 rate. During the subsequent 2 week pre-encephalitic period of lead feedings, both state 3 and 4 rates become increasingly dpressed. Cytochrome oxidase activity shows the same changes. These effects are more significant in cerebellar than in cerebral hemisphere mitochondria. Importantly,
KEYWORDS: LEAD;TOXICITY;BRAIN;CHILDREN;METABOLISM;AGE DEPENDENCE;PATHOLOGICAL CHANGES;PHOSPHORYLATION;MITOCHONDRIA;RATS;ENZYMES;PATHOGENESIS;NERVOUS SYSTEM DISEASES

<033104>
TITLE: Alterations of Cell Membranes and Metabolism by Ozone
PROJECT NUMBER: R01 ES01204
PRINCIPAL INVESTIGATOR: Heath, R.L.
ADDRESS: Department of Biology, Riverside, CA 92502
AFFILIATION: California Univ., Riverside (USA). Dept. of Biology
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01204
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$33,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: A three year program of research is proposed to elucidate the primary biochemical and biophysical causes for cellular injury resulting from the photooxidant ozone. The basic hypothesis to be tested is that the primary point of oxidant attacks is the cellular plasma membrane and that a loss of critical ions, particularly K/sup +/, alters the metabolism of the cell and destroys cellular homostasis. Two membrane components, sulfhydryls and unsaturated fatty acids, are highly probable sites of ozone attack and alterations in these molecules would undoubtedly lead to gross changes in permeability and transport properties of the membrane. These studies will utilize two model biological systems. (1) The unicellular alga Chlorella sorokiniana will be subjected to ozone under two regions: (a) high levels for short durations and (b) continuous low levels. K/sup +/ levels, specific permeability indicators, level of pertinent enzymes, lipid composition changes, and sulfhydryl alterations will be assayed. (2) Membrane fragments of Red Blood Cells will be subjected to ozone to ascertain which biochemicals in the membrane are altered first.
KEYWORDS: OZONE;CELL MEMBRANES;HEALTH HAZARDS;AIR POLLUTION;PHOTOCHEMICAL OXIDANTS;BIOCHEMICAL REACTION KINETICS;METABOLISM;PERMEABILITY;UNICELLULAR ALGAE;BLOOD CELLS;MAN;PLANTS;PATHOLOGICAL CHANGES;BIOCHEMISTRY

<033105>
TITLE: Environmental Factors Related to Chromosome Damage
PROJECT NUMBER: R01 ES01207
PRINCIPAL INVESTIGATOR: Hook, E.B.
ADDRESS: 47 New Scotland Avenue, Albany, NY 12208
AFFILIATION: Albany Medical Coll., N.Y. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01207
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$37,900
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The goals of this study are (1) to determine what environmental factors are associated with ''somatic mutations'' as manifested in chromosome breakage and other evidence of chromosome damage which occurs in those with evidence of embryotoxicity and (2) to investigate the feasibility of a new method of evaluation of chromatid interchanges (using Hoechst 33258 binding) and its applicability to the determination of chromosome damage in the population under study; and, in so doing, to assess the more general applicability of this approach to the monitoring of populations ''at risk'' which are known to be exposed to possible environmental hazards such as X-irradiation, pesticides, etc. Chromatid interchanges as detected with this method will be correlated with the frequency of chromosome breakage in the population under study as well as with history of exposure to radiation, among other factors.
KEYWORDS: CHROMOSOMAL ABERRATIONS;MUTAGENESIS;BIOLOGICAL REPAIR;HUMAN POPULATIONS;ENVIRONMENTAL EFFECTS;X RADIATION;PESTICIDES;HEALTH HAZARDS;TERATOGENESIS;ANIMALS;MUTATIONS;TOXICITY

<033106>
TITLE: Compartment Models for Body Burden of Pollutants
PROJECT NUMBER: R01 ES01236
PRINCIPAL INVESTIGATOR: Marcus, A.H.
ADDRESS: 5401 Wilkens Avenue, Catonsville, MD 21228
AFFILIATION: Maryland Univ., College Park (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01236;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$24,900

TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Cobalt (50%);METALS/Lead (50%)
HARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
EGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: It is often possible to model the body burden of pollutants as a mixed exponential moving average of the external pollutant dosage. This model fails: (a) when the pollutant occupies a significant fraction of a system e.g., carbon monoxide; and (b) when an appreciable fraction of pollutant is retained in long-lived components, e.g., bone-seekers such as lead. A semi-Markov model for physiological kinetics generalizes this model. By representing body burden as a stochastic integral of external dosage, it is often possible to estimate the frequency, duration, and parameters of other integral exceedance measures for body burden, thus to estimate the effects of environmental quality standards on body burden variation. Physiological kinetic models for carbon monoxide, for the lead-calcium system, and for cadmium-zinc, will be estimated using non-linear regression techniques for experiments (as reported in the literature) on uptake and elimination in constant environments. Stochastic models will be developed for external dosage of CO and lead, and the parameters of the exceedance measures of body burden estimated. In this way it may prove possible to establish a better rationale for environmental standards setting.
KEYWORDS: BODY BURDEN;BIOLOGICAL MODELS;AIR POLLUTION;HEALTH HAZARDS;CARBON MONOXIDE;LEAD;CALCIUM;CADMIUM;ZINC;UPTAKE;POLLUTION;BIOCHEMICAL REACTION KINETICS;POLLUTION REGULATIONS;PLANNING;PHYSIOLOGY;FISHES;DISEASES;DNA;PATHOGENESIS;TOXICITY;COBALT

<033107>
TITLE: Respiratory Tract Deposition of Inhaled Aerosols
PROJECT NUMBER: R01 ES01239
PRINCIPAL INVESTIGATOR: Yu, C.P.
ADDRESS: Department of Engineering Science, Buffalo, NY 14214
AFFILIATION: State Univ. of New York, Buffalo (USA). Dept. of Engineering Science
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES01239;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$49,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Mathematical models are to be developed for theoretical prediction of particle deposition and distribution along the respiratory tract system. Specifically, the following tasks are to be undertaken during the period of requested support: (1) Develop a mathematical model for deposition in man at nose-breathing. (2) Recommend figures for the regional deposition in the human lung at nose and mouth-breathing under various working conditions. Emphasis will be given to fine particles which are difficult to be removed from power plant emissions. (3) Develop a mathematical model for deposition in smokers and patients with chronic obstructive pulmonary disease. (4) Develop a mathematical model for deposition in experimental animals. The basic method to be used is the one previously developed by the principal investigator and his faculty associate.
KEYWORDS: AEROSOLS;HEALTH HAZARDS;AIR POLLUTION;RESPIRATORY SYSTEM DISEASES;MATHEMATICAL MODELS;ANIMALS;MAN;LUNGS;POWER PLANTS;ENVIRONMENTAL EFFECTS;PARTICLES;FORECASTING;DEPOSITION;TOBACCO SMOKES;RESPIRATION

<033110>
TITLE: Binding of CH3HG, An Environmental Hazard, With DNA
PROJECT NUMBER: R01 ES01268
PRINCIPAL INVESTIGATOR: Maki, A.H.
ADDRESS: Department of Chemistry, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA). Dept. of Chemistry
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES01268
77 FUNDING: Environmental Protection Agency National Inst. of Environmental Health Sciences FY77:$52,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We intend to determine the extent to which DNA of chromosomes binds alkyl and aryl mercury in living cells. Also, we wish to obtain information on the molecular level concerning the nature of the complexes. The method to be used is a spectroscopic one, optical detection of magnetic resonance, odmr, by means of which magnetic resonance transitions in photoexcited triplet states are detected optically. A heavy atom effect caused by mercury binding to an aromatic chromophore such as a heterocyclic base of DNA makes the resulting triplet state a highly radiative trap which is especially sensitive to odmr. The odmr method thus selects the mercury-perturbed chromophore which then can be identified by the magnetic resonance frequencies, and other properties of the phosphorescent state. Selectivity by the heavy atom effect is especially good in DNA which normally is not highly luminescent. As a major system for study, we intend to use Allium cepa for which cytological data of chromosomal aberrations of root cells caused by mercurial treatment exists.
KEYWORDS: DNA;MERCURY;HEALTH HAZARDS;PATHOLOGICAL CHANGES;AIR POLLUTION;LAND POLLUTION;CYTOLOGY;PLANT CELLS;MAGNETIC SPECTROMETERS;MERCURY COMPLEXES;BIOCHEMICAL REACTION KINETICS;ALLIUM CEPA;CHROMOSOMAL ABERRATIONS;MEDICINE;MUTAGENESIS;PATHOGENESIS

<033111>
TITLE: Development of DNA Repair for Monitoring Human Health
PROJECT NUMBER: R01 ES01281
PRINCIPAL INVESTIGATOR: Mitchell, A.D.
ADDRESS: 333 Ravenswood Avenue, Menlo Park, CA 94025
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES01281;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$87,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Various (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The nation's response to the needs for energy self-sufficiency could increase the number of hazardous agents that are released into man's daily environment. Efficient and economical systems are needed to predict human susceptibility to hazardous agents and to monitor human populations for adverse genetic effects which may be caused by unforeseen mutagens. There is a high probability that these needs could be met by further development of DNA repair synthesis. The utility of the present in vitro DNA repair synthesis tests can be enhanced by developing in vivo DNA repair synthesis to measure organ and tissue specificities of responses to hazardous agents and by using these same tissues as the sources of metabolic activation enzymes for in vitro DNA repair synthesis assays. The significance of DNA repair synthesis will be further enhanced by examinations of DNA repair in prematurely condensed chromosomes and by correlations of the extent of DNA repair with measurements of cytogenetic aberrations, with mutagenesis of mammalian cells, and with carcinogenesis as measured by cell transformation.
KEYWORDS: DNA;BIOLOGICAL INDICATORS;BIOLOGICAL REPAIR;HEALTH HAZARDS;HUMAN POPULATIONS;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;METABOLISM;MUTAGENESIS;CARCINOGENESIS;NEOPLASMS;CARCINOGENS;MUTATIONS

<033112>
TITLE: Multiple Loci Screen For Mutations in Mammalian Cells
PROJECT NUMBER: R01 ES01287
PRINCIPAL INVESTIGATOR: Siciliano, M.J.
ADDRESS: M.D. Anderson Hospital and Tumor Institute, Houston, TX 77025
AFFILIATION: Anderson (M.D.) Hospital and Tumor Inst., Houston, Tex. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Programs
MONITOR: Owens, Robert G.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES01287;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$97,300
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Various (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is our intention to develop a new system for testing the mutagenic potential of various environmental agents on mammalian somatic cells. The basis of the procedure is to expose cells to mutagen and plate out single cell clones. Clonal isolates, after being grown up to 40 x 10 to the sixth power cells, are then screened for electrophoretic variation of the products of over 40 genetic loci. Where a clonal variant is detected, it is isolated and its heritability determined by subcloning and subsequent electrophoresis. The procedure avoids many of the problems associated with the detection on selective systems of recessive mutations (auxotrophic, drug resistant, and temperature sensitive) in diploid mammalian cells since electrophoretic mutations are co-dominant. Lack of enrichment for mutants by selection is also compensated for by the increased probability of obtaining an electrophoretic shift in a protein as the result of a single nucleotide substitution in its gene as opposed to the complete loss of function by such an event, and the study of the products of a large number of loci. Additional attributes of the procedure are that each variant may be associated with a specific genetic locus, mutations in a wide range of genetic loci may be studied, the system requires no change in the medium limiting the cause of any observed variation to intracellular events, and mutations in both
KEYWORDS: POLLUTION;MUTAGENESIS;TESTING;ANIMAL CELLS;MUTAGENS;MUTATION FREQUENCY;ENZYMES;GENETICS;IN VITRO

<033113>
TITLE: Function of Methallothionein in Heavy Metals Metabolism
PROJECT NUMBER: R01 ES01288
PRINCIPAL INVESTIGATOR: Brady, F.O.
ADDRESS: Department of Biochemistry, Vermillion, SD 57069
AFFILIATION: South Dakota Univ., Vermillion (USA). Dept. of Biochemistry
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-R01 ES01288;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$36,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The low molecular weight, cysteine rich protein, methallothionein will be studied under a variety of conditions in order to elucidate its function in heavy metal metabolism. Its involvement in the mechanisms of incorporation, metabolism, deposition and turnover of hazardous toxic metals, which are becoming increasingly prevalent in the environment as byproducts associated with various energy related technologies, will be elucidated. Specifically, the focus of these studies will be on the mechanisms of action and sites of localization and transfer of heavy metals in perfused rat lungs, and possibly livers

and kidneys, (both in vivo and ex vivo) and in rats (both adults and neonates). The heavy metals of interest in this study are zinc, copper, cadmium, mercury, nickel, and thallium. Initially, these will be studied individually as a preliminary to more important experiments which will involve the study of interactions of two or more of these metals, e.g., a situation which is more likely to occur under environmental conditions. The goal of these studies is to establish whether methallothionein is functioning in detoxification of toxic heavy metals or has another role in the normal metabolism of essential heavy metals, the presence of toxic heavy metals serving to interfere with these normal processes.
KEYWORDS: PROTEINS;CYSTEINE;METALS;METABOLISM;TOXICITY;ENERGY;ENVIRONMENTAL EFFECTS;RATS;LUNGS;HEALTH HAZARDS;LIVER;KIDNEYS;PERFUSED TISSUES;ZINC;COPPER;CADMIUM;MERCURY;NICKEL;THALLIUM;SYNERGISM;UPTAKE;BIOLOGICAL REPAIR;BIOCHEMICAL REACTION KINETICS;PATHOGENESIS;TOXICITY

<033114>
TITLE: A Modified Host-Mediated Assay Using Human Cells
PROJECT NUMBER: R01 ES01290
PRINCIPAL INVESTIGATOR: Huang, C.C.
ADDRESS: Roswell Park Memorial Inst. 666 Elm St., Buffalo, NY 14263
AFFILIATION: Roswell Park Memorial Inst., Buffalo, N.Y. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01290;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$39,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this proposal is to develop a modified host-mediated assay system by using cultured human lymphoid cells as target cells for screening chemical mutagens and carcinogens. Induction of chromosome damage will be used as an indicator of possible mutagenicity or carcinogenicity of a given compound. First, the growth and cytogenetic characteristics of several selected human lymphoid cell lines will be studied in vitro and after inoculation of such cells in heterologous hosts, second, effects on chromosomes of human lymphoid cells in host by several known mutagens and carcinogens will be tested in this modified host-mediated system and third, the mutagenicity and carcinogenicity of several pesticides in common use will be evaluated by using the modifed host-mediated assay developed.
KEYWORDS: MUTAGENS;CARCINOGENS;CHROMOSOMAL ABERRATIONS;PESTICIDES;HEALTH HAZARDS;GENETIC EFFECTS;DNA;BIOCHEMISTRY;MAN;LYMPHOCYTES;CYTOLOGY;MUTAGENESIS

<033115>
TITLE: Mutagenesis in Cultured Lymphocytes
PROJECT NUMBER: R01 ES01293
PRINCIPAL INVESTIGATOR: Bloom, A.D.
ADDRESS: College of Physicians and Surgeons, New York, NY 10032
AFFILIATION: Columbia Univ., New York (USA). Coll. of Physicians and Surgeons
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01293;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$207,900
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Various (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project involves the development of mammalian lymphoid culture systems to test for the mutagenicity of environmental agents. Compounds which are known mutagens (such as alkylating agents, and frameshift mutagens) will be tested in human and lymphoid cell lines for the induction of mutations at the hypoxanthine-guanine phosphoribosyl transferase and the argininosuccinic acid synthetase loci, and in murine lymphoid cells for the induction of altered immunoglobulin. The induction of chromosomal breakage in these cell lines will be studied using the G and H banding techniques. In addition, the research will utilize bacterial test systems to determine the relationship between mutagenicity in simpler organisms and in more complex, differentiated mammalian cells.
KEYWORDS: LYMPHOCYTES;MUTAGENESIS;POLLUTION;HEALTH HAZARDS;CYTOLOGY;CHROMOSOMAL ABERRATIONS;ANIMAL CELLS;BACTERIA;ENZYMES;MUTATIONS

<033116>
TITLE: Statistical Studies of Problems of Health and Biology
PROJECT NUMBER: R01 ES01299
PRINCIPAL INVESTIGATOR: Neyman, J.
ADDRESS: 405 Evans Hall, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01299;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$81,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: It is intended to work on the development of statistical and probabilistic subdisciplines particularly important in the studies of biology and health problems. Whenever possible, such studies will be conducted in conjunction with substantive biological studies. To facilitate the

establishment of the relevant contacts, seminar meetings with substantive speakers will be used, once a week during the academic year and more frequently during summer. Many problems contemplated for the immediate future are suggested by the current energy crisis. The broad, say, ultimate statistical problem connected with this crisis can be stated as follows: given that in a locality a new energy producing plant is to be constructed, with a specified additional environmental pollution, to estimate the consequent changes in the selected parameters of public health. It is proposed to study a number of subproblems of this ''ultimate'' problem. These include: (1) the use of Markov chains to study ''competing risks'', (2) methodology of treating factorial experiments, and (3) construction of stochastic models of biological phenomena like carcinogenesis and mutagenesis. Some relevant mathematical problems will also be studied.
KEYWORDS: COMPETING RISKS;FACTORIAL EXPERIMENTS;AIR POLLUTION;LAND POLLUTION;HEALTH HAZARDS;MATHEMATICAL MODELS;BIOLOGICAL MODELS;STATISTICS;EDUCATION;ENERGY SHORTAGES;MARKOV PROCESS;CARCINOGENESIS;MUTAGENESIS;NEOPLASMS;COMPUTER CODES;ECOSYSTEMS

<033117>
TITLE: Auditory Effects of Long Exposure to Low Levels of Noise
PROJECT NUMBER: R01 ES01301
PRINCIPAL INVESTIGATOR: Mills, J.H.
ADDRESS: 80 Barre Street, Charleston, SC 29401
AFFILIATION: Medical Univ. of South Carolina, Charleston (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01301
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$61,200
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOISE, VIBRATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;OS
PROJECT DESCRIPTION: The major objective is to specify the quantitative and qualitative relations between physical characteristics of noise and the temporary hearing losses produced by the noise. Knowledge of these relations for human observers will permit the specification of levels of noise that will not injure the inner ear, will not produce a temporary hearing loss, and will not delay the decay of an existing hearing loss. In addition, these relations will provide a scientific basis for the development of noise standards and criteria. Human observers will be exposed to low levels of continuous and intermittent noises for periods of up to 48 to 60 hrs. Auditory sensitivity for pure tones as well as other tests of auditory function will be measured before an exposure, during quiet periods interspersed within an exposure, and after an exposure. Results will be evaluated with respect to previous human and sub-human data, a predictive model (the equivalent power model), and current noise standards and criteria. Collectively, the proposed experiments will provide a parallel to earlier and current animal experiments and aid in elucidating the mechanisms of hearing and hearing loss.
KEYWORDS: PREDICTIVE MODEL;HEARING LOSS;NOISE;BIOLOGICAL EFFECTS;AUDITORY ORGANS;PHYSIOLOGY;MAN;SENSITIVITY;STANDARDS;ANIMALS

<033118>
TITLE: Monitoring Mutagens With Mammalian Chromosomes
PROJECT NUMBER: R01 ES01304
PRINCIPAL INVESTIGATOR: Hsu, T.C.
ADDRESS: 6723 Bertner Avenue, Houston, TX 77025
AFFILIATION: Texas Univ., Houston (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01304;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$116,900
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: There is an urgent need for devising and standardizing procedures for monitoring the effects of environmental mutagens on the genetic systems of higher animals. For practical purposes, these procedures should be relatively inexpensive, not laborious, easily quantitated, and the test objects should be related to the genetic system of man and other mammals. Chromosomes of cells in culture fulfill all these criteria and should be one of the most suitable testing materials. Since most mutagens induce chromosome damage (hence they are also clastogens), chromosome damage should serve as a conservative indicator of gene damage. However, investigators in the past used various test objects (many were poor materials) and test systems (many haphazardly designed), so their data are incomplete and are not strictly comparable. This project is designed to systematically test several cytologically advantageous materials and to determine the most efficient, economical and information-yielding protocol for future screening of environmental mutagens. Our test materials include, in addition to diploid human fibroblasts, cells of the Chinese hamster (for its fast growth rate and good chromosomes), the Indian muntjac (for its very low diploid number, 2n = 6), two species of the deer mice (differing drastically in the amount of constitutive heterochromatin and repetitive DNA content), the laboratory mouse,
KEYWORDS: MUTAGENS;HEALTH HAZARDS;CHROMOSOMES;BIOLOGICAL INDICATORS;CYTOLOGY;MONITORING;ANIMAL CELLS;HAMSTERS;MICE;DRUGS;BIOLOGICAL REPAIR;CHICKENS;MEASURING METHODS;BIOCHEMISTRY;DNA;MUTAGENESIS

<033119>
TITLE: Trace Element Deposition in Ambient Aerosol Inhalation
PROJECT NUMBER: R01 ES01326
PRINCIPAL INVESTIGATOR: Winchester, J.W.
ADDRESS: Department of Oceanography, Tallahassee, FL 32306
AFFILIATION: Florida State Univ., Tallahassee (USA). Dept. of Oceanography
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350

TYPE OF FUNDING: Grant No.-R01 ES01326;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$57,100
CHNOLOGY: FOSSIL FUEL/General (100%)
ERGY CYCLE: COMBUSTION OR END USE (100%)
LLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: The response to inhalation of ambient aerosol particles from indoor and selected outdoor environments will be investigated using high sensitivity elemental analysis by proton induced X-ray emission, PIXE. The response may include both deposition of particles in the respiratory tract and growth in particle size due to exposure to high relative humidity during breathing. Both responses may depend on particle size and on chemical composition of the particles and may be different for different component particles in a mixed aerosol. The different components may be distinguished by their different elemental composition, and the respiratory response of each may be determined in a single experiment. Samples will be taken by 5 stage cascade impactor with fine particle filter and will provide resolution of particles < 0.25 to > 4 mu m equivalent aerodynamic diameter. Each size range is analyzed for its elemental constituents by PIXE, including S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Br, Pb, Zr, Cd, and additional heavy metals if present in the aerosol. The nanogram sensitivity of the PIXE technique permits fine particle size resolution at a sampling rate of 1 liter/minute and requires of human subjects only 10 minutes or less of breathing time per sample. Experiments are carried out using ambient aerosol from different actual environments and do not require the use of special tracer
KEYWORDS: AEROSOLS;INHALATION;PARTICLES;RESPIRATORY SYSTEM;DEPOSITION;PARTICLE SIZE;CHEMICAL COMPOSITION;METALS;MEASURING INSTRUMENTS;LUNGS

<033120>
TITLE: Environmental Pollutants and Toxicology of the Liver
PROJECT NUMBER: R01 ES01332
PRINCIPAL INVESTIGATOR: Peterson, R.E.
ADDRESS: School of Pharmacy, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA). School of Pharmacy
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward, Jr.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01332
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$36,100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO (50%);ORGANICS/PCB;ORGANICS/Carbontetrachloride (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives are to study the effects of certain environmental pollutants and hepatotoxins with the retrograde intrabiliary injection (RII) technique and gain some insight into how these agents produce effects on the liver. Some studies have already been initiated using CCl/sub 4/ as a model compound to produce liver damage. We have found that CCl/sub 4/ liver damage produces a ''dicrotic notch'' in the recollection curve for the retrogradely injected compounds. Several approaches are proposed to investigate this finding based on the proposition that this effect of CCl/sub 4/ is on duct and ductular sites in the biliary tree. Ability to detect functional damage at such sites is a new finding for CCl/sub 4/. For obvious reasons, we will broaden the study to include other hepatotoxins and environmental pollutants. CO in initial trials, by virtue of its effect to depress bile flow, produces changes in the shape of the recollection curves for the compounds given by retrograde intrabiliary injection. Attempts will be made to differentiate effects of hypoxia from those of CO. Because dichloromethane type compounds are converted by metabolism to CO, possible intrahepatic release of CO and effects of this release will be evaluated. A study of selected compounds which produce liver damage will be made. Allylisopropylacetamide will be studied for hepatic porphyric effects. Liver damage and
KEYWORDS: CARBON TETRACHLORIDE;LIVER;PATHOLOGICAL CHANGES;BIOLOGICAL EFFECTS;CARBON MONOXIDE;BERYLLIUM;ORGANIC CHLORINE COMPOUNDS;BIOCHEMISTRY;TOXICITY

<033121>
TITLE: Lead Toxicity Related to Heme Biosynthesis
PROJECT NUMBER: R01 ES01343
PRINCIPAL INVESTIGATOR: Piper, W.N.
ADDRESS: School of Medicine, San Francisco, CA 94143
AFFILIATION: California Univ., San Francisco (USA). Dept. of Medicine
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-R01 ES01343
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$29,800
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Lead poisoning remains a major health problem in the United States. Up to 19% of the children from a recent series of screening programs from 1969-1971 had lead blood levels of 60 mu g/100 ml or higher, concentrations that are generally accepted as severe enough to require medical treatment. Lead is known to be toxic to the erythropoietic system, producing anemia. A possible explanation for this anemia is inhibition of heme biosynthesis in erythropoietic tissue. The goal of the research proposed in this project is to elucidate the role of a dialyzable, protective factor against lead inhibition of uroporphyrinogen I synthetase, an enzyme midway along the heme synthetic pathway. Results of preliminary experiments have demonstrated that this factor is present in the liver and offers complete protection against lead inhibition of hepatic uroporphyrinogen I synthetase activity. However, this factor is

evidently not present in the erythrocyte, or is present at a lower concentration, since lead is a potent inhibitor of hemolysate enzyme. The results of studies directed towards understanding this protection against lead inhibition of this enzymatic step of heme biosynthesis by this dialyzable factor will provide valuable information on mechanisms of lead toxicity and new information on the possible treatment of lead intoxication.
KEYWORDS: LEAD;TOXICITY;HEALTH HAZARDS;AIR POLLUTION;LAND POLLUTION;BLOOD CELLS;ECOLOGICAL CONCENTRATION;ERYTHROPOIESIS;ENZYMES;BIOCHEMICAL REACTION KINETICS;ANEMIAS

<033122>
TITLE: Preventive Surveillance of Environmental Chemicals for Toxic Potential
PROJECT NUMBER: Z01 ES 20003-04 OHHA
PRINCIPAL INVESTIGATOR: Posner, H.S.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Posner, H.S.
TELEPHONE: F629-3471
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$77,000
TECHNOLOGY: FOSSIL FUEL/General (33%);SOLAR/General (33%);SPECIFIED OTHER TECHNOLOGIES/Methanol (34%)
ENERGY CYCLE: TRANSPORTATION (33%);STORAGE (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The project develops and utilizes a variety of modes of preventive surveillance appropriate to NIEHS in the attempt to minimize possible toxic events in specific or general populations. The information developed relates, first to the compounds or physical agents being considered, and then as much as possible to related chemical, physical, or biological systems.
APPROACH: The biologic hazards of methanol were reviewed including its context in the many proposed uses in the future. Participation on the IMOS (Inadvertent Modification of the Stratosphere) Task Force of the Council on Environmental Quality and the Federal Council for Science and Technology, and one of its subcommittees resulted in a report entitled, ''Fluorocarbons and the Environment'' and in a proposal for short- and long-term research on the biologic and climatic effects of potential ozone reduction in the stratosphere.
KEYWORDS: LAND POLLUTION;HEALTH HAZARDS;MONITORING;HUMAN POPULATIONS;ORGANIC COMPOUNDS;VINYL MONOMERS;ORGANIC HALOGEN COMPOUNDS;METHANOL;BIOLOGICAL EFFECTS;STRATOSPHERE;AIR QUALITY;OZONE;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL EFFECTS;METABOLISM;INHALATION;SYNTHETIC FUELS;TOXICITY;INGESTION;MAN

<033123>
TITLE: Technological Surveillance of Potential Neurobehavioral Toxicity
PROJECT NUMBER: Z01 ES 20004-03 OHHA
PRINCIPAL INVESTIGATOR: Damstra, T.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Damstra, T.
TELEPHONE: F629-3471
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$49,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/As identified (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To determine whether exposure to a large variety of chemical agents from both existing and developing technologies may result in long-term neurological and behavioral consequences. (2) To assess the availability, validity, and utility of animal test systems which are used to reveal such neurobehavioral toxicity. (3) To evaluate methods for monitoring neurobehavioral effects in exposed humans. (4) To suggest research programs necessary to establish a firm scientific basis for using neurophysiological and behavioral tests as early warning indicators of toxicity.
APPROACH: Literature review aimed at integrating the available information on neurobehavioral toxicity. Attendance at meetings and membership on committees concerned with the neurological and behavioral effects of various agents. Reviews of documents and manuscripts; preparation of reports; and consultations with scientists from other Government agencies, industry, and academia.
RESULTS: The long-range objectives of this project are to (1) provide information on the neurological and behavioral effects of chemicals that may accumulate to critical levels following long-term low-level exposure and (2) to assess the practicality and validity of using neurobehavioral tests as early indicators of toxicity and surveillance ''tools.''
KEYWORDS: CENTRAL NERVOUS SYSTEM;BEHAVIOR;PHYSIOLOGY;LAND POLLUTION;HEALTH HAZARDS;DOSE-RESPONSE RELATIONSHIPS;NEUROLOGY;ANIMALS;TOXICITY;MONITORING;HUMAN POPULATIONS;BIOLOGICAL INDICATORS;DISEASES;INGESTION;INHALATION

<033125>
TITLE: Effects of Environmental Contaminants on Cardiac Function
PROJECT NUMBER: Z01 ES 30042-02 EBCB (ERR-4.75.2A)
PRINCIPAL INVESTIGATOR: Van Stee, E.W.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Van Stee, Ethard W.
TELEPHONE: F629-3404
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$17,500; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION IN SITU (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
OJECT DESCRIPTION: The objectives of this project are to assess the cardiac effects from exposure to various environmental agents. At the present time studies will be performed using isolated perfused small animal hearts. Compounds of current interest include low molecular weight halogenated alkanes such as anesthetics, fluorocarbons, and brominated compounds as well as some of the energy-related pollutants. In the future we would like to be able to compare in vitro vs. in vivo preparations using surgically implanted energy transducers and detectors. This project is directed toward the detection of functional changes in the cardiovascular system associated with the inhalation of anesthetics, fluorocarbons, and brominated compounds as well as energy-related pollutants. The function of isolated, perfused rabbit, rat, and guinea pig hearts will be monitored. Animals may be previously exposed to contaminants followed by excision and perfusion of hearts or the hearts may be exposed acutely in vitro. Myocardial mechanical, electrical, and metabolic activity may be monitored concurrently.
APPROACH: Two model systems are employed: (1) the perfused, isolated, Langendorff heart preparation; and (2) the superfused isolated papillary muscle preparation. Mechanical activity in the whole heart is monitored using an intraventricular balloon connected to a pressure transducer, and in the papillary muscle using a force transducer. Electrical activity is assessed using surface electrograms or microelectrode recordings. Metabclic activity of the whole heart is determined by monitoring perfusate pH, PCO/sub 2/, and PO/sub 2/ as it enters the aorta and as it exits the coronary sinus.
KEYWORDS: HEART;ALKANES;ANESTHETICS;BROMINE COMPOUNDS;POLLUTION;RABBITS;RATS;GUINEA PIGS;PHYSIOLOGY;METABOLISM;BIOLOGICAL EFFECTS;AIR POLLUTION;ORGANIC FLUORINE COMPOUNDS;ORGANIC BROMINE COMPOUNDS;HEALTH HAZARDS;HALOGENS;ORGANIC HALOGEN COMPOUNDS;INHALATION;CHEMICAL EFFLUENTS

<033127>
TITLE: Disposition, Pharmacokinetic Models, and Species-to-Species Extrapolation
PROJECT NUMBER: Z01 ES 02002-05 BB (ERR-6.76.52)
PRINCIPAL INVESTIGATOR: Anderson, M.W.;Eling, T.E.;Matthews, H.B.;Tuey, D.B.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Anderson, M.W.
TELEPHONE: F629-3448
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$140,000
TECHNOLOGY: CONSERVATION/Energy storage (30%);GENERAL SCIENCE (70%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/PCB (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this project is to understand the mechanisms which determine the disposition of environmental chemicals in various animal species and to develop pharmacokinetic models for these chemicals. After developing pharmacokinetic models in several species, it may be possible to extrapolate disposition of chemicals to other species, and, ultimately, to man. The prediction of the accumulation in man after low-level chronic exposure could then be done. Pharmacokinetic information (models) can be very useful in the design and interpretation of toxicity studies. The topics of present interest are: (1) disposition of several polychlorinated biphenyl isomers in the rat, mouse, dog, and monkey; and (2) development of pharmacokinetic models in these species.
KEYWORDS: PCB;LAND POLLUTION;HEALTH HAZARDS;METABOLISM;BIOCHEMICAL REACTION KINETICS;PHARMACOLOGY;MATHEMATICAL MODELS;BIOLOGICAL MODELS;MAN;FORECASTING;BODY BURDEN;CHRONIC INTAKE;DOSE-RESPONSE RELATIONSHIPS;RATS;MICE;DOGS;MONKEYS;DRUGS;ORGANIC CHLORINE COMPOUNDS;AROMATICS;ENVIRONMENTAL TRANSPORT

<033130>
TITLE: Microwave Exposure Systems and Microwave Dosimetry
PROJECT NUMBER: Z01 ES 50014-08 LEB
PRINCIPAL INVESTIGATOR: McRee, D.I.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: McRee, D.I.
TELEPHONE: F629-3382
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Microwaves (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is the objective of this project to develop exposure systems for bioeffects research and to develop and test techniques for measuring energy absorption. During the past year components have been obtained to develop waveguide exposure systems which will be used to expose cell systems and isolated neurons. The fabrication and calibration of the system will be accomplished during the next fiscal year.
APPROACH: The pressure transducer-capillary temperature detector was tested. The detector did not have the necessary stability at the desired sensitivity range. The response time of the instrument was slower than desired. As a result of these studies, this detector proved unsatisfactory for microwave energy absorption measurements at the levels associated with microwave hazards. A liquid crystal-optic fiber (LCOF) temperature measurement probe was obtained from the Office of Naval Research. This probe does not interact with the microwave field and provides a technique for measuring energy absorption. We used the probe to test the thermistor which we have been using for energy absorption measurements. Excellent agreement between the two detectors was obtained and verifies our techniques as being accurate.
EYWORDS: INSTRUMENTATION;MICROWAVE RADIATION;HEALTH HAZARDS;DOSE-RESPONSE RELATIONSHIPS;RADIATION DETECTION;PERFORMANCE TESTING;ACCURACY;ANIMAL CELLS;CENTRAL NERVOUS SYSTEM

<033131>
TITLE: Effects of Microwaves on Neural Response
PROJECT NUMBER: Z01 ES 50015-04 LEB
PRINCIPAL INVESTIGATOR: McRee, D.I.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: McRee, D.I.
TELEPHONE: P629-3382
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Microwaves (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to determine the effect of microwave radiation on neurological response. Isolated neurons such as the abdominal ganglion of the Aplysia, the sciatic nerves of frogs and the saphenous nerves of cats will be exposed to CW and modulated microwave radiation in the power density range of 1-10 mW/square cm. The effects of the microwave radiation on the strength-duration of a stimulus to produce an action potential, amplitude of the response, and conductive velocity will be investigated.
KEYWORDS: MICROWAVE RADIATION;HEALTH HAZARDS;NEUROLOGY;AIR POLLUTION;LAND POLLUTION;BIOLOGICAL RECOVERY;DOSE-RESPONSE RELATIONSHIPS;CENTRAL NERVOUS SYSTEM;PHYSIOLOGY;BEHAVIOR

<033132>
TITLE: Effects of 2450 MHz Microwave Radiation on Biological Materials at Cellular Level
PROJECT NUMBER: Z01 ES 50016-06 LEB
PRINCIPAL INVESTIGATOR: Hamrick, P.E.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Hamrick, P.E.
TELEPHONE: P629-3383
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Microwaves (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are to determine how 2450 MHz microwave radiation interacts with biological material at the cellular and macromolecular level, to observe any effects of this interaction and to relate the amount of microwave energy absorbed to the effects. Biological systems employed in the study are bacteria and bacteriophage, solutions of DNA, 2-4 cell stage embryos from mice, rabbit erythrocytes and rat lymphocytes. In these experiments, the temperature, humidity, and other various growth conditions have been carefully monitored in order to eliminate any effects not intrinsically caused by the microwave radiation. Results have shown very few differences between exposed and control samples that could not be explained by the thermal heating of the microwave radiation.
KEYWORDS: MICROWAVE RADIATION;HEALTH HAZARDS;CYTOLOGY;BIOLOGICAL MATERIALS;AIR POLLUTION;LAND POLLUTION;BACTERIA;DNA;MICE;EMBRYOS;ERYTHROCYTES;LYMPHOCYTES;RATS;THERMAL POLLUTION;BIOLOGICAL RADIATION EFFECTS;PRENATAL IRRADIATION;MOLECULAR BIOLOGY;ANIMAL CELLS

<033133>
TITLE: Effects of 2450 MHz Microwaves on the Embryonic Development of Japanese Quail
PROJECT NUMBER: Z01 ES 50017-04 LEB
PRINCIPAL INVESTIGATOR: McRee, D.I.;Hamrick, P.E.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: McRee, D.I.
TELEPHONE: P629-3382
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$42,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Microwaves (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are to determine the effects of 2450 MHz CW microwave radiation on the embryological development of Japanese quail and the subsequent growth, reproduction, and immunological response of the mature quail which had been exposed during the developmental period.
APPROACH: Fertilized Japanese quail eggs were exposed to 2450 MHz CW microwave for various periods of embryonic development at power densities of 30 mW/square cm and 5 mW/square cm. The effects of exposure on hatchability, gross deformities and hematological parameters were measured in the 2 day old quail. Fertilized eggs were also exposed to 5 mW/square cm for the first 12 days of development. The quail were kept to maturity and growth rates, egg production, fertility and immunological response were measured.
KEYWORDS: MICROWAVE RADIATION;EMBRYOS;BIRDS;HEALTH HAZARDS;PRENATAL IRRADIATION;DOSE-RESPONSE RELATIONSHIPS;AIR POLLUTION;LAND POLLUTION;GENETIC RADIATION EFFECTS;REPRODUCTION;TERATOGENESIS

<033137>
TITLE: Mutagenic Activity of Chemical Carcinogens in Neurospora Crassa
PROJECT NUMBER: Z01 ES 60003-04 LEM
PRINCIPAL INVESTIGATOR: Ong, T.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Ong, Tong-man
TELEPHONE: P629-3242
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Recent studies on the mutagenicity of chemical carcinogens in various systems have shown that there is a positive correlation between mutagenicity and carcinogenicity. Our previous studies with chemical carcinogens in Neurospora crassa not only show a positive correlation, but also indicate that potent chemical carcinogens induce predominantly base-pair substitution mutations. It is necessary to extend our studies to other carcinogenic compounds and to determine whether those compounds are also mutagenic in Neurospora and to determine whether those compounds induce bse-pair substitution mutations. The ad-3 test system of N. crassa developed by de Serres is used in this study. Conidia are treated with chemical carcinogens. Treated and untreated conidia are assayed for the presence of ad-3 mutants by the direct method. The isolated mutants are analyzed by complementation, dikaryon and trikaryon tests.
KEYWORDS: CARCINOGENS;MUTAGENESIS;NEUROSPORA;MUTATIONS;DNA

<033138>
TITLE: Development of a Spot Test System in Neurospora Crassa
PROJECT NUMBER: Z01 ES 60004-04 LEM
PRINCIPAL INVESTIGATOR: Ong, T.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Ong, Tong-man
TELEPHONE: P629-3242
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All chemicals (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Development of a spot test will provide a simple, economical and quick system in eukaryotes for the detection and evaluation of the mutagenic activity of chemical carcinogens and environmental agents. We have established optimal conditions for the spot test and have selected four strains from hundreds of mutants as tester strains. Conidia from 7-day-old vegetative cultures of testers are harvested and 2 x 10 to the 7 power conidia in 1 ml saline are added to 2 ml of cover medium. The mixture of conidia and cover medium is poured onto a plate containing 20 ml of Fries' minimal medium. Samples of an environmental agent are placed on the center of the plate. After 7 days' incubation at 30 degrees C, revertants from each plate are recorded. The results of our studies show that the spot test system of Neurospora can be used for screening the mutagenicity of environmental agents. We are in the process of improving our spot test system by introducing UV sensitive markers into tester strains. We are also in the process of developing a forward mutation spot test system.
KEYWORDS: CARCINOGENS;MUTAGENESIS;TESTING;NEUROSPORA;DNA;MUTATIONS

<033139>
TITLE: Mutagenicity and Mutagenic Specificity of Chemical Carcinogens in UV-Sensitive Strains of Neurospora Crassa
PROJECT NUMBER: Z01 ES 60006-03 LEM
PRINCIPAL INVESTIGATOR: Inoue, H.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Inoue, Hirokazu
TELEPHONE: P629-3434
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$56,000
TECHNOLOGY: NUCLEAR/General (30%);GENERAL SCIENCE (70%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Many studies, in bacteria as well as in other microbial organisms, have shown that some of the repair-deficient strains are more mutable than the wild type. In studies with the ad-3 test system of Neurospora crassa, F.J. de Serres and his co-workers showed that repair-deficient strains, upr-1 and uvs-2, are more mutable than wild type after UV or gamma-ray irradiations. It has also been shown by de Serres that the spectra of genetic alterations caused by UV in repair-deficient strains are different from that caused by UV in the wild type. It is of interest to study and compare the mutagenic sensitivity of repair-deficient and wild-type strains to various chemical carcinogens and to compare the spectra of genetic alterations caused by these carcinogenic agents in the UV-sensitive and the wild-type strains.
KEYWORDS: ULTRAVIOLET RADIATION;RADIOSENSITIVITY;MUTANTS;NEUROSPORA;SENSITIVITY;CARCINOGENS;BIOLOGICAL REPAIR;GENETIC EFFECTS;DNA;X RADIATION;MOLECULAR BIOLOGY;MUTAGENESIS

<033145>
TITLE: The Use of Male Germinal Tissue in the Detection of Mutational Events
PROJECT NUMBER: Z01 ES 60019-04 LEM (ERR-1.75.1 AND ERR 1.75.6)
PRINCIPAL INVESTIGATOR: Malling, H.V.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Malling, Heinrich V.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$5,000; Environmental Protection Agency FY77:$16,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The aim of this project is to develop systems for measuring the frequency of point mutations and DNA loss in male germinal tissue. These systems would have the advantage of testing the human population by means of readily available samples, i.e., spermatozoa. At present enzyme histochemical methods are being developed to detect point mutations in male mice and three enzymes and their inhibitors have been characterized. These enzymes are alpha-glycerophosphate dehydrogenase, lactate dehydrogenase and succinate dehydrogenase. Preliminary work has started with the FACS-1 cell sorter to determine its usefulness in measuring the distribution of DNA content in a population of sperm. It is hoped that this instrument may prove useful in showing changes in the distribution pattern in sperm populations derived from mice treated or untreated with known mutagens.
KEYWORDS: MUTATION FREQUENCY;GERM CELLS;SPERMATOZOA;MAN;DNA;MEASURING INSTRUMENTS;MUTAGENS;ANIMALS;ENZYMES;EPIDEMIOLOGY;IN VIVO

<033149>
TITLE: Comparison and Evaluation of Mutagenic Test Systems for Mass Screening Systems
PROJECT NUMBER: Z01-ES-60023-03 LEM
PRINCIPAL INVESTIGATOR: Claxton, L.D.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Claxton, Larry D.
TELEPHONE: F629-3227
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$7,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All chemical (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to evaluate and compare the usefulness, reliability and scientific soundness of presently available mutation test systems using a variety of mutagenic agents. This project will attempt to provide standardized protocols and computerized control of tests that can be used in future hierarchal test systems commonly called Tier tests. This evaluation would aid in the comparison of results from several test systems and in the extrapolation to human studies. The computer programming of test systems would ensure objective analysis and comparison of data which is not presently available.
KEYWORDS: MUTAGENS;MUTATIONS;TESTING;STANDARDS;COMPUTER CODES;IN VITRO;CARCINOGENS;BACTERIA

<033150>
TITLE: Comparative Sensitivities of Different Mouse Strains to Mutagenic Agents
PROJECT NUMBER: Z01 ES 60026-04 LEM
PRINCIPAL INVESTIGATOR: Soares, E.R.;Sheridan, W.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Soares, Eugene R.
TELEPHONE: F629-3372
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000
TECHNOLOGY: NUCLEAR/General (10%);GENERAL SCIENCE (90%)
POLLUTANTS: RADIATION (20%);SPECIFIED OTHER POLLUTANTS/General chemical (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Earlier studies, utilizing irradiation as the mutagenic source, have shown that the genome of the test organism is a major factor in the determination of its susceptibility to genetic damage. It is our purpose to investigate to what extent such genetically caused differences in sensitivity pertain to other mutagenic agents. We also want to know if the relative level of sensitivity of a defined genome to induction of mutations is constant for all agents or variable depending on the mutagen used.
KEYWORDS: MICE;SENSITIVITY;MUTAGENS;GENETIC EFFECTS;IN VIVO;MUTAGENESIS

<033151>
TITLE: Comparisons of Effects of Chemical Mutagens on Somatic and Germ Cells of Mice
PROJECT NUMBER: Z01 ES 60027-04 LEM
PRINCIPAL INVESTIGATOR: Sheridan, W.;Soares, E.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Sheridan, William
TELEPHONE: F629-3287
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$21,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (20%);SPECIFIED OTHER POLLUTANTS/General chemicals (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is designed to explore the feasibility of using somatic cells to screen for chemically induced chromosomal aberrations. Included in this project are comparisons with respect to the efficiency of detection of chromosome aberrations in germ cells (testicular preparations and sperm morphology), cultured lymphocytes and bone marrow preparations.
KEYWORDS: MICE;SOMATIC CELLS;GERM CELLS;MUTAGENS;CHROMOSOMAL ABERRATIONS;TESTING;FEASIBILITY STUDIES;ANIMALS;GENETIC EFFECTS;MUTAGENESIS;SOMATIC MUTATIONS;IN VITRO

<033152>
TITLE: Genetic Effects on Early Mouse Embryos After Mutagenic Treatment of the Parents
PROJECT NUMBER: Z01 ES 60028-03 LEM
PRINCIPAL INVESTIGATOR: Burki, K.;Sheridan, W.
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AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Burki, Kurt
TELEPHONE: F629-3466
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$91,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this project is to study the underlying causes of induced embryonic mortality in the dominant lethal test in the mouse. This is achieved by direct observation of the in vitro development of embryos and by cytogenetic analysis of their karyotypes.
KEYWORDS: MICE;EMBRYOS;DOMINANT MUTATIONS;LETHAL MUTATIONS;IN VITRO;MUTAGENESIS;TOXICITY

<033153>
TITLE: Simultaneous Detection of a Variety of Genetic Events in Aspergillus
PROJECT NUMBER: Z01 ES 60033-02 LEM
PRINCIPAL INVESTIGATOR: Scott, B.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Scott, Barry R.
TELEPHONE: F629-3282
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$7,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/General chemical (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: At present there is no system which can simultaneously detect both forward mutation and chromosome aberrations. This program is designed to fill this lacuna, such that at least 50 plus genetic events can be detected in one organism, Aspergillus nidulans, medium system. The objectives are to construct a diploid strain of Aspergillus heterozygous for various loci and to elucidate the types of induced mutagenic events induced in this strain by various standard mutagens.
KEYWORDS: ASPERGILLUS;MUTATIONS;CHROMOSOMAL ABERRATIONS;MUTAGENS;TESTING;GENETICS;SOMATIC MUTATIONS;MUTAGENESIS

<033154>
TITLE: Detection of Air Pollutants and Low Levels of Mutagens/Carcinogens
PROJECT NUMBER: Z01 ES 60034-02 LEM
PRINCIPAL INVESTIGATOR: Scott, B.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Scott, Barry R.
TELEPHONE: F629-3282
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$7,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/General chemical (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: "Low, repeated doses of such commonplace pollutants as fumes in the air and chemicals in drinking water are increasing risks of cancer, heart disease and genetic mutations," according to a Library of Congress report. This report also indicates that the existing testing methods are expensive, arduous and not sensitive enough to detect polluting agents. The primary aim of this project is to attempt to develop inexpensive biomonitors to detect these hazardous environmental agents and compare the results obtained with these systems with the work already in progress at Brookhaven using Tradescantia.
KEYWORDS: MUTAGENS;CARCINOGENS;TESTING;POLLUTION;BACTERIA;FUNGI;YEASTS;MICROORGANISMS;AEROSOLS;MUTAGENESIS

<033155>
TITLE: Development of Test Systems in Yeast
PROJECT NUMBER: Z01 ES 60035-02 LEM
PRINCIPAL INVESTIGATOR: Callen, D.F.
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AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Callen, David F.
TELEPHONE: F629-3242
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$42,000
TECHNOLOGY: GENERAL SCIENCE (100%)

POLLUTANTS: SPECIFIED OTHER POLLUTANTS/General chemical (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It should be possible to increase the sensitivity of the yeast strain D4 by (1) including the UV sensitive gene rad/sub 18/ in the strain. From the results of other workers it is known that a strain possessing this gene will be more sensitive than wild-type to a variety of mutagens. (2) Increasing the permeability of the strain D4 to mutagens. When the yeast cell is grown anaerobically the lipids become depleted. Since lipids are components of the outer membrane the permeability of this membrane may change. Although many systems are available for monitoring mutation or gene conversion, there is no simple method for detecting changes involving whole chromosomes. It is proposed to develop a method for monitoring non-disjunction in yeast by constructing a diploid strain heterozygous for two linked recessive resistance genes.
KEYWORDS: YEASTS;SENSITIVITY;MUTAGENS;CHROMOSOMAL ABERRATIONS;TESTING;GENETIC EFFECTS;MUTAGENESIS;SOMATIC MUTATIONS;ULTRAVIOLET RADIATION

<033156>
TITLE: Genetic Activity of Environmental Agents in Yeast
PROJECT NUMBER: Z01 ES 60036-02 LEM
PRINCIPAL INVESTIGATOR: Callen, D.F.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Callen, David F.
TELEPHONE: F629-3242
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/General chemical (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Studies with yeast indicated that (1) a drug, F30066, used in China for the treatment of schistosomiasis, was genetically active and (2) of three structurally related nitroimidazoles tested, one was found to be genetically active in the yeast system.
KEYWORDS: YEASTS;GENETIC EFFECTS;DRUGS;IMIDAZOLES;DISEASES;MUTATIONS;MUTAGENESIS;CARCINOGENS

<033157>
TITLE: Aflatoxin Activation and Mutagenesis in Neurospace Crassa
PROJECT NUMBER: Z01 ES 60038-01 EMB
PRINCIPAL INVESTIGATOR: Ong, T.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Ong, Tong-Han
TELEPHONE: F629-3242
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$42,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/General chemical (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Aflatoxin B/sub 1/ is known to be one of the most potent chemical carcinogens ever found in the human environment. This and other aflatoxins, unfortunately, are common contaminants in agricultural products. Studies on the carcinogenicity of aflatoxins in rats have shown that aflatoxin B/sub 1/ is more tumorgenic than aflatoxin G/sub 1/ in liver. The latter compound, however, induces more tumor formation than the former compound in male kidney. Neither aflatoxin B/sub 1/ or G/sub 1/ are carcinogenic in the kidney of female rats. It would be of interest, therefore, to see (1) are more mutagenic metabolites being converted from aflatoxin B/sub 1/ than aflatoxin G/sub 1/ by rats liver homogenates; (2) are more mutagenic metabolites being converted from aflatoxin G/sub 1/ than aflatoxin B/sub 1/ by kidney homogenates of male rats; (3) are kidney homogenates from female rats failing to convert aflatoxins B/sub 1/ and G/sub 1/ to mutagenic metabolites; (4) does epoxy hydrase affect the presence of mutagenic metabolites; and (5) is 2,3 epoxide an active form of aflatoxin metabolites. Conidia are treated with aflatoxin B/sub 1/ or G/sub 1/, rat liver or kidney homogenates and a NADPH generating system at 37 degrees C for 2 hours. Epoxy hydrase or epoxy hydrase inhibitor might also be added to the treatment solution. At the end of the treatment conidia are washed. Treated and untreated conidia are assayed for the presence of ad-3 mutants by the direct method.
KEYWORDS: APLATOXIN;CARCINOGENESIS;LIVER;RATS;KIDNEYS;GENETICS;IN VITRO;CARCINOGENS;FOOD;MUTATIONS

<033160>
TITLE: Synergistic Effects of Radiation and Chemical Mutagens on Spermatogonia in Mice
PROJECT NUMBER: Z01 ES 60041-02 LEM
PRINCIPAL INVESTIGATOR: Sheridan, W.;Soares, E.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Sheridan, William
TELEPHONE: F629-3287
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000
TECHNOLOGY: NUCLEAR/General (10%);GENERAL SCIENCE (90%)
POLLUTANTS: RADIATION (10%);SPECIFIED OTHER POLLUTANTS/General chemical (90%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Investigations using known chemical mutagens have failed to show induction of dominant lethal mutations in spermatogonial stem cells of mice. We are investigating whether pretreatment with

irradiation will sensitize spermatogonia to induction of mutations by chemical treatment following the irradiation. Comparisons are being made between groups of animals receiving the combined treatment, radiation alone or only chemical treatment for induction of dominant lethals and chromosome aberrations.
KEYWORDS: IONIZING RADIATIONS;IRRADIATION;SPERMATOGONIA;MICE;GENETIC RADIATION EFFECTS;MUTATIONS;RADIOINDUCTION;MUTAGENS;RADIOSENSITIVITY EFFECTS;SYNERGISM;GAMMA RADIATION

<033161>
TITLE: The Study of Recessive Lethal Mutations Induced in Mice by Chemical Mutagens
PROJECT NUMBER: Z01 ES 60042-02 LEM
PRINCIPAL INVESTIGATOR: Sheridan, W.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Sheridan, William
TELEPHONE: FTS 629-3287
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Studies of the induction of recessive lethal mutations in mice by chemical mutagens are being conducted. Backcross progeny between F/sub 1/ offspring to chemical mutagen treated parents and their F/sub 2/ daughters are used to detect the presence of recessive lethals. An increase in fetal mortality is used as indicator of the lethal.
KEYWORDS: LETHAL MUTATIONS;MICE;MUTAGENS;PROGENY;FETUSES;MORTALITY;BIOLOGICAL EFFECTS;MUTAGENESIS;IN VIVO

<033162>
TITLE: Biochemical Genetic Variation: Its Measurement and Significance
PROJECT NUMBER: Z01 ES 60044-02 LEM
PRINCIPAL INVESTIGATOR: Langley, C.H.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Langley, Charles H.
TELEPHONE: FTS 629-3434
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$126,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Population geneticists have been aware of the enormous genetic variation at biochemical level in natural populations (including humans) for some ten years. No satisfactory interpretation of the biological significance of the subtle variations has been identified. The aim of this project is to discern association among various biochemical polymorphism that might indicate their physiological or developmental effects.
KEYWORDS: BIOCHEMISTRY;GENETICS;GENETIC VARIABILITY;HUMAN POPULATIONS;BIOLOGICAL EFFECTS;EPIDEMIOLOGY;ENVIRONMENT;POPULATION DYNAMICS;ENZYMES;MUTATIONS

<033164>
TITLE: Effect of Environmental Agents on Ontogenesis After Parental Exposure
PROJECT NUMBER: Z01-ES-70020-05 LET
PRINCIPAL INVESTIGATOR: Staples, R.E.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Staples, Robert E.
TELEPHONE: FTS 629-3418
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$84,000
TECHNOLOGY: CONSERVATION/General (25%);GENERAL SCIENCE (75%)
POLLUTANTS: ORGANICS (80%);NOISE, VIBRATION (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The long range purpose of this project is to estimate the potential hazard of selected environmental agents to human development. Studies were conducted to determine the teratogenic potential of Dipterex, captan, ethylenethiourea, asbestos, noise, and Provera in laboratory animals (mice, rats, rabbits, or hamsters).
KEYWORDS:
ONTOGENESIS;HAZARDS;MAN;TERATOGENESIS;ASBESTOS;NOISE;INSECTICIDES;MICE;RATS;RABBITS;HAMSTERS;ENVIRONMENTAL EFFECTS;INGESTION;INHALATION;TOXICITY

<033165>
TITLE: Postimplantation Embryo Culture: A Model for the Study of Organogenesis
PROJECT NUMBER: Z01 ES 70010-01 LET
PRINCIPAL INVESTIGATOR: Staples, R.E.;Sanyal, M.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Staples, Robert E.
TELEPHONE: FTS 629-3418
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: CONSERVATION/General (30%);GENERAL SCIENCE (70%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)

REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This work was undertaken to determine whether direct application of test agents to embryos followed by continued development to near term in vivo would prove to be a valuable approach for detection of teratogenicity and embryotoxicity.
KEYWORDS: MAMMALS;EMBRYOS;ASBESTOS;HEALTH HAZARDS;TERATOGENESIS;DOSE-RESPONSE RELATIONSHIPS;ORGANIC COMPOUNDS;CHLOROFORM;PESTICIDES;IN VIVO;ENVIRONMENT;AIR POLLUTION;LAND POLLUTION;TERRESTRIAL ECOSYSTEMS;REPRODUCTION;BIOLOGICAL EFFECTS;TOXICITY

<033166>
TITLE: The Study of Toxic Effects of Environmental Chemicals on Spermatogenesis
PROJECT NUMBER: Z01 ES 70080-04 LET
PRINCIPAL INVESTIGATOR: Lee, I.P.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Lee, Insu P.
TELEPHONE: F629-3390
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$210,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: These studies seek to assess the effects of environmental agents on spermatogenesis. Environmental chemicals are tested, test systems validated and new approaches to toxicity testing proposed. To date, alkylating agents and selected trace metals have been studied. The DNA repair system in mouse germ cells appears useful as a predictor of toxicity. Biochemical and toxic effects of environmental agents on rodent spermatogenesis are also studied using velocity sedimentation cell separation and serial mating techniques. Enzyme development during spermatogenesis and "marker" enzymes have been defined which indicate normal cellular differentiation as well as toxic effects of chemicals. The nature of the blood-testis barrier and the penetration of environmental chemicals from blood to spermatogenesis cells have been reported. These studies contribute to an improved understanding of the reliability of laboratory animal toxicity tests for reproductive effects and the validity of their extrapolation to humans.
KEYWORDS: CHEMICAL EFFLUENTS;TOXICITY;METALS;ORGANIC COMPOUNDS;TERRESTRIAL ECOSYSTEMS;REPRODUCTION;RATS;DNA;BIOLOGICAL REPAIR;BIOLOGICAL INDICATORS;SPERMATOGENESIS;BIOCHEMICAL REACTION KINETICS;ENZYMES;BLOOD;TESTES;HUMAN POPULATIONS;HEALTH HAZARDS;AIR POLLUTION;LAND POLLUTION;MUTAGENESIS

<033167>
TITLE: Factors Affecting the Regulation and Metabolism of Urine and Hemoproteins in Mammalian Tissues
PROJECT NUMBER: Z01 ES 70140-05 LET
PRINCIPAL INVESTIGATOR: Woods, J.S.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Woods, James S.
TELEPHONE: F629-3340
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$140,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are: (1) to determine a functional correlation between hepatic heme biosynthesis and the biogenesis of hepatic hemoproteins in fetal mammalian liver; (2) to evaluate the nature of the specific role of heme in the synthesis and assembly of hepatic cytochromes, specifically cytochrome oxidase and cytochrome P-450; (3) to investigate the relationship between hemoprotein synthesis and the biogenesis of mitochondria in fetal liver; (4) to determine the mechanisms by which agents that specifically interfere with hepatic heme synthesis might alter the functional development of metabolic and/or drug-metabolizing enzymes in fetal liver; and (5) to provide a means for predicting the potential transplacental hematotoxicity of environmental agents in humans.
KEYWORDS: HEME;BIOSYNTHESIS;MAMMALS;REPRODUCTION;HEALTH HAZARDS;ORGANIC COMPOUNDS;TERRESTRIAL ECOSYSTEMS;AIR POLLUTION;LAND POLLUTION;METABOLISM;TOXICITY;LIVER;BLOOD;ENZYMES;MOLECULAR BIOLOGY

<033168>
TITLE: The Morphologic and Biochemical Effects of Toxic Metals
PROJECT NUMBER: Z01 ES 70200-04 LET (ERR-2.76.43)
PRINCIPAL INVESTIGATOR: Fowler, B.A.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Fowler, B.A.
TELEPHONE: F629-3363
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$332,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: When animals are chronically exposed to different trace metals, each metal produces an enzymatic response profile which specifically characterizes exposure to that metal. It is the objective of these studies to assess and characterize response profiles resulting from exposure to various environmentally important toxic metals and apply knowledge of their response profiles to the design of

tests (such as the ALA test currently available for the detection of lead) for use among human populations in detecting pre-clinical, i.e., pre-toxic, exposure to a given metal. Specific metals and areas of interest include the biochemical effects of methyl mercury, arsenic, lead, and lead plus fluoride on mitochondrial structure and function. Enzyme activities associated with mitochondrial membranes have been found to show early and pronounced changes in mitochondria of rats and mice following chronic exposure to methyl mercury and arsenic. Further development of these biochemical response profiles should permit development of metal-specific biochemical testing procedures which accurately assess a biological response to exposure from these agents.
KEYWORDS: AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;HEALTH HAZARDS;CHRONIC INTAKE;METHYLMERCURY;ARSENIC;LEAD;LEAD FLUORIDES;MITOCHONDRIA;CELL MEMBRANES;HUMAN POPULATIONS;TOXICITY;ENZYMES;MOLECULAR BIOLOGY

<033169>
TITLE: Neurobehavioral Toxicity of Developmental Exposure to Lead
PROJECT NUMBER: Z01 ES 70220-04 LET
PRINCIPAL INVESTIGATOR: Kimmel, C.A.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Kimmel, C.A.
TELEPHONE: FTS 629-3388
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The effects of lead on the behavior and development of offspring exposed chronically before and after birth is being studied. A broad battery of observations of physical developmental milestones, reflex ontogeny, and behavioral functions is being employed to determine the full range of neurotoxic potential of lead. These observations are being related to the teratogenic activity and body burden of lead as estimated from levels found in blood, brain, and bone at various times throughout the exposure period and to neurochemical parameters which indicate changes in developing brain chemistry. The value of this multidisciplinary approach will be evaluated in terms of its usefulness for routine evaluation of compounds with unknown neurotoxic potential.
KEYWORDS: NEUROLOGY;BEHAVIOR;TOXICITY;LEAD;LAND POLLUTION;HEALTH HAZARDS;TERATOGENESIS;BODY BURDEN;BLOOD;BRAIN;SKELETON;ANIMALS;INGESTION;NEUROLOGY;REPRODUCTION

<033170>
TITLE: Xenobiotic Metabolizing Enzyme Activity in Skin and Its Response to Environmental Agents
PROJECT NUMBER: Z01 ES 80003-04 LP
PRINCIPAL INVESTIGATOR: Pohl, R.J.;Pouts, J.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Pohl, R.J.
TELEPHONE: FTS 629-3241
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$77,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (95%);SPECIFIED OTHER POLLUTANTS/Ultraviolet, 254nm, 300nm, 355nm (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is designed to elucidate the role of xenobiotic metabolizing enzymes in toxic responses of skin to environmental agents. Enzyme activity and cytochrome P-450 content are assayed in skin microsomes isolated from hairless mice and NZW rabbits after exposure of the animals to polycyclic hydrocarbons, chlorinated hydrocarbons, ultraviolet radiation, etc.
KEYWORDS: ENZYMES;SKIN;HEALTH HAZARDS;ULTRAVIOLET RADIATION;DOSE-RESPONSE RELATIONSHIPS;MICE;RABBITS;HYDROCARBONS;SKIN ABSORPTION;CHLORINATED ALICYCLIC HYDROCARBONS;CHLORINATED ALIPHATIC HYDROCARBONS;TOXICITY;CARCINOGENS

<033171>
TITLE: Study of Factors Affecting Biotrans Formation of Xenobiotics and Internal Transplant of Nutrients
PROJECT NUMBER: Z01 ES 80004-05 LP
PRINCIPAL INVESTIGATOR: Chhabra, R.S.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Chhabra, R.S.
TELEPHONE: FTS 629-3386
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: METALS (25%);ORGANICS (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The long range purpose of this project is to study the effects of environmental pollutants such as heavy metals, pesticides, and carcinogenic polycyclic hydrocarbons on the biological functions of the intestine. In past years, the emphasis was on studying the factors influencing the toxication-detoxication of foreign chemicals by intestinal mucosa. Other intestinal functions such as digestion, absorption, and metabolism of nutrients which may be affected adversely by the presence of environmental pollutants in food are under initial stages of investigation.
APPROACH: There are three subprojects currently under study: (1) comprehensive studies of xenobiotic

metabolizing enzyme systems in rabbit small intestine and comparison with similar systems in liver and effects of environmental pollutants on these systems; (2) genetic regulation of induction of xenobiotic metabolizing enzymes in various strains of mice; and (3) study of effects of pollutants such as lead and dioxins on the intestinal absorption of amino acids and carbohydrates.
KEYWORDS: METALS;PESTICIDES;CARCINOGENS;CHLORINATED ALICYCLIC HYDROCARBONS;INTESTINES;METABOLISM;LIVER;RABBITS;GENETIC EFFECTS;LUNGS;ENZYMES;HEALTH HAZARDS;LAND POLLUTION;PHYSIOLOGY;ANIMALS;TOXICITY

<033172>
TITLE: In Vitro Metabolism of Xenobiotics by Selected Marine Species
PROJECT NUMBER: Z01 ES 80005-05 LP
PRINCIPAL INVESTIGATOR: Bend, J.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Bend, J.R.
TELEPHONE: F629-3422
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$168,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;COASTS/Northeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To compare hepatic and extrahepatic microsomal xenobiotic oxidative metabolism in several vertebrate and invertebrate marine species. (2) To characterize the hepatic mixed-function oxidase system of the little skate, Raja erinacea, since it possesses relatively high enzyme activity. (3) To investigate some xenobiotic conjugating enzymes in marine vertebrates and invertebrates. (4) To study the effects of environmental contaminant administration on in vitro xenobiotic mixed-function oxidation and conjugation by tissues from marine elasmobranchs and teleosts.
APPROACH: We are investigating the biotransformation of foreign organic compounds in hepatic and extrahepatic tissues of vertebrate and invertebrate marine species from coastal Maine and Florida. Both cytochrome P-450-dependent microsomal mixed-function oxidases and epoxide or arene oxide metabolizing enzymes (epoxide hydrase and glutathione S-transferases) are being characterized in control fish and in fish pre-exposed to environmental contaminants such as polycyclic aromatic hydrocarbons or dioxins.
KEYWORDS: LIVER;METABOLISM;VERTEBRATES;INVERTEBRATES;ENZYMES;AQUATIC ORGANISMS;WATER POLLUTION;BIOLOGICAL EFFECTS;ORGANIC COMPOUNDS;FISHES;CHLORINATED ALICYCLIC HYDROCARBONS;ORGANIC OXYGEN COMPOUNDS;TOXICITY;CARCINOGENS;IN VITRO

<033173>
TITLE: Pollutants: Uptake, Distribution, Metabolism, Excretion and Storage Sites in Marine Species
PROJECT NUMBER: Z01 ES 80006-06 LP
PRINCIPAL INVESTIGATOR: Bend, J.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Bend, J.R.
TELEPHONE: F629-3386
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000; Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS (75%);HEAT, THERMAL (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;COASTS/Northeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The long range objectives of this project are to study the in vivo uptake, distribution, metabolism, and excretion of single, purified radiolabeled environmental contaminants, such as 2,4,5-trichlorophenoxyacetic acid, polychlorinated biphenyl isomers or hydrocarbons, in vertebrate and invertebrate marine species that serve as human food sources. The role of environmental temperature and exposure to other pollutants on the processes involved are also investigated.
KEYWORDS: WATER POLLUTION;HEALTH HAZARDS;ORGANIC COMPOUNDS;THERMAL POLLUTION;WASTE HEAT;METABOLISM;HYDROCARBONS;VERTEBRATES;INVERTEBRATES;AQUATIC ORGANISMS;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;BIOCHEMICAL REACTION KINETICS;ABSORPTION;TOXICITY;UPTAKE;ENZYMES;FISHES;ANIMAL CELLS

<033174>
TITLE: Pharmacokinetic Functions of the Lung
PROJECT NUMBER: Z01 ES 80009-06 LP
PRINCIPAL INVESTIGATOR: Eling, T.E.;Anderson, M.W.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Eling, T.E.
TELEPHONE: F629-3448
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$112,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (25%);ORGANICS (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The goal of this project is to examine pharmacokinetic functions of the lung with regard to both endogenous and exogenous chemicals. The pharmacokinetics of these chemicals will be related to

environmentally induced pulmonary damage. An isolated perfused lung is used which permits examination of the pharmacokinetics of chemicals reaching the lungs both from the circulatory system and from the inhaled air.
KYWORDS: LUNGS;PERFUSED TISSUES;AIR POLLUTION;BIOCHEMICAL REACTION KINETICS;PHARMACOLOGY;HEALTH HAZARDS;METALS;ORGANIC COMPOUNDS;TOXICITY;ENZYMES;IN VITRO;METABOLISM;BIOLOGICAL FUNCTIONS

<033175>
TITLE: Prostaglandin and Thromboxane Biosynthesis and Release by Lungs
PROJECT NUMBER: Z01 ES 80010-06 LP
PRINCIPAL INVESTIGATOR: Eling, T.E.;Anderson, M.W.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Eling, T.E.
TELEPHONE: F629-3448
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$77,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The goal of this project is to study the biosynthesis, release, and metabolism of prostaglandins (PG) by pulmonary tissue and to relate altered PG biosynthesis, release, or metabolism to pulmonary diseases. Also of interest is to study prostaglandins as early indicators of pulmonary damage induced by exposure to environmental agents. Emphasis is being placed on studying the biochemical mechanisms that control the release of PG precursors, unsaturated fatty acids, from lung phospholipids and, thus, partially controlling PG biosynthesis. This is a continuing project directed toward obtaining a better understanding of lung function. The primary objectives are to investigate the biosynthesis, release, and metabolism of prostaglandins by the lung and to relate changes in steady-state concentrations of the various prostaglandins to biological effects. In addition, the effects of various environmental agents (SO/sub 2/, O/sub 3/, NO/sub 2/, O/sub 2/, etc.) on the ability of the lung to synthesize, release, and degrade prostaglandins (PG) will be investigated. Attempts will be made to correlate the biological effect of pollutants and modulation of PG levels with human pulmonary diseases. Altered PG biosynthesis and release in pathologic states will be examined as potential markers for pulmonary damage.
KEYWORDS: PROSTAGLANDINS;METABOLISM;BIOSYNTHESIS;BIOLOGICAL INDICATORS;LUNGS;HEALTH HAZARDS;LAND POLLUTION;PATHOLOGICAL CHANGES;SULFUR DIOXIDE;OZONE;NITROGEN DIOXIDE;OXYGEN;BIOLOGICAL EFFECTS;INHALATION;CHEMICAL EFFLUENTS;ENZYMES;AIR POLLUTION

<033176>
TITLE: Biochemical Indices of Inhalation Exposure to Environmental Agents
PROJECT NUMBER: Z01 ES 80018-07 EBCB
PRINCIPAL INVESTIGATOR: Van Stee, E.W.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Van Stee, E.W.
TELEPHONE: F629-3404
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000
TECHNOLOGY: CONSERVATION/General (25%);GENERAL SCIENCE (75%)
ENERGY CYCLE: COMBUSTION IN SITU (25%);TRANSPORTATION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Determine if pretreatment of animals with compounds which modify hepatic and/or pulmonary microsomal enzymes will alter the acute and chronic toxicity of selected environmental agents including benzene, xylene, vinyl chloride and vinyl bromide. (2) Determine whether inhalation of common solvents affects their enzymatic degradation in lung and liver. (3) Identify the various metabolic pathways involved in the enzymatic degradation of p-xylene and vinyl bromide, and determine whether pretreatment by known inducers stimulates different pathways. (4) Develop systems for assaying the in vitro metabolism of these solvents and investigate the variables which alter the rate of metabolism of these compounds. (5) Investigate the uptake oxidation and incorporation of glucose, amino acids and fatty acids by lung tissue and evaluate the relationship between metabolic changes and functional changes occurring after exposure to toxicants, inhibitors, uncouplers or metal ions. (6) Continue the development of the inhalation facility with automated monitoring systems and the capability of handling hazardous materials.
APPROACH: In this long term project the effects of inhaled solvents are being investigated. Biochemical indices of pulmonary and hepatic injury are being studied using serum enzymes as well as pulmonary and hepatic microsomal enzymes. Oxygen consumption of lung slices is being used to assess toxicity of these agents. Previous compounds investigated include benzene and dichloromethane. Agents presently being studied include xylene, vinyl chloride and vinyl bromide.
KEYWORDS: BIOCHEMISTRY;INHALATION;AIR POLLUTION;HEALTH HAZARDS;SOLVENTS;LUNGS;PATHOLOGICAL CHANGES;TOXICITY;BENZENE;XYLENES;VINYL MONOMERS;METABOLISM;CHLORIDES;BROMIDES;BIOCHEMICAL REACTION KINETICS;ORGANIC COMPOUNDS;LIVER;PREVENTIVE MEDICINE;SYNERGISM;KIDNEYS;HEART;CHEMICAL EFFLUENTS

<033177>
TITLE: Changes in Mammalian Pulmonary Function Produced by Inhaled Environmental Agents
PROJECT NUMBER: Z01 ES 80020-05 EBCB
PRINCIPAL INVESTIGATOR: Van Stee, E.W.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Van Stee, E.W.
TELEPHONE: F629-3404
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/General (25%);CONSERVATION/General (10%);GENERAL SCIENCE (65%)
ENERGY CYCLE: COMBUSTION IN SITU (25%);TRANSPORTATION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%)
POLLUTANTS: NOXIOUS GAS (75%);PARTICULATES (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our objectives are to develop the technology necessary to monitor classical indices of pulmonary function in small animals and to develop more sensitive indicators of pulmonary disease. Changes in pulmonary function caused by inhalation of various environmental agents are of specific interest. These functional changes will be correlated with changes in heart rate and in pulmonary morphology. Compounds of current interest are H/sub 2/SO/sub 4/ mist, ozone, a combination of the two, aluminum dusts, and an aerosol of the toxin produced by Gymnodinium breve, a dynoflagellate which causes the Florida Red Tide.
APPROACH: Changes in pulmonary function resulting from inhalation of airborne pollutants are being estimated using a whole body pressure plethysmograph constructed for use with small animals. Both acute and chronic exposure to oxidants, singly and in combination with other compounds result in functional changes. Changes in pulmonary mechanics (e.g. resistance, compliance), spirometry (e.g., lung volumes, frequency of breathing), heart rate, and pulmonary morphology will be estimated.
KEYWORDS: LUNGS;AIR POLLUTION;INHALATION;HEALTH HAZARDS;ANIMALS;BIOLOGICAL INDICATORS;SULFURIC ACID;OZONE;SYNERGISM;ALUMINIUM;AEROSOLS;PHYSIOLOGY;DOSE-RESPONSE RELATIONSHIPS;MORPHOLOGICAL CHANGES;CHEMICAL EFFLUENTS;INHALATION

<033178>
TITLE: The Composition and Origins of the Acellular Lining Layer of the Lung
PROJECT NUMBER: Z01 ES 80023-05 LP
PRINCIPAL INVESTIGATOR: Hook, G.E.R.;DiAugustine, R.P.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Hook, Gary E.R.
TELEPHONE: F629-3385
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$165,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Numerous chemical analyses of the acellular lung lining layer have been made and there is little doubt concerning the identity of the surfactant material obligatory for normal lung function. However, the acellular layer is also a barrier to the environment and consequently may be one of the first sites subject to attack by inhaled toxic agents. Unfortunately, apart from its lipid composition very little is known about the acellular lining layer. The objectives of this investigation are as follows: (1) to determine the enzymatic and protein composition of the lung lining; (2) to determine the origin of these activities, and (3) to investigate compositional variations of the lining under the influence of drugs, disease, and airborne pollutants.
KEYWORDS: LUNGS;GASEOUS WASTES;CHEMICAL EFFLUENTS;ORGANIC COMPOUNDS;TERRESTRIAL ECOSYSTEMS;PHYSIOLOGY;ENZYMES;PROTEINS;DRUGS;DISEASES;AIR POLLUTION;BIOLOGICAL EFFECTS;HEALTH HAZARDS;METABOLISM;TOXICITY;ANIMALS

<033180>
TITLE: Diagnostic Markers of Pulmonary Damage and Disease
PROJECT NUMBER: 201 ES 80028-02 LP
PRINCIPAL INVESTIGATOR: Hook, G.E.R.;Reasor, M.J.;Nadeau, D.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Hook, Gary E.R.
TELEPHONE: F629-3385
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$112,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is concerned with the identification and characterization of components which are lung specific or pulmonary disease-related which could be used as diagnostic markers for pulmonary damage or disease. Current attention is being focused on (1) the soluble alkaline phosphatases of the normal lung, (2) abnormal hydrolases present in pulmonary lavage effluents from patients with alveolar proteinosis, and (3) enzymic components of human amniotic fluid which originate in the fetal lung.
KEYWORDS: LUNGS;DISEASES;BIOLOGICAL INDICATORS;AIR POLLUTION;RESPIRATORY SYSTEM DISEASES;ENZYMES;HUMAN POPULATIONS;LAVAGE;FETUSES;AMNIOTIC FLUID;TERATOGENESIS;HEALTH HAZARDS;LAND POLLUTION;TOXICITY

<033181>
TITLE: Diagnostic Markers of Pulmonary Damage and Disease
PROJECT NUMBER: Z01 ES 80028-02 LP
PRINCIPAL INVESTIGATOR: Hook, G.E.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: Hook, Gary E.R.
TELEPHONE: F629-3385
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$112,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: These studies have been concerned with a number of human pulmonary diseases of possible environmental origin which are treated clinically by bronchoalveolar lavage. The diseases being studied are alveolar proteinosis, bronchial asthma, and some occupationally related unnamed pulmonary disorders. At present, attention has been directed towards characterization of lavage effluent components from patients with alveolar proteinosis, a human pulmonary disease of unknown etiology characterized by the accumulation of large amounts of proteinaceous material in the acini of the lungs.
KEYWORDS: LUNGS;DISEASES;RESPIRATORY SYSTEM DISEASES;ETIOLOGY;BRONCHI;LAVAGE;OCCUPATIONAL DISEASES;MAN;ORGANIC COMPOUNDS;HEALTH HAZARDS;TOXICITY;AIR POLLUTION;METABOLISM;ENZYMES

<033182>
TITLE: Synthesis of Polypeptide Hormones and Prohormones by Normal and Neoplastic Lung Epithelium
PROJECT NUMBER: Z01 ES 8033-01 LP
PRINCIPAL INVESTIGATOR: DiAugustine, R.P.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITOR: DiAugustine, Richard P.
TELEPHONE: F629-3218
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$280,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Certain non-endocrine tumors have been reported to produce polypeptide hormones. For instance, the formation of adrenocorticotropic hormone (ACTH) and "big" or precursor ACTH by lung tumors in man is well known. The proposed studies will attempt (1) to correlate the synthesis of ACTH as detected by radioimmunoassay and immunohistochemical techniques with the various stages of tumor growth, (2) to examine the possible formation de novo of polypeptide hormones in vitro in tracheal organ cultures in the presence of chemical carcinogens, and (3) to develop sensitive radioimmunoassay procedures that can be used for the diagnosis, management, and early detection of bronchogenic carcinomas.
KEYWORDS: GASEOUS WASTES;ORGANIC COMPOUNDS;HEALTH HAZARDS;LUNGS;NEOPLASMS;POLYPEPTIDES;PEPTIDE HORMONES;ACTH;SYNTHESIS;TRACER TECHNIQUES;RADIOIMMUNOLOGY;CARCINOGENESIS;CHEMICAL EFFLUENTS;AIR POLLUTION;MAN;ETIOLOGY;ANIMALS;DISEASES;INHALATION

<033183>
TITLE: Fate of Heavy Metals and Heavy Metal Complexes in Soils and Plants
PROJECT NUMBER: N01-ES-2-2043
PRINCIPAL INVESTIGATOR: Wildung, R.E.
ADDRESS: Battelle Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Office of Program
MONITOR: Piver, Warren T.
TELEPHONE: F629-3471
TYPE OF FUNDING: Contract No.-72-2043
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$98,500
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The proposed investigations will aim at determining, by means of radiotracers and advanced chemical analytical techniques, the fate of agriculturally important metals in soils, in soil microorganisms, and in representative grass and broadleafed plants grown on treated soil. The rate and extent of uptake and translocation and the sites of deposition of metallic compounds within the plant will be measured. In microbial and plant tissues in which radioactivity is accumulated, investigations will be directed toward determining the bond types and the chemical forms of the metabolites. Establishment of the deposition locations of metals and metal transformation products will allow both the reaction pathway to be estimated and the rate-limiting reactions to be studied in depth. The results of the fundamental investigations will be utilized to devise recommendations for chemical treatments and soil-crop management practices which may serve as remedial or preventive measures to minimize health hazards arising from the accumulation of metals or their metabolites.
KEYWORDS: HEAVY METALS;METALS;COMPLEXES;DIFFUSION;LAND POLLUTION;SOILS;TRACER TECHNIQUES;RADIOISOTOPES;AGRICULTURE;UPTAKE;TRANSLOCATION;DEPOSITION;PLANTS;ENVIRONMENTAL EXPOSURE PATHWAY;BIOLOGICAL REPAIR;HEALTH HAZARDS;METABOLISM;FOOD CHAINS;BIOSPHERE;TERRESTRIAL ECOSYSTEMS;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL TRANSPORT

<033184>
TITLE: Effect of Environmental Components on Reproduction and Ontogenesis
PROJECT NUMBER: NIH-NIEHS-73-2102 (ERR-4.75.25)
PRINCIPAL INVESTIGATOR: Schwetz, B.A.
ADDRESS: The Dow Chemical Company, Midland, MI 48640
AFFILIATION: Dow Chemical Co., Midland, Mich. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
MONITOR: Staples, Robert E.
TELEPHONE: F629-3418
TYPE OF FUNDING: Contract No.-73-2102;Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$357,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);COMBUSTION OR END USE (20%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (25%);ORGANICS (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To determine the teratogenic potential in animals of environmental components when administered singly or in combination. (2) To determine species differences in response to teratogens and to study the etiology of such differences. (3) To investigate the mechanisms of action of teratogens and to improve experimental testing and extrapolation to man.
APPROACH: In general, the screening approach outlined by the World Health Organization (Technical Report No. 364, 1967) is being followed with certain modifications to alleviate some of the problems encountered by private industry during the testing of potential therapeutic agents.
KEYWORDS: REPRODUCTION;ONTOGENESIS;TERATOGENESIS;INDUSTRY;POLLUTION;BIOLOGICAL EFFECTS;TESTING;TOXICITY;ANIMALS;PATHOGENESIS

<033185>
TITLE: Genetic Tests to Characterize Specific Locus Mutants in Neurospora Crassa
PROJECT NUMBER: N01-ES-3-2113
PRINCIPAL INVESTIGATOR: Colbourn, J.L.
ADDRESS: Miles Laboratory, Elkhart, IN
AFFILIATION: Miles Lab., Elkhart, Ind. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Mutagenesis Laboratory
MONITOR: Ong, Tong-man
TELEPHONE: F629-3282
TYPE OF FUNDING: Contract No.-73-2113
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (25%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The primary objective of this contract is the genetic characterization of presumptive adenine-3 (ad-3) mutants of Neurospora crassa derived from forward-mutation experiments at the Institute and at Illinois State University (under contract with the Institute) with various environmental chemicals as well as chemical carcinogens.
APPROACH: Stock cultures of presumptive ad-3 mutants have been characterized by a series of heterokaryon tests with various standard tester sets which determine the genotypes of the mutants, the complementation pattern of ad-3B mutants showing allelic complementation and also distinguishes point mutations from chromosome deletions. The contract also includes making mutants homokaryotic and preparing silica gel stock cultures.
KEYWORDS: NEUROSPORA;MUTANTS;TESTING;GENOTYPE;GENETICS;MUTATIONS;MUTAGENESIS

<033187>
TITLE: Development of a Polygenic Assay for Point Mutations in Mice
PROJECT NUMBER: N01-ES-5-2135 (ERR-1.75.5)
PRINCIPAL INVESTIGATOR: Crenshaw, J.W. Jr.
ADDRESS: Georgia Institute of Technology, Atlanta, GA 30332
AFFILIATION: Georgia Inst. of Tech., Atlanta (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Mutagenesis Laboratory
MONITOR: Johnson, Franklin M.
TELEPHONE: F629-3372
TYPE OF FUNDING: Contract No.-75-2135;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences Environmental Protection Agency FY77:$76,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (25%);ORGANICS (50%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The scope of this contract is to develop an understanding of the mutagenic effects in mice of some known mutagens, as measured by mean and variance changes in polygenic characters.
APPROACH: The contractor proposes to investigate the cumulative effects of multiple mutagen-induced polygenic mutations on a series of traits on F/sub 1/ and F/sub 2/ generation progenies descended from mutagenized males of an inbred strain of mice. F/sub 1/ and F/sub 2/ progeny will be examined for a series of traits including: age of eruption of incisors, mean and variance of body weight at weaning, sex ratio at weaning, serum cholesterol level at weaning, and hematocrit at weaning. The contractor proposes to study at least two different mutagens in two strains of mice.
KEYWORDS: MUTAGENS;GENETIC EFFECTS;MICE;MUTATIONS;PHYSIOLOGY;TESTING;MUTAGENESIS;DNA;SOMATIC MUTATIONS

<033188>
TITLE: Detection of Point Mutations in Somatic Cells
PROJECT NUMBER: N01-ES-4-2151
PRINCIPAL INVESTIGATOR: Nute, P.E.
ADDRESS: University of Washington, Seattle, WA 98105
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Mutagenesis Laboratory
MONITOR: Malling, Heinrich V.
TELEPHONE: F629-3398
TYPE OF FUNDING: Contract No.-74-2151
77 FUNDING: Environmental Protection Agency National Inst. of Environmental Health Sciences FY77:$167,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (25%);ORGANICS (25%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is likely that an increase in the mutation rate in the human population would be detrimental, yet there is no system developed to monitor the human population for point mutations. The purpose of this investigation is to develop a simple system to measure point mutations in readily accessible human somatic cells. It is likely that the somatic cell mutation rate would reflect the germ cell mutation rate, and the rate of introduction of genetic defects into the human population.
APPROACH: Many different types of hemoglobin mutations exist in the human population. Some of these are point mutations in the alpha and beta chain. Since such mutations occur in the germinal tissue, it is reasonable to assume that they also occur in the stem cells for the red blood cells (RBC). This type of mutation should result in an RBC which would contain an aberrant hemoglobin. By using a monospecific antibody to a number of aberrant hemoglobin types, such cells should be detected in samples from normal individuals after reaction of the antibodies with various fluorescent dyes. Antibodies are being produced against Hb-Wayne, Hb-Cranston, Hb-C and Hb-S.
KEYWORDS: HUMAN POPULATIONS;SOMATIC CELLS;MUTATION FREQUENCY;HEMOGLOBIN;GENETICS;IMMUNOLOGY;MUTAGENESIS

<033190>
TITLE: Development of a System for Detecting Lethal Mutations in Mice
PROJECT NUMBER: N01-ES-4-2156 (ERR-1.75.2)
PRINCIPAL INVESTIGATOR: Roderick, T.H.
ADDRESS: The Jackson Laboratory, Bar Harbor, ME 04609
AFFILIATION: Jackson Lab., Bar Harbor, Maine (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Mutagenesis Laboratory
MONITOR: Sheridan, William
TELEPHONE: F629-3287
TYPE OF FUNDING: Contract No.-74-2156;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$40,000; National Inst. of Environmental Health Sciences FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (25%);ORGANICS (25%);RADIATION (25%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: At present no efficient test system exists for detection of point mutations in mammals. The aim of the contract is to develop strains of mice, carrying marked inversions, which may be used in studies of induction of point mutations. Theoretically these tests will be comparable to the system presently used in Drosophila. The prime goal is to induce inversions in as many chromosomes of the mouse as possible and combine them in a number of strains to be used as tester stocks.
APPROACH: The contractor induces chromosome breaks and inversions by means of radiation and/or chemical agents. He mates the treated animals and in the P/sub 1/ does cytological analysis of one testis of each individual male. If a significant increase in anaphase bridges appears, this is taken as an indication that the animal may carry an inversion; and he is mated to get offspring for further study. Following cytolcgical and linkage studies to characterize the aberration, decision is made as to the utility of the inversion and appropriate marker genes are induced into the stock.
KEYWORDS: MUTATIONS;TESTING;MICE;CHROMOSOMAL ABERRATIONS;MUTAGENS;DNA;GENETICS;MUTAGENESIS

<033191>
TITLE: Development of a New Mouse Strain to Maximize the Sensitivity of a Point Mutation Assay
PROJECT NUMBER: N01-ES-4-2159 (ERR-1.75.3)
PRINCIPAL INVESTIGATOR: Roderick, T.H.;Womack, J.
ADDRESS: The Jackson Laboratory, Bar Harbor, ME 04609
AFFILIATION: Jackson Lab., Bar Harbor, Maine (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Mutagenesis Laboratory
MONITOR: Malling, Heinrich
TELEPHONE: F629-3413
TYPE OF FUNDING: Contract No.-74-2159;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$30,000; National Inst. of Environmental Health Sciences FY77:$12,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (25%);ORGANICS (25%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The sensitivity of a point mutational assay system is directly related to the number of loci that can be tested in each individual. In the present system in our laboratory, nine loci are sampled. Other inbred strains of mice possess enzyme variants which can possibly be incorporated into one of our present strains. This contract seeks to fully identify these additional variants (at least 13) and then by repeated backcrossing to incorporate them into the C57BL/6J genome.
APPROACH: Starch gel electrophoresis is used to determine whether a strain carries an allele that is not

found in either the DBA/2J or C57BL/6J strains. When such a variant is found, the strain is backcrossed repeatedly to C57BL/6J for 8-10 generations to develop a new strain which will be homozygous with C57BL/6J. Electrophoresis tests will be performed on progeny in each generation to insure that the allelic differences already present in the C57BL/6J line are maintained.
KEYWORDS: MICE;ENZYMES;MUTATIONS;TESTING;ELECTROPHORESIS;DNA;GENETICS;MUTAGENESIS

<033192>
TITLE: An Appraisal of Environmental Exposure to Heavy Metals
PROJECT NUMBER: N01-ES-2-2090
PRINCIPAL INVESTIGATOR: Smith, I.C.
ADDRESS: Midwest Research Institute, Kansas City, MO
AFFILIATION: Midwest Research Inst., Kansas City, Mo. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Office of Program
MONITOR: Piver, Warren T.
TELEPHONE: F629-3471
TYPE OF FUNDING: Contract No.-72-2090
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$59,300
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To explore environmental contamination with specific metals which may be hazardous to health. To search the literature and other reports and to seek expert opinions from industry in order to compile these data on potential hazards of specific metals. Special emphasis is placed on determination of the physical parameters and chemical properties, valency, reactivity, etc., as the metal compound makes contact with man. The information is to be put together in a document on each of the metals of specific interest.
KEYWORDS: HEAVY METALS;METALS;ENVIRONMENT;HEALTH HAZARDS;DATA ACQUISITION;CHEMICAL PROPERTIES;PHYSICAL PROPERTIES;LAND POLLUTION;PLANNING;DIFFUSION;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT

<033193>
TITLE: Effects of 60 Hz Fields on the Mammalian Central Nervous System
PROJECT NUMBER: NR-201-219 (ERR-4.75.23)
PRINCIPAL INVESTIGATOR: Adey, W.R.
ADDRESS: University of California at Los Angeles, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Biophysics Branch
MONITOR: McRee, Donald I.
TELEPHONE: F629-3382
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement-NIEHS
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (10%);ELECTRICAL TRANSMISSION (90%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this research are to determine the effects of 60 Hz fields from high voltage transmission lines on the central nervous system of mammals.
APPROACH: Environmental field conditions similar to those found in the vicinity of high voltage transmission lines will be simulated. These field gradients will range from 1 to 2000 volts/meter. The effects of these fields on the biological rhythms in rats and conditional behavior in monkeys will be evaluated. The effects on the neuroendocrine mechanism in rats and primates will be examined by using 17-hydroxysteroids, calcium, phosphorus, vanilmandelic acid and other urinary indicators of biorhythmicity. Changes in the neurochemistry of brain tissue of cats will be studied. These studies will include the measurement of both Ca and amino acid effluxes from the cerebral cortex of the cat.
KEYWORDS: POWER TRANSMISSION LINES;ELECTROMAGNETIC RADIATION;BIOLOGICAL EFFECTS;CENTRAL NERVOUS SYSTEM;RATS;MONKEYS;PHYSIOLOGY;MICROWAVE RADIATION;NEUROLOGY;PATHOGENESIS

<033194>
TITLE: Mineralogical Characterization of Fibers
PRINCIPAL INVESTIGATOR: Campbell, W.
ADDRESS: College Park Metallurgy Center, U.S. Bureau of Mines, College Park, MD 20740
AFFILIATION: Bureau of Mines, College Park, Md. (USA). College Park Metallurgy Research Center
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Research Resources Program
MONITOR: Moore, John A.
TELEPHONE: F629-3267
TYPE OF FUNDING: Contract No.-14-09-0070-598;Interagency agreement-NIEHS
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$200,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);PROCESSING, CONVERSION (10%);WASTE MANAGEMENT (50%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To advise and assist NIEHS in the development of protocols to be used in the preparation and characterization of mineral fibers. To assume a lead role in the chemical, physical, and mineralogical characterization of these materials. To prepare and provide in 1200 pound quantities a crocidolite and an

amosite material.
APPROACH: Standard mineralogic methodology.
KEYWORDS: WATER POLLUTION;LAND POLLUTION;MINERALS;FIBERS;CHEMICAL PROPERTIES;RESOURCE CONSERVATION;ENERGY CONSERVATION;PHYSICAL PROPERTIES;ASBESTOS;HEALTH HAZARDS;MINERAL RESOURCES;MINING;PATHOGENESIS;WASTE MANAGEMENT;CHEMICAL EFFLUENTS;INGESTION

<033195>
TITLE: Respiratory Tract Deposition Models
PROJECT NUMBER: AT(29-2)-1013 (ERR-3.75.17)
PRINCIPAL INVESTIGATOR: Raabe, O.G.
ADDRESS: Lovelace Foundation for Medical Education and Research, Albuquerque, NM 87108
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Biophysics Branch
MONITOR: Walsh, Phillip J.
TELEPHONE: F629-3381
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement-NIEHS
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$125,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (25%);TRANSPORTATION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objectives of this research are: (1) construction of physical models of the respiratory tracts of man and several animal species; (2) measurement of the deposition of aerosols as small as 0.01 micron diameter in the models; (3) determination of deposition of selected particle sizes in animals and in man if practical; (4) development of a theoretical model of deposition in the lung based on the above results; and (5) field evaluation of the physical-theoretical model.
KEYWORDS: AEROSOLS;DEPOSITION;RESPIRATORY SYSTEM;MAN;ANIMALS;STRUCTURAL MODELS;PARTICLE SIZE;AIR POLLUTION;INHALATION;PATHOGENESIS;RESPIRATION

<033196>
TITLE: The Physiological Effects of Arsenic, Cadmium, and Copper of Marine Shellfish
PROJECT NUMBER: AEC-015-77-EI-AR-1 (ERR-8.75.39)
PRINCIPAL INVESTIGATOR: Engel, D.W.
ADDRESS: National Marine Fisheries Service, Beaufort, NC 28516
AFFILIATION: National Marine Fisheries Service, Beaufort, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Toxicology Branch
MONITOR: Fowler, Bruce A.
TELEPHONE: F629-3363
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement-NIEHS
77 FUNDING: National Inst. of Environmental Health Sciences Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This study was undertaken to determine the physiological, biochemical, and ultrastructural effects of arsenic, cadmium, and copper on tissues of marine shellfish in comparison with those previously observed in mammals. Large numbers of shellfish will be exposed to these elements for subsequent incorporation of freeze-dried shellfish meats into rat diets for evaluation of pharmacokinetic and toxicological differences in comparison to similar doses of these metals administered in drinking water.
APPROACH: Flowing seawater systems with continuous trace element injection, atomic absorption spectroscopy, radiotracer analyses, histological and ultrastructural techniques, cellular respiration studies.
KEYWORDS: HEAVY METALS;ARSENIC;CADMIUM;COPPER;BIOLOGICAL EFFECTS;AQUATIC ORGANISMS;TOXICITY;RATS;PHYSIOLOGY;RESPIRATION;DRINKING WATER;MOLLUSCS;COMPARATIVE EVALUATIONS

<033197>
TITLE: Chemical and Environmental Mutagen Studies Utilizing the Tradescantia Test System
PROJECT NUMBER: 2Y01 ES 20009-03 (ERR-5.75.31)
PRINCIPAL INVESTIGATOR: Sparrow, A.H.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Office of the Director
MONITOR: de Serres, Frederick J.
TELEPHONE: F629-3320
TYPE OF FUNDING: Contract No.-E(30-1)-16;EPA pass-thru funding;Interagency agreement-NIEHS
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$182,000; Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (25%)
POLLUTANTS: NOXIOUS GAS (75%);PARTICULATES (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of the proposed research are: (1) to demonstrate the usefulness of and further develop the Tradescantia somatic mutation test system as a quantitative monitor in environments containing known or suspected mutagens; (2) to use special genetic clones of Tradescantia to establish the relative mutagenicity of a limited number of mutagens (primarily in gaseous form), as to magnitude of the effect, specificity of action and possibility of synergism; (3) to look for evidence of genetic repair of DNA injury produced by chemical mutagens and to determine lowest effective concentrations; (4) to determine in greater detail the time and dose response for several loci for one selected gaseous mutagen,

comparing these with presently available radiation data and with results observed in animal cells; and (5) to develop and validate the mobile laboratory to use this assay system to evaluate mutagenicity of air pollutants (gases and particulates) in geographical areas with high atmospheric pollution.
APPROACH: Two different clones of Tradescantia (clone 02 and clone 4430), which are heterozygous for a flower petal color mutation were used to determine the mutagenicity of exposure under various experimental conditions. Refinements in chemical mutagen exposure techniques were made to establish 1,3-dibromoethanol (DBE) as the mutagen standard in these studies rather than ethylmethane sulfonate (EMS) and this work has continued using tritium labeled DBE. Plant breeding and new clone selection have also been continued to obtain more sensitive clones which might provide better indicators of weak mutagens and chronic levels of exposure. New clones with a wider range of spontaneous mutation rates at each of three loci are being used along with existing mutable clones to develop methods for studying repair. Genetic effects of air pollutants with the mobile laboratory concept are being studied in various U.S. cities on a monthly basis in collaboration with NERC-EPA.
KEYWORDS: TRADESCANTIA;SOMATIC MUTATIONS;TESTING;MUTAGENS;GENETIC EFFECTS;DNA;BIOLOGICAL REPAIR;DOSE-RESPONSE RELATIONSHIPS;PLANT BREEDING;INHALATION;MOBILITY;LABORATORY EQUIPMENT;GASES;AEROSOLS

<033198>
TITLE: Environmental Teratology Information Center (ETIC)
PROJECT NUMBER: ERDA 40-524-75 (ERR-2(6).75.13)
PRINCIPAL INVESTIGATOR: Wassom, J.S.
ADDRESS: Oak Ridge National Laboratory, US Energy Research and Development Administration, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
MONITOR: Staples, Robert E.
TELEPHONE: F629-3418
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement-NIEHS
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$200,000; Environmental Protection Agency FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (15%);METALS (15%);PARTICULATES (15%);ORGANICS (25%);RADIATION (15%);NOISE, VIBRATION (10%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To establish a teratology information center.
APPROACH: (1) To collect reprints of all publications that contain data pertinent to determination of the teratogenic potential of environmental agents or conditions to which man is exposed. (2) To use facilities available at Oak Ridge National Laboratories to enter extracts from the relevant references onto magnetic tape such that the information contained can be readily recalled for use. (3) To encourage scientific evaluation of the adequacy of available data on high priority agents for determination of teratogenic potential.
KEYWORDS: TERATOGENESIS;INFORMATION CENTERS;DATA ACQUISITION;INFORMATION RETRIEVAL;GENETICS;INFORMATION

<033199>
TITLE: Environmental Mutagen Information Center
PROJECT NUMBER: 103-063 (ERR-5.75.30)
PRINCIPAL INVESTIGATOR: Wassom, J.S.
ADDRESS: Oak Ridge National Laboratory, Information Center Complex/Information Division, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Mutagenesis Laboratory
MONITOR: Malling, Heinrich V.
TELEPHONE: F629-3398
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement-NIEHS
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$145,000; Environmental Protection Agency FY77:$45,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (15%);METALS (15%);PARTICULATES (15%);ORGANICS (25%);RADIATION (15%);HEAT, THERMAL (15%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The mission of the Environmental Mutagen Information Center (EMIC) is to collect, organize and disseminate chemical mutagenesis information.
APPROACH: The tasks the Environmental Mutagen Information Center will carry out are to compile the past and present literature on mutagenesis testing of energy related pollutants. This information will then be processed into EMIC's data bank noting bibliographic details, and keywording of chemicals, organisms, and system studied. A special tabular abstract of the papers containing original test data will be made. This table will have the same format as the tabular abstract made for the Food and Drug Administration on a selected series of food additives. In order to make these data easily available, bibliographies containing agent, organism, test object, chemical abstract services (CAS), registry number and a KWIL index will be printed and distributed to interested individuals.
KEYWORDS: MUTAGENS;INFORMATION CENTERS;DATA ACQUISITION;INFORMATION RETRIEVAL;MUTAGENESIS;MUTATIONS;INFORMATION;ENERGY;CHEMICAL EFFLUENTS

<033202>
TITLE: Risk Assessment for Environmental Carcinogens
PROJECT NUMBER: Z01-ES-01001-03 BB (ERR-6.75.32)
PRINCIPAL INVESTIGATOR: Guess, H.A.;Crump, K.S.
ADDRESS: P.O. Box 12233, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Biometry Branch
MONITOR: Guess, H.A.

TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$5,000; National Inst. of Environmental Health Sciences FY77:$5,000
NOLOGY: GENERAL SCIENCE (100%)
ACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: A new statistical technique is being developed for obtaining, from experimental data, maximum likelihood estimates of low dose carcinogenic risk. The statistical properties of the technique, such as error estimates, are being investigated.
KEYWORDS: CARCINOGENS;BIOLOGICAL EFFECTS;DOSE-RESPONSE RELATIONSHIPS;STATISTICS;HEALTH HAZARDS

<033203>
TITLE: Effects of Environmental Components on Reproduction and Ontogenesis
PROJECT NUMBER: NIH-NIEHS-73-2102 (ERR-4.75.25)
PRINCIPAL INVESTIGATOR: Schwetz, B.A.
AFFILIATION: Dow Chemical Co., Midland, Mich. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Experimental Toxicology
MONITOR: Staples, Robert E.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency National Inst. of Environmental Health Sciences FY77:$357,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Cobalt; sulfur dioxide (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Pregnant mice and rabbits are being exposed in inhalation chambers to sulfur dioxide, sulfur dioxide plus carbon monoxide or various particulates, and to sulfuric acid aerosol to determine the effects of these pollutants on development of the conceptus. The offspring are examined just before birth for the presence of external and internal structural alterations.
KEYWORDS: GESTATION;SULFUR DIOXIDE;CARBON MONOXIDE;INHALATION;MICE;RABBITS;PREGNANCY;BIOLOGICAL EFFECTS;EMBRYOS;SULFURIC ACID;AEROSOLS;REPRODUCTION

<033205>
TITLE: Metabolism and Disposition of Selected Radiolabelled Hydrocarbons by Isolated, Perfused Rabbit Lung
PROJECT NUMBER: Z01 ES 80007-06 LP (ERR-2.75.12)
PRINCIPAL INVESTIGATOR: Bend, J.R.;Philpot, R.M.
ADDRESS: P.O. Box 12233, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Pharmacology Branch
MONITOR: Bend, J.R.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$20,000; National Inst. of Environmental Health Sciences FY77:$288,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The metabolism of pure, radiolabelled unsaturated hydrocarbons of different types (aliphatic, alicyclic and polycyclic aromatic) and of their epoxides will be studied in the isolated, perfused rabbit lung and in the isolated, perfused rat liver. Major metabolites will be identified and quantitated; the relative importance of epoxide hydrase and glutathione S-epoxidetransferases as deactivation pathways for the chemically reactive epoxides will be assessed. Covalent binding, if present, will be quantitated in both liver and lung homogenates. The effect of glutathione depletion on this covalent binding will also be measured.
KEYWORDS: HYDROCARBONS;METABOLISM;LUNGS;LIVER;RABBITS;RATS;CHEMICAL BONDS;BIOCHEMICAL REACTION KINETICS;TRANSFERASES;HYDROGENASE

<033206>
TITLE: Effects of Prenatal Exposure to Foreign Chemicals on Genital Tract Function
PROJECT NUMBER: Z01 ES 70060-04 LET (ERR-4.75.22)
PRINCIPAL INVESTIGATOR: Lucier, G.W.;McLachlan, J.A.
ADDRESS: PO Box 12233, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
MONITOR: Lucier, George W.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000; National Inst. of Environmental Health Sciences FY77:$26,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (10%);GENERAL SCIENCE (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
JECT DESCRIPTION: We are proposing to study the effects of exposure of pregnant animals to energy-related pollutants on male and female reproductive tract function in F-1 offspring. Forced-breeding and serial

mating techniques will be used to evaluate fertility. Endocrinology and histopathology parameters will be studied in reproductively abnormal animals. Screening procedures will be done on contract and further mechanistic studies will be attempted in intramural laboratories.
KEYWORDS: ENERGY SOURCES;POLLUTION;MALES;FEMALES;PROGENY;REPRODUCTION;BIOLOGICAL EFFECTS;FERTILITY;HORMONES;PATHOLOGY;ANIMALS;CHEMICAL EFFLUENTS;HISTOLOGY;ENDOCRINE GLANDS

<033207>
TITLE: Pulmonary Effects of Environmental Oxidant Pollutants
PROJECT NUMBER: 5 P01 ES 00628-06 (ERR-7(6).75.38)
PRINCIPAL INVESTIGATOR: Dungworth, D.D.
ADDRESS: Davis, CA 95616
AFFILIATION: California Univ., Davis (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$321,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Ozone;NOXIOUS GAS/Photochemical (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Rats and monkeys will be chronically exposed to oxidant air pollutants, primarily ozone, at concentrations approximating high ambient levels (0.2 to 0.5 ppM). A multidisciplinary group will make integrated biochemical, microbiological, physiological and morphological evaluations of effects. The findings will have relevance to the specific problem of air pollution and to a general understanding of pulmonary pathobiology. By plotting the relative levels of sensitivity of the various parameters studied and the effects observed, a basis will be provided for making predictions of possible long-term consequences of photochemical smog on man. Comparison of effects in rats and monkeys should provide for more confident extrapolation to man and hence enable the setting of rational air quality criteria. A primary goal is to test critical hypotheses concerning biochemical, immunological and cellular mechanisms responsible for the deleterious effects of the pollutants. Major pathogenetic and modifying factors of interest are: the role of lipid peroxidation in initiating damage; the induction of antioxidant defense mechanisms by continued exposure and the general phenomenon of adaptation; the sites of impairment in pulmonary alveolar macrophages and components of the immune system in the lung; the sequence and nature of lesions resulting in the development of chronic obstructive lung disease
KEYWORDS: LUNGS;RATS;MONKEYS;AIR POLLUTION;OZONE;MORPHOLOGICAL CHANGES;PHYSIOLOGY;BIOCHEMISTRY;AIR QUALITY;BIOLOGICAL ADAPTATION;VITAMIN E;BIOLOGICAL EFFECTS;PATHOLOGY;AEROSOLS;SMOG;PHOTOCHEMICAL OXIDANTS;PATHOLOGICAL CHANGES

<033208>
TITLE: Carcinogenic Effects of Petroleum Hydrocarbons on Selected Marine and Estuarine Organisms
PROJECT NUMBER: NIH-N01-ES-7-2101 (ERR-8.75.41)
PRINCIPAL INVESTIGATOR: Felton, S.P.;Miller, B.S.
ADDRESS: Fisheries Research Institute, Seattle, WA
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
MONITOR: Fowler, Bruce A.;Bend, Jack R.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$29,000; National Inst. of Environmental Health Sciences FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Pre-metamorphic and post-metamorphic forms of a selected flatfish species, that has been demonstrated to develop epidermal papillomas, will be exposed to benzo(a)pyrene and possibly some of its electrophilic derivatives and the incidence of papillomas in the exposed animals will be assessed. Control groups will be included for each exposed group in the study. The histopathology of tumors occurring in both exposed and control groups will be assessed comprehensively. Benzo(a)pyrene hydroxylase activity will be measured in hepatic microsomes prepared from both control and exposed fish, with and without epidermal papillomas, that survive until sacrifice (10-12 months of age).
KEYWORDS: FLATFISH;PETROLEUM;HYDROCARBONS;AQUATIC ORGANISMS;FISHES;BENZOPYRENE;NEOPLASMS;HYDROXYLASE;METABOLISM;PATHOLOGY;LIVER;MICROSOMES;SKIN;BIOLOGICAL EFFECTS;POLLUTION;MORPHOLOGICAL CHANGES

<033210>
TITLE: Respiratory Anaphylaxis to Industrial Chemicals
PROJECT NUMBER: 1R01ES01532-01
PRINCIPAL INVESTIGATOR: Karol, M.H.
ADDRESS: 622 Parran Hall, Pittsburgh, PA 15261
AFFILIATION: Pittsburgh Univ., Pa. (USA). Graduate School of Public Health
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1 R01 ES 01532-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$42,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Small airborne industrial chemicals (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The guinea pig will be developed as an animal model of pulmonary hypersensitivity to small airborne industrial chemicals. To define the conditions providing maximum sensitization, small chemicals (haptens) will be covalently linked to carrier protein molecules, and the resulting

hapten-protein conjugates used as antigens. Hapten-specific respiratory hypersensitivity occurring either immediately or several hours following exposure (delayed onset) to the allergen will be assessed by analysis of pulmonary functions. For these determinations, the hapten will be coupled to a heterologous carrier. The influence of the following factors upon induction of hapten-specific pulmonary hypersensitivity will be determined: (a) dose of allergen; (b) number and length of daily exposures; and (c) interval between exposures. Using the conditions producing optimum hapten-specific hypersensitivity, various industrial chemicals will be aerosolized. Determination and comparison of the allergenic capabilities of the chemicals using dose-response and threshold concentration studies should allow prediction of safe levels for industrial workers. Histopathological examination of the sensitized respiratory tissue and skin test sites will provide indications of cell-mediated immunity. Serological evaluations will be routinely performed. Local and circulating hapten-specific antibodies will be assayed by the following techniques: radioimmunoelectrophoresis, enzyme-linked immunosorbent assay, passive cutaneous anaphylaxis, and passive leukocyte sensitization. In this way a possible relationship between an in vitro immunological assay and the state of pulmonary hypersensitivity as ascertained by bronchial provocation should become apparent.
KEYWORDS: INDUSTRY;CHEMICAL EFFLUENTS;HEALTH HAZARDS;AEROSOLS;GUINEA PIGS;INHALATION;BIOLOGICAL MODELS;LUNGS;PATHOLOGICAL CHANGES;IMMUNOLOGY;TOXICITY;AIR POLLUTION

<033211>
TITLE: Inhaled Aerosols: Behavior Effects and Clearance
PROJECT NUMBER: 1P01ES01478-01
PRINCIPAL INVESTIGATOR: Frank, R.
ADDRESS: 679 6000, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Owens, Robert G.
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1P01ES01478-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$249,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: An interdisciplinary effort is proposed to study the interaction between inhaled aerosols and the respiratory system. Project 1 seeks to determine the influence of the hygroscopic growth of aerosols on deposition; whether supersaturation of aerosols occurs and its implications for deposition; and the influence of altered respiratory mechanics on deposition. Project 2 examines the importance of the pH and molecular composition of sulfate/sulfite aerosols in causing pulmonary functional changes in guinea pigs; and whether the NH3 excreted into alveoli modifies the chemistry and effect of acid aerosols. Project 3 extends the observations of Project 2 to healthy subjects and to adolescent asthmatic patients with exposures during rest and exercise. Project 4 examines the role of the alveolar wall in determining whether insoluble particles that deposit locally are cleared along the muco-ciliary system or enter the tissue compartment.
KEYWORDS: AEROSOLS;INHALATION;DEPOSITION;PH VALUE;SULFATES;SULFITES;LUNGS;GUINEA PIGS;PATIENTS;AIR POLLUTION;BIOLOGICAL EFFECTS;CLEARANCE;PATHOLOGICAL CHANGES;BIOCHEMISTRY;EPIDEMIOLOGY

<033212>
TITLE: Metal Intoxication and Metallocytochrome Synthesis
PROJECT NUMBER: 1R01ES01628-01
PRINCIPAL INVESTIGATOR: Vanderkooi, J.M.
ADDRESS: Dept. of Biochemistry and Biophysics, Philadelphia, PA 19174
AFFILIATION: Pennsylvania Univ., Philadelphia (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01628-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$20,300
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Miscellaneous (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this project is to examine whether during heavy metal toxication mistakes are made in the synthesis of cytochromes so that the porphyrin does contain iron. Animals will be exposed to high concentrations of metals either through diets or through the atmosphere. Because porphyrins containing closed metals, unlike iron porphyrins, are fluorescent, incorporation of metals such as zinc can be detected in low levels by examining the luminescence of tissues as lung or liver, or tissue fragments such as mitochondria or endoplasmic reticulum. The incorporation of metals into cytochromes will be considered as a possibility of a cause of metal toxicosis and may provide a means to diagnose metal toxication caused by environmental pollution. Finally, the role of enzymes, in inserting the metal into the porphyrin will be examined in-vitro the results compared with the in-vivo findings.
KEYWORDS: METALS;TOXICITY;ENVIRONMENTAL EXPOSURE PATHWAY;ZINC;TISSUE DISTRIBUTION;ENZYMES;BLOOD;BIOCHEMISTRY;PATHOLOGICAL CHANGES;ANIMALS;METABOLISM;CYTOCHROMES

<033213>
TITLE: Study of Fibrous Dust Propagation Using Holography
PROJECT NUMBER: 1R01ES01613-01
PRINCIPAL INVESTIGATOR: Boettner, E.A.
ADDRESS: 109 Observatory, Ann Arbor, MI 48109
AFFILIATION: Michigan Univ., Ann Arbor (USA). School of Public Health
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01613-01

77 FUNDING: National Inst. of Environmental Health Sciences FY77:$41,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Asbestos;PARTICULATES/Fibers (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The technique of holography has provided a new method for study of environmental situations which heretofore could not be approached. In particular, the possibility of studying the dynamics of particles and fibers in the atmosphere or in a duct by direct observation without the intrusion of measuring devices, now exists. The combination of pulsed lasers with the holographic method will permit a ''stopping'' or ''freezing'' of the motion of possible dust pollutants in space, such that their flow patterns can be observed both qualitatively and quantitatively. We propose to use this methodology to attain the following objectives: (1) Determine the speed and mode of fall of fiberous and platy materials (e.g., asbestos, glass fibers, talc, etc.) as they move through space. (does an asbestos fiber 2 mum in diameter and 20 mum long move perpendicular to its long axis, parallel to it, or does it tumble.) Establish how the rate and type of movement varies with size, shape, and concentration of particles per unit volume; and compare this with the values obtained using mathematical formulas and experimental data developed previously by others for the movement of particulate matter. (2) Determine the action of fiberous and platy materials as they move or are drawn to the face of filters of various types at various speeds. What can be done by varying the rate of air flow through the filter to change this mode of motion for a more efficient collection. (3) Determine the effect of a surface on the same types of dusts as they move toward the face of a filter.
KEYWORDS: DUSTS;ENVIRONMENTAL TRANSPORT;ASBESTOS;FIBERS;AEROSOLS;MINING;GLASS;HOLOGRAPHY;AIR FILTERS;AIR POLLUTION;DESIGN

<0 33214>
TITLE: Environmental Contaminants: Effect on Tumor Immunity
PROJECT NUMBER: 1R01ES01612-01
PRINCIPAL INVESTIGATOR: Koller, L.D.
ADDRESS: 107 Druden Hall, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01612-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Pb;METALS/Mercury;METALS/Cadmium (75%);ORGANICS/PCB (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The proposed study will determine the effects selected environmental contaminants have on the immune response of mice to a growing tumor and the effects of contaminant-induced immune alteration on the incidence and growth rate of tumors in intoxicated animals. Several parameters of immunity will be assessed at various times after tumor inoculation. Assays will include lymphocyte-mediated cytotoxicity, serum blocking activity, lymphokine production, and lymphocyte blastogenesis. In addition, contaminant-exposed animals will be monitored for changes in in vivo tumor growth rate parameters (regression, progression, metastases formation). Contaminants (lead, cadmium, arsenic, PCBs) will be administered in the drinking water or in food for 15 weeks prior to tumor inoculation and immune testing. Subclinical doses of the contaminants will be included. Two tumor systems, the B16 melanoma and MSV-induced sarcoma, will be utilized to compare the differences in immune function between a progressive and a regressive tumor in the presence of environmental contaminants.
KEYWORDS: LEAD;MERCURY;CADMIUM;ENVIRONMENTAL TRANSPORT;IMMUNOLOGY;IMMUNITY;MICE;NEOPLASMS;AROMATICS;ORGANIC CHLORINE COMPOUNDS;CHLORINATED AROMATIC HYDROCARBONS;BIOLOGICAL EFFECTS;HEALTH HAZARDS;PATHOLOGICAL CHANGES;CARCINOGENESIS

<0 33215>
TITLE: Lead Absorption, Excretion and Metabolism
PROJECT NUMBER: 1R01ES01306-01
PRINCIPAL INVESTIGATOR: Conrad, M.
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AFFILIATION: Alabama Univ., Birmingham (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01306-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$57,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Previous reports from a variety of sources have associated a number of factors with the absorption, excretion, and total body burden of lead. An animal model system has been developed which permits studies of the absorption, excretion, and body distribution of lead. This will be utilized to confirm or deny older reports and then to investigate the mechanism by which these factors influence the absorption or excretion of lead. Substances shown to exert an intraluminal effect which enhance or diminish the absorption of lead will be investigated to characterize the physiochemical changes which occur with lead in the lumen of the small intestine. Factors identified as producing either a mucosal or corporeal effect will be investigated and an effort will be made to identify common sites in the pathway for the absorption and excretion of lead and the competitive or facilitating substance. The effects of total body burden of lead upon the subsequent absorption of dietary lead will be studied to ascertain if there is an inhibitory feedback mechanism. If the latter can be identified, the importance of lead in various body pools in contributing to this effect will be studied and a search will be undertaken for

other substances which exert a similar inhibitory effect. It is postulated that these studies will provide a rational understanding of factors associated with acute and chronic lead intoxication and basic information related to the pathways regulating the absorption and excretion of lead.
WORDS: LEAD;METABOLISM;EXCRETION;INTESTINAL ABSORPTION;BIOLOGICAL MODELS;BODY BURDEN;TOXICITY;PATHOLOGICAL CHANGES;HEALTH HAZARDS

<033216>
TITLE: Frog Mutagenesis Test System
PROJECT NUMBER: 1R01ES01605-01
PRINCIPAL INVESTIGATOR: McKinnell, R.G.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01605-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$73,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/TEM (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We propose a 3-year project to develop and characterize a mutagenic test system in the frog, Rana pipiens, and to compare the results obtained with those from other mutagenic test systems. In its simplest terms the test system will consist of administration of mutagenic chemical to male frog, recovery of the treated animal's sperm, fertilization of eggs with the sperm, and analysis of the developing embryos for mutagenic changes. We will establish a dose response relationship for both chromosome aberrations and abnormal morphology of developing embryos for the known mutagen, triethylenemelamine (TEM), we will compare somatic vs. gametic chromosomal changes within the same animal, and we will confirm the genetic nature of induced changes by amphibian nuclear transplantation (cloning). The usefulness for mutagenesis screening of androgenetic haploid embryos will be studied. We will test the effects on frogs of different routes of administration of test chemicals. The mutagenic potential of varying classes of known chemical mutagens will be studied.
KEYWORDS: TRIETHYLENEMELAMINE;MUTAGENESIS;TESTING;FROGS;MUTAGENS;SPERMATOZOA;EMBRYOS;DOSE-RESPONSE RELATIONSHIPS;CHROMOSOMAL ABERRATIONS;MORPHOLOGICAL CHANGES;MUTATIONS;ALKYLATING AGENTS

<033217>
TITLE: Teratogenicity of Chlorinated Hydrocarbon Solvents
PROJECT NUMBER: 1R01ES01601-01
PRINCIPAL INVESTIGATOR: Manson, J.M.
ADDRESS: 3223 Eden Avenue, Cincinnati, OH 45267
AFFILIATION: Cincinnati Univ., Ohio (USA). Coll. of Medicine
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01601-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$76,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Chlorinated hyrocarbon (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Increasingly greater numbers of women of child-bearing age are entering the work force where they are exposed to agents of unknown teratogenic potential. Chlorinated hydrocarbon solvents are widely used in industry, and preliminary studies have indicated they could have a detrimental effect on the developing fetus. These preliminary studies were not performed with reference to pregnant women workers in that inhalation exposure occurred only from days 6 to 15 of gestation in rats, and teratogenic analyses were conducted on term fetuses alone. We propose to examine the teratogenicity and/or embryotoxicity, transplacental carcinogenicity and behavioral effects of methyl chloroform, methylene chloride, trichloroethylene and tetrachloroethylene with reference to working populations of women. Adult female rats will be pretreated with ethanol or phenobarbital, exposed to high and low concentrations of solvents by inhalation for two weeks prior to gestation. After breeding, the dams will be exposed from days 0 to 16 of gestation, which approximates the first two trimesters of human development. Fetuses will be analyzed at term for embryotoxic and/or teratogenic effects, postnatally for behavioral alterations, and at 18 months for carcinogenic lesions.
KEYWORDS: HYDROCARBONS;TERATOGENESIS;ORGANIC CHLORINE COMPOUNDS;SOLVENTS;WOMEN;FETUSES;PREGNANCY;INHALATION;TOXICITY;BEHAVIOR;RATS;ETHANOL;PHENOBARBITAL;BIOLOGICAL EFFECTS;AIR POLLUTION;PATHOLOGICAL CHANGES

<033218>
TITLE: Effects of Mercurial Poisons on Na+, K+-ATPase
PROJECT NUMBER: 1R01ES01599-01
PRINCIPAL INVESTIGATOR: Askari, A.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01599-01
FUNDING: National Inst. of Environmental Health Sciences FY77:$51,700
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Na+,K+-ATPase, an enzyme of the plasma membrane, is involved in the regulation of the internal ionic environment of most mammalian cells. Previous work has suggested that the inhibition of

this enzyme by methylmercury may be related to the neurological abnormalities and the embryotoxic effects produced by this environmental poison. Our recent work shows that the interaction of methylmercury and other short-chain alkylmercury compounds with Na+,K+-ATPase leads to a unique mode of modification of this enzyme. While the overall Na+,K+-dependent ATPase activity of the mercurial-modified enzyme is inhibited, none of the partial reactions of the enzyme seem to be affected. In view of this, the goals of this project are: (1) to study in detail the mechanism of modifying effects of these mercurials on the isolated Na+,K+-ATPase; (2) to determine the functional consequences of the mercurial-induced modification of the enzyme; (3) to determine if the toxic effects of methylmercury in the intact animal are related to this unique type of modification of the enzyme. The purified dog kidney enzyme will be used to study the effects of mercurials on the kinetics of the partial reactions of the enzyme, and to identify the site of the reaction of the mercurials within the enzyme complex. Intact human red cells, and phospholipid vesicles containing the purified enzyme will be used to study the effects of mercurials on the Na+,K+-translocations that are mediated by the enzyme. Methylmercury-poisoned pregnant mice will be used to determine if the brain enzyme obtained from the mother and the fetus are affected in the same way that the purified enzyme is modified by methylmercury in vitro.

KEYWORDS: ATP-ASE;MEMBRANES;METHYLMERCURY;INHIBITION;TOXICITY;MERCURY COMPOUNDS;METABOLISM;DOGS;KIDNEYS;ERYTHROCYTES;PHOSPHOLIPIDS;MICE;FETUSES;PATHOLOGICAL CHANGES

<0033219>
TITLE: Toxicity of Prenatal Carbon Monoxide Exposure
PROJECT NUMBER: 1R01ES01589-01
PRINCIPAL INVESTIGATOR: Annan, Z.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01589-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$82,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Carbon monoxide (CO) has long been recognized as an environmental hazard and standards for acute exposure have been established. Little attention has been focused, however, upon the effects that chronic exposures to this gas might have although such exposure is relatively common. Cigarette smoking is the major source of carboxyhemoglobin (HbCO) and smokers on the average maintain HbCO levels of 5%. The fetus of a smoking mother carries similar burdens of CO in blood. The proposed research is designed to assess the effects of chronic prenatal CO exposures on the development of the neonatal organism, to determine the permanence of such changes through longitudinal studies, and to determine threshold values below which such effects do not occur. The principal levels of analysis include spontaneous behavioral assessments as well as responses to centrally acting drugs, brain and organ development through protein and DNA analyses, and neurochemical studies designed to measure perturbations in monoamine systems resulting from prenatal hypoxia.
KEYWORDS: CARBON MONOXIDE;TOXICITY;HAZARDS;STANDARDS;TOBACCO PRODUCTS;FETUSES;CARBOXYHEMOGLOBIN;NEONATES;BEHAVIOR;BRAIN;DNA;BIOLOGICAL EFFECTS;NEONATES;GROWTH

<0033220>
TITLE: Heavy Metal-Induced Damage to the Nervous Tissue
PROJECT NUMBER: 1R01ES01576-01
PRINCIPAL INVESTIGATOR: Prasad, K.N.
ADDRESS: 4200 E. 9th Avenue, Denver, CO 80262
AFFILIATION: Colorado Univ., Denver (USA). Medical Center
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01576-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$92,500
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this proposal is to investigate the molecular mechanisms by which heavy metals damage nervous tissue.
APPROACH: The specific aim of this project is to study the effect of methyl mercury on the nervous tissue, using mouse neuroblastoma and rat glioma cells in culture as experimental models. We propose to perform the following studies: (a) to establish the dose-response relationships for methyl mercury effects upon growth rate and differentiation; (b) to establish the dose-response relationships for methyl mercury effects upon neurotransmitter metabolism; and (c) to establish dose-response relationships for methyl mercury effects upon cyclic nucleotide metabolism. Data may be useful in estimating the relative sensitivity of dividing nerve and glial cells to methyl mercury using the above criteria.
RESULTS: Results obtained from this study will show to what extent mercury-induced damage to these cellular functions can be reversed and at what stage these damages become irreversible. The data may also be useful in estimating the maximum permissible concentrations of mercury for the nervous tissue especially in the fetus.
KEYWORDS: METHYLMERCURY;BIOLOGICAL EFFECTS;MOLECULES;MICE;CENTRAL NERVOUS SYSTEM;RATS;BEHAVIOR;METABOLISM;DOSE-RESPONSE RELATIONSHIPS;MAXIMUM PERMISSIBLE CONCENTRATION;FETUSES;STANDARDS;RECOMMENDATIONS;HEALTH HAZARDS;BIOLOGICAL REPAIR;TOXICITY

<033221>
TITLE: Active Site of delta-Aminolevulinic Acid Dehydratase
PROJECT NUMBER: 1R01ES01572-01
PRINCIPAL INVESTIGATOR: Lerman, C.L.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01572-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Pb (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The project will attempt to elucidate the identity, three-dimensional relationships, and chemical properties of the groups which are responsible for the catalysis of conversion of delta-aminolevulinic acid to porphobilinogen by the enzyme delta-aminolevulinic acid dehydratase from bovine liver.
APPROACH: The tools to be used are probes in the form of substrate analogs. Work will include inhibition by stereoisomers of substrate analogs and affinity labeling to identify active site residues.
RESULTS: Since the enzyme appears to be a locus for the effects of lead poisoning, the effect of lead on certain steps of the reaction will be examined.
KEYWORDS: AMINOLEVULINIC ACID;LEAD;BIOCHEMICAL REACTION KINETICS;COWS;ENZYMES;TOXICITY;LIVER;METABOLISM;BIOLOGICAL EFFECTS;PATHOLOGICAL CHANGES;TRACER TECHNIQUES

<033222>
TITLE: Effect of Nitrogen Dioxide on Pulmonary Monocytes
PROJECT NUMBER: 1R01ES01561-01
PRINCIPAL INVESTIGATOR: Acton, J.D.
ADDRESS: Department of Microbiology, Winston-Salem, NC 27103
AFFILIATION: Wake Forest Univ., Winston-Salem, N.C. (USA). Bowman Gray School of Medicine
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01561-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$42,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The research program is designed to study the nature of the lesions which nitrogen dioxide induces in the pulmonary cell populations involved in the immune response.
APPROACH: The following topics will be investigated: (1) Compare the effect of NO2 the viral and nonviral-induced production of interferon by lung monocytes; the cytotoxic activity of these preparations will be evaluated. Following exposure to NO2, the capacity of pulmonary cells lavaged from rabbits to produce interferon will be studied. The virus model will involve the use of Newcastle disease virus as the inducing agent and vesicular stomatitis as the challenge virus; poly I.poly C will be used as a nonviral inducer. (2) Determine the effect of NO2 on the mycobacterium bovis (BCG)-induced cell-mediated immune response in the lung. The effect of NO2 on the quantity and functions of cells recruited into the lung following BCG vaccination will be examined. In particular, the generation of migration inhibitory factor (MIF), macrophage agglutinating factor (MAgF), cytotoxic activity, and immune interferon will be studied. (3) Determine the effect of NO2 on alveolar macrophage membrane receptors involved in the immune response. Experiments will be performed in vitro to study the effect of NO2/sup -/ on alveolar macrophage receptors for macrophage agglutinating factor, migration inhibitory factor, interferon, lymphocytes, immunoglobulin and complement.
KEYWORDS: NITROGEN DIOXIDE;METABOLISM;LUNGS;PATHOLOGICAL CHANGES;VIRUSES;RABBITS;IMMUNITY;TOXICITY;ANIMAL CELLS

<033223>
TITLE: Metabolism, Genome Repair and Environmental Mutagens
PROJECT NUMBER: 1R01ES01555-01
PRINCIPAL INVESTIGATOR: Waldren, C.A.
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AFFILIATION: Colorado Univ., Denver (USA). Medical Center
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01555-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$47,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is clear that certain environmental agents with little known toxicity of their own can greatly enhance the lethal and mutagenic action of other physical and chemical agents. An example of this is the effect of caffeine and related compounds on the lethal action of uv and X-irradiation and on the action of certain alkylating agents. Inhibition of purine biosynthesis has also been shown to cause serious damage, mainly embryotoxicity and teratogenicity. The interrelationship of these phenomena will be studied by examining the metabolism of caffeine in Chinese hamster ovary cells (CHO-K1/pro-) and mutant cells defective in purine, pyrimidine, and amino acid metabolism grown in culture. Methods will include assessment of caffeine metabolism by high pressure liquid chromatography, the effect of caffeine on

nucleotide biosynthesis, and the analysis of genetic repair processes in selected mutants under various experimental conditions.
KEYWORDS: MUTAGENESIS;MUTAGENS;CAFFEINE;ULTRAVIOLET RADIATION;X RADIATION;ALKYLATING AGENTS;SYNERGISM;TOXICITY;FETUSES;METABOLISM;HAMSTERS;ANIMAL CELLS;DNA;BIOLOGICAL REPAIR;GENETIC RADIATION EFFECTS;BIOLOGICAL EFFECTS;OXIDATION

<033224>
TITLE: Nature of Lead and Mercury Binding Nuclear Proteins
PROJECT NUMBER: 1R01ES01535-01
PRINCIPAL INVESTIGATOR: Cherian, G.M.
ADDRESS: Health Sciences Center, London, Ontario, Canada
AFFILIATION: Western Ontario Univ., London (Canada)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01535-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$13,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Pb;METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objectives of this study are to determine the nature of proteins forming intracellular complexes with potentially toxic metals, particularly lead and mercury. Both of these metals are known to bind intracellularly with acid nuclear proteins. It is not known whether these proteins are synthesized specifically for binding with these metals.
APPROACH: Experiments are planned to determine the role of de novo synthesis on the availability of the proteins. Rats exposed to excessive amounts of lead and mercury will be treated with metabolic inhibitors of protein synthesis and acidic nuclear protein-metal complexes will be isolated and compared quantitatively with intoxicated rats not treated with metabolic inhibitors. If it is found that treatment by inhibitors of protein synthesis (e.g., cycloheximide and/or actinomycn D) inhibits lead protein formation, the toxic effects of the same amounts of metal will be compared in treated and untreated rats. If protein-metal complexing is desirable, as suspected from studies to date, possible induction of lead and/or mercury binding acidic nuclear proteins will be studied by prior exposure to less toxic essential metals, zinc and/or copper.
RESULTS: These studies should contribute toward understanding (1) variation in susceptibility of different individuals in the population to the toxic effects of metals encountered in industrial exposure or in the ambient environment and (2) may determine possible ways of inducing protective metal-binding proteins by administration of less toxic metals.
KEYWORDS: LEAD;MERCURY;METABOLISM;BIOCHEMICAL REACTION KINETICS;PROTEINS;BIOSYNTHESIS;RATS;METABOLISM;ZINC;COPPER;SYNERGISM;GENETIC VARIABILITY;PATHOLOGICAL CHANGES

<033225>
TITLE: Distribution of Polonium-210 in Human Lung
PROJECT NUMBER: 1RO1ES1550-01
PRINCIPAL INVESTIGATOR: Harley, N.
ADDRESS: 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA). Medical Center
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1RO1ES01550-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$49,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Polonium-210 is found in mainstream cigarette smoke and it has been suggested that the alpha radiation from the Po-210 deposited in the lung is etiologically related to bronchogenic carcinoma. Reported average concentrations of Po-210 in human lung are significantly higher in smokers than in non-smokers. The concentration is thought to be non-uniform on the bronchial epithelium.
APPROACH: The study in this application will establish the concentration of Po-210 in lungs of smokers and non-smokers and will focus on determining the microdistribution of this radionuclide on the bronchial epithelium.
RESULTS: The study will establish the radiation dose to the critical basal cells of the bronchial epithelium. It should then be possible to determine whether or not this dose could be carcinogenic in view of the past human experience with alpha-emitting radionuclides in the lung.
KEYWORDS: POLONIUM 210;TISSUE DISTRIBUTION;LUNGS;CONTAMINATION;CARCINOMAS;TOBACCO PRODUCTS;BRONCHI;RADIATION DOSES;ALPHA PARTICLES;TOXICITY;RESPIRATION

<033226>
TITLE: Metabolism, Induction and Toxicity of PCBs
PROJECT NUMBER: 1R01ES01544-01
PRINCIPAL INVESTIGATOR: Kaminsky, L.S.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01544-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$52,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/PCB (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The polychlorinated biphenyls (PCBs) are found universally as toxic environmental pollutants. The objectives of the proposed research program are to determine the mechanisms of hepatic microsomal metabolism of selected individual PCBs and to relate this metabolism to the toxicity of the corresponding PCB.
APPROACH: The role of the number and position of chlorine substituents on the PCBs in controlling metabolite patterns and toxicity will be determined and used to predict the toxicity of untested PCBs. The inductive effects of PCBs on hepatic microsomal mixed function oxidases and the consequences of such induction for hepatic drug and xenobiotic metabolism will also be investigated. Mechanisms of PCB metabolism will be investigated by (1) the determination of binding constants for PCB-hepatic cytochrome P-450 interactions in rat and monkey microsomes using difference spectral techniques; (2) isolation, using high pressure liquid chromatography, and identification, using mass spectrometry and NMR, of the metabolic products of the in vitro metabolism of selected PCBs by hepatic microsomes; (3) molecular orbital calculations of PCBs and theoretical reactive intermediate metabolites (e.g., arene oxides) using extended Huckel and CNDO/2 calculations; (4) the study of the covalent binding of C-14 labeled PCB metabolites to microsomal macromolecules; and (5) the investigation of the effect of epoxide hydrase and glutathione S-epoxide transferase on the in vitro metabolism of PCBs by microsomal and solubilized rat enzyme systems. The acute and chronic inductive effects of PCBs will be probed in rats using quantitative assays of hepatic microsomal enzyme levels and determinations of drug metabolism activities.
RESULTS: The results of these studies will be used to estimate safe levels of PCBs of differing chlorine contents. A number of the metabolic studies will be repeated using chlorinated dibenzofurans as substrates. These compounds frequently occur as impurities in PCBs and these studies should resolve the possibility of dibenzofurans being the source of toxic effects normally attributed to PCBs.
KEYWORDS: AROMATICS;ORGANIC CHLORINE COMPOUNDS;TOXICITY;LIVER;MICROSOMES;CYTOCHROMES;RATS;MONKEYS;MASS SPECTRCMETERS;CHROMATOGRAPHY;METABOLISM;CARBON 14;ENZYMES;BENZOFURANS;PATHOGENESIS

<033227>
TITLE: Distribution and Retention of Inhaled Pollutants
PROJECT NUMBER: 1R01ES01543-01
PRINCIPAL INVESTIGATOR: Wagner, H.N.
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AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). School of Hygiene and Public Health
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01543-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$72,000
TECHNOLOGY: FOSSIL FUEL/General (75%);NUCLEAR/General (25%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (50%);RADIATION (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The estimation of health hazards due to inhaled atmospheric pollutants depends on knowledge of the amount and location of material retained in the lungs. In order to provide the information on which these estimates can be based, we are proposing an experimental program for the measurement of the distribution and clearance of inhaled radiolabeled aerosols over a wide range of particle sizes and breathing patterns. Three factors have come together to make such an investigation particularly appropriate at this time: (1) The technological advances in recording and analyzing radioactive tracer data that have been made over the past 5 years can greatly improve the quality of the fundamental information to be gained; (2) Considerable experience has been gained in generating controlled aerosols; (3) As the nation faces the possibility of considerable expansion of nuclear and coal-fired power plants, more information is needed in order to judge the relative health hazards of alternative sources of energy.
KEYWORDS: AIR POLLUTION;RADIOACTIVE AEROSOLS;LUNGS;HEALTH HAZARDS;INHALATION;TISSUE DISTRIBUTION;CLEARANCE;PARTICLE SIZE;PATHOGENESIS;RESPIRATION

<033228>
TITLE: Nature of Radiation Induced Genetic Damage
PROJECT NUMBER: 1R01ES01536-01
PRINCIPAL INVESTIGATOR: Novitski, E.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01536-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$62,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The relation between radiation-induced mutations and chromosome breaks is not understood at the present time; a new hypothesis of the whole animal from only one of the first two cleavage products appears to resolve some of the problems.
APPROACH: The research will focus on the study of the production of mosaics in Drosophila melanogaster as a function both of X-ray dose and chemical treatment, and the computer analysis of genetic data on chromosome loss and dominant lethal production in view of this hypothesis.
WORDS: MUTATIONS;CHROMOSOMAL ABERRATIONS;RADIOINDUCTION;DROSOPHILA;X RADIATION;BIOLOGICAL RADIATION EFFECTS;DATA ANALYSIS;COMPUTERS;MUTAGENS;DNA;GAMMA RADIATION;PATHOGENESIS

<033229>
TITLE: Effects of Hydrocarbons on Defense Mechanisms
PROJECT NUMBER: 1R01ES01531-01
PRINCIPAL INVESTIGATOR: Tripp, M.R.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01531-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$61,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: TRANSPORTATION (50%);STORAGE (25%);COMBUSTION OR END USE (25%)
POLLUTANTS: ORGANICS/Hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Environmental chemicals, particularly hydrocarbons, cause disease themselves and may make organisms more susceptible to infectious disease as well. It is proposed to study 3 animal species as models and show how hydrocarbons adversely affect defense mechanisms.
APPROACH: The hard clam (Mercenaria mercenaria), blue crab (Callinectes sapidus), and mummichog (Fundulus heteroclitus) will be exposed chronically to nonlethal concentrations of phenol, naphthalenes, and water soluble petroleum extracts. In the clam effects on epithelial surfaces will be examined histologically (including ultrastructure), phagocytosis by hemocytes and intracellular digestion will be measured as will changes in hemolymph protein. In the crab damage to gills will be assessed by light and electron microscopy, hemocyte function assayed and hemolymph protein assayed by electrophoresis. These two species lack the ability to form immunoglobulins, thus offering unique opportunities to study the effect of chemicals on nonspecific defense mechanisms. Treated fish will be assayed for their ability to reject scale transplants and to form immunoglobulins. Other physiological parameters to be measured include blood cortisol concentrations, hematocrit, blood cell and protein composition.
RESULTS: The relative importance of epithelia, phagocytes, and nonspecific humoral factors and how they may be repressed by hydrocarbons will be clarified. Mechanisms of nonspecific as well as specific humoral and cellular immunity in fish will be clarified.
KEYWORDS: DEFENSE MECHANISMS;HYDROCARBONS;BIOLOGICAL EFFECTS;MOLLUSCS;CRUSTACEANS;FISHES;BIOLOGICAL MODELS;PHENOLS;NAPHTHALENE;PETROLEUM;HISTOLOGY;PROTEINS;ELECTROPHORESIS;IMMUNOGLOBULINS;IMMUNE REACTIONS;TRANSPLANTS;HYDROCORTISONE;BLOOD CELLS;PHAGOCYTES;OIL SPILLS;TOXICITY

<033230>
TITLE: Environmental Mutagens: Their Mechanisms of Action
PROJECT NUMBER: 1R01ES01527-01
PRINCIPAL INVESTIGATOR: Sofer, W.H.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01527-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$97,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The Adh-gene-enzyme system may be used to study the mechanism of action of chemical mutagens in a higher organism. This system is unique for this purpose because (1) chemical methods have been developed to detect forward mutations, (2) chemical procedures have been developed to detect reverse mutations, and (3) the product of the gene, alcohol dehydrogenase (ADH) has been purified and chemically characterized, and will soon be sequenced.
APPROACH: This project involves 4 separate steps: (1) we will generate Adh-negative mutants with five interesting chemical mutagens; (2) we will characterize these mutants with regard to whether they yield ADH-like cross-reacting material (CRM); and (3) for those mutants that are CRM-negative, we will carry out reversion analysis and examine their polytene chromosomes.
RESULTS: The data generated from these experiments will yield important information concerning (1) the mutation rate of a given mutagen at a well defined locus, (2) the rate at which CRM-positive mutants are generated relative to the total rate, and (3) the changes at the nucleotide level which the particular mutagen generates.
KEYWORDS: MUTAGENS;GENES;ENZYMES;DEHYDROGENASES;CHROMOSOMES;NUCLEOTIDES;METABOLISM;BIOLOGICAL EFFECTS;PURIFICATION;INVERTEBRATES;MUTATIONS;DROSOPHILA

<033231>
TITLE: Bacterial Degradation of PCB: Consequences and Effects
PROJECT NUMBER: 1R01ES01521-01
PRINCIPAL INVESTIGATOR: Saylor, G.S.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01521-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/PCB (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This investigation is designed to determine the interaction between Polychlorinated

Biphenyls (PCB) and naturally occurring microbial communities.
APPROACH: The direct objectives of the proposed investigation are fourfold: (1) to determine the environmental rate of PCB degradation in aquatic habitats; (2) to assess the potential for bioamplification of PCB residues in aquatic food chains; (3) to determine the mutagenic potential of PCB and its metabolites in aquatic environments; (4) to elucidate the effect of PCB contamination and potential metabolites on the structure and function of aquatic heterotrophic bacterial communities. Gas chromatography and radioisotope assays will be employed to assess microbial PCB degradation and bioaccumulation. Auxotrophic bacterial mutants will be used as test organisms in screening experimentally degraded samples for the presence of microbially produced mutagenic PCB metabolites. The impact of PCB contamination on the microbial ecology of selected freshwater habitats will be determined by comparing heterotrophic respiration rates, radioisotopic substrate decomposition rates, heterotrophic uptake kinetics, and generic composition of natural microbial populations in control and PCB dose environments.
RESULTS: Fulfillment of these objectives will aid in predicting the residence time of PCB in the environment and the potential ecological effects and environmental health hazards posed by acute or chronic PCB contamination.
KEYWORDS: AROMATICS;ORGANIC CHLORINE COMPOUNDS;BIODEGRADATION;BACTERIA;BIOLOGICAL ACCUMULATION;MUTANTS;ECOLOGY;FRESH WATER;RESPIRATION;AQUATIC ECOSYSTEMS;WATER POLLUTION;HEALTH HAZARDS;POLLUTION;TOXICITY

<033232>
TITLE: Lead Retention in Relation to Nutrient Intake
PROJECT NUMBER: 1R01ES01507-01
PRINCIPAL INVESTIGATOR: Huber, A.M.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-1R01ES01507-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$46,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Pb (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of these studies is to evaluate the effects of marginal and excess nutrient intakes on susceptibility to lead toxicity under conditions of low lead exposure. The influence of nutrient intake on lead detoxification will also be investigated and compared with chelation therapy.
APPROACH: In a series of studies, nutrient-lead interactions will be investigated to elucidate their mechanisms.
RESULTS: The aim of the studies is to define the optimum dietary conditions which afford the greatest resistance to lead exposure.
KEYWORDS: LEAD;ENVIRONMENTAL EXPOSURE PATHWAY;BIOLOGICAL MODELS;NUTRIENTS;INTAKE;METABOLISM;TOXICITY;HEALTH HAZARDS;BIOLOGICAL REPAIR;BIOCHEMICAL REACTION KINETICS;CHELATES;PATHOLOGICAL CHANGES;PATHOGENESIS;DIET;NUTRITION

<033233>
TITLE: Metallothionein: Structure-Function Relationships
PROJECT NUMBER: 1R01ES01504-01
PRINCIPAL INVESTIGATOR: Petering, D.H.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: 629-3350
TYPE OF FUNDING: Grant No.-1R01ES01504-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$71,100
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Cd (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The role of the cadmium binding protein, metallothionein, in the pathology of environmental cadmium exposure is a question of prime importance. Although some properties of the protein are known, in depth studies have not been done to define the metal-ligand structure and dynamics of this protein, their possible role in cadmium movements and deposition in cells, and the actual, quantitative relationship of cadmium binding in the metallothionein to cellular and organismic toxicity from the metal.
APPROACH: The present research sets forth a series of experiments which will address these areas of needed inquiry: (1) a variety of physico-chemical techniques including laser Raman and atsup 13atC NMR spectroscopy, amperometric titrimetry, and functional group modification will be used to examine the structure of the metal binding sites in metallothionein; (2) kinetic studies will determine rates of metal exchange between metallothionein and metal complexes and ligands; (3) quantitative analysis of cadmium distribution between metallothionein and other cellular constituents will be undertaken under controlled conditions of exposure of rats to toxic and essential metals which produce definite toxic effects; (4) antibodies to metallothionein and thionein will be developed which will be used for the sensitive immunodetection of these proteins in rat tissues; (5) model kinetic studies of metal exchange between metallcthionein and rat liver mitochondria will be used to investigate the distribution of cadmium among cellular components; (6) a line of Ehrlich ascites cells resistant to cadmium will be developed so that biochemical aspects of cadmium toxicity and resistance to cadmium may be examined in vitro.
KEYWORDS: PROTEINS;CADMIUM;PATHOLOGY;METABOLISM;LIGANDS;MOLECULAR STRUCTURE;TOXICITY;CARBON 13;SPECTROSCOPY;BINDING ENERGY;QUANTITATIVE CHEMICAL ANALYSIS;ANIMAL CELLS;ANTIBODIES;RATS;LIVER;TISSUE DISTRIBUTION;ASCITES TUMOR CELLS;BLOOD;KIDNEYS;LUNGS

<033234>
TITLE: Detecting Mutations Induced by Environmental Pollutants
PROJECT NUMBER: 1R01ES01498-01
PRINCIPAL INVESTIGATOR: Lark, K.G.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01498-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$118,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We propose to develop a system which can be used to study the ability of environmental pollutants to induce somatic mutagenesis at different loci in animal and plant cells. The methods used to develop this system will be applicable to development of a similar system in other animal or plant cell lines.
APPROACH: A series of conditional lethal mutants will be prepared. In the heterozygous form these will appear as pseudo dominant with incomplete penetrance. Inactivation of such mutant loci will result in reversion of the heterozygote to wild type. Such reversions will detect point, deletion, and frameshift mutations. As a result, the mutant strains will provide a sensitive system for the detection of environmentally induced mutations. In such strains somatic crossing-over also should be readily detected, thus allowing a test for agents which increase cross-over rate. The project will approach (a) induction of mutants and thir selection in heterozygotes, (b) conversion of heterozygotes to mutant homozygotes, (c) marker rescue incorporation of mutant loci from these homozygotes into a non-mutagenized background, to produce ''clean'' heterozygotes, (d) tests for reversion of the heterozygotes. Initially, a model system (HGPRTase) will be used to test predicted characteristics of heterozygotes containing dominant alleles with partial penetrance.
KEYWORDS: MUTATIONS;POLLUTION;MUTAGENESIS;ANIMAL CELLS;PLANT CELLS;MUTANTS;HYBRIDIZATION;BIOLOGICAL MODELS;BIOLOGICAL EFFECTS;ANIMALS;GENETICS;NEOPLASMS;PLANTS

<033235>
TITLE: Cadmium: Neurobehavioral and Trace Metal Studies
PROJECT NUMBER: 1R01ES01494-01
PRINCIPAL INVESTIGATOR: Cooper, G.P.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01494-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$74,100
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/CAdmium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The studies are designed as a coordinated effort to define the behavioral and neurophysiological effects of acute and chronic cadmium administration, the sensitivity of the rat to cadmium at major developmental stages, and the potential interrelations between essential trace metal balance and cadmium toxicity.
APPROACH: In the studies of chronic Cd exposure we will (a) assess the effects on selected behavioral and neurophysiological parameters such as spontaneous locomotor activity, motor coordination, aggressiveness, learning, peripheral nerve conduction velocity, visual evoked response and skeletal muscle contractile force; (b) determine the relative effects of Cd exposure during the pre-gestational, gestational, neonatal, and adult periods, and (c) determine the concentration of Cd, Fe, Zn, and Cu in selected tissues to ascertain whether changes in trace metal balance may be associated with the occurrence of signs of neurotoxicity. In the acute exposures and in vitro work our objectives are to (a) elucidate the mechanism of action of Cd as a synaptic blocking agent and (b) determine the effects of localized brain injections of Cd and whether particular brain loci are more sensitive than others.
RESULTS: These studies will provide a comprehensive assessment of the neurotoxic effects of cadmium, including the possibly crucial role that essential trace metals may have in determining toxicity.
KEYWORDS: CADMIUM;METALS;TRACE AMOUNTS;BEHAVIOR;BIOLOGICAL EFFECTS;TOXICITY;NERVOUS SYSTEM;IRON;ZINC;COPPER;ECOLOGICAL CONCENTRATION;TISSUE DISTRIBUTION;IN VIVO;PATHOGENESIS

<033236>
TITLE: Nephrotoxic Effects of Environmental Hydrocarbons
PROJECT NUMBER: 1R01ES01480-01
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01480-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$49,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Hydrocarbon solvents (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This research has a goal of defining the relationship between chronic progressive renal disease and exposure to environmental hydrocarbon solvents. Clinical studies have established a relationship between human glomerulonephritis and hydrocarbon solvent exposure, in addition to the well known acute renal tubular toxicity of many of these agents.

APPROACH: This study will attempt to produce an animal model of hydrocarbon-induced glomerulonephritis in rats by chronic intraperitoneal administration of common petroleum distillates and hydrocarbon solvents. Gasoline, carbon tetrachloride, toluene, trichloroethylene and a degreasing solvent, stanisol, will be studied regarding their glomerulotoxic and nephrotoxic potential. The mechanism of induced injury will be studied by examining tissue with light, immunofluorescence and electron microscopy.
N,N-diacetylbenzidine has been shown to produce a proliferative glomerulonephritis in rats. We propose to study the pathogenesis of this glomerulonephritis which is morphologically similar to a form of human glomerulonephritis mediated by immune mechanisms. The role of the immune system in potentiating this toxin-induced glomerulonephritis will be studied by light, immunofluorescence and electron microscopy of renal tissue, as well as by a search for serum anti-kidney antibodies.
RESULTS: If immunologic mechanisms are involved in perpetuating glomerulonephritis, this would explain why many cases of human glomerulonephritis are apparently mediated by immune mechanisms, but the antigens stimulating the immune response are unknown.
KEYWORDS: KIDNEYS;NEPHRITIS;HYDROCARBONS;BIOLOGICAL EFFECTS;TOXICITY;BIOLOGICAL MODELS;SOLVENTS;CARBON TETRACHLORIDE;GASOLINE;TOLUENE;FLUORESCENCE;ELECTRON MICROSCOPY;PATHOGENESIS;IMMUNOLOGY;INHALATION

<033237>
TITLE: Intranasal Homeostasis Viruses and Pollutant Gases
PROJECT NUMBER: 1RO1ES01477-01
PRINCIPAL INVESTIGATOR: Bang, F.B.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1RO1ES01477
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$48,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Respiratory disease is the major cause of human death. SO2 is a universal air pollutant, the nasal mucosa is the first site of impact of airborne viruses and toxins, and epithelial sloughing is a primary response to both. The most important single mechanism for maintaining nasal mucociliary clearance during exposure to daily fluctuating doses of toxins and viruses is mucociliary homeostasis.
APPROACH: New techniques will be used to monitor nasal homeostatic mechanisms sequentially in individual living chickens during exposure to combined effects of acute and chronic viral infections and graded levels of SO2. Immunopathology and nasal histopathology will be followed during all phases of the interactions between viruses and pollutant gas. An added study will evaluate effects of continuous low level exposure to SO2 during the first three weeks of life on cell dynamics, on nasal and sinus transport rates, and on development of organized lymphoid cell systems in nasal and paranasal tissues and in the thymus and bursa.
KEYWORDS: HOMEOSTASIS;VIRUSES;RESPIRATORY SYSTEM DISEASES;SULFUR DIOXIDE;AIR POLLUTION;MUCOUS MEMBRANES;PATHOLOGY;IMMUNE REACTIONS;ANIMAL CELLS;LYMPHOCYTES;THYMUS;NOSE;BIOLOGICAL EFFECTS;BACTERIA;LUNGS;TOXICITY

<033238>
TITLE: Epidemiologic Study of Cord in Cohorts
PROJECT NUMBER: 1RO1ES01473-01
PRINCIPAL INVESTIGATOR: Detels, R.
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DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1RO1ES01473-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$432,900
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This is a proposal to perform longitudinal studies on three already established population-based cohorts in areas exposed to (1) moderate levels of photochemicaloxidant pollutants, (2) combined reductant, oxidant and hydrocarbon pollutants, (3) minimal levels of chemical pollutants, and a cohort to be established in an area chronically exposed to high levels of oxidant-type pollutants. The objectives of the proposal are to (1) observe the natural history of chronic obstructive respiratory disease (CORD) and functional respiratory impairment, (2) identify environmental factors including chronic exposure to specific air pollutants which play a role in the evolution, exacerbation and rate of progression of CORD and/or functional impairment, (3) identify as yet unsuspected demographic, familial and constitutional characteristics of individuals who go on to develop irreversible CORD and/or functional impairment, (4) identify those parameters of expiratory flow, and the flow-volume curve derived from spirometry; the alveolar plateau, closing volume fraction and residual volume derived by the single-breath nitrogen test (SBNT); airway resistance, functional residual capacity, and specific conductants derived from body plethysmography; x-ray and reported symptoms which can best predict impending CORD and/or functional impairment at a still reversible stage in susceptible individuals, (5) provide information on the variability (a) of individual performance and subgroup performance for each of these tests of lung function and (b) associated with seasonal factors or other factors present at the time of testing.
APPROACH: The more than 15,000 individuals in the cohorts who have been characterized by baseline lung function studies will be followed annually for reported changes in respiratory health, changes of address, etc. On the fifth anniversary of the baseline studies tests of lung function will be administered to members of the cohort. Variability will be evaluated by immediate retesting of a probability sample of individuals completing lung function at the Mobile Lung Function Laboratory, retesting a probability

sample of individuals in the cohort at three-month intervals in each of the four seasons, and reexamining a probability sample of residents at the UCLA Pulmonary Function Laboratory using the same and more sophisticated tests of lung function.
KEYWORDS: RESPIRATORY SYSTEM DISEASES;HUMAN POPULATIONS;POLLUTION;HYDROCARBONS;AIR POLLUTION;BIOLOGICAL EFFECTS;RESPIRATION;BIOMEDICAL RADIOGRAPHY;LUNGS;PHYSIOLOGY;STATISTICS;INHALATION;OXIDATION;PATHOGENESIS;ULTRAVIOLET RADIATION

<0033239>
TITLE: Effect of Hg Resistant Mouse Gut Flora on Hg Toxicity
PROJECT NUMBER: 1RO1ES01461-01
PRINCIPAL INVESTIGATOR: Summers, A.O.
ADDRESS: Fruit Street, Boston, MA 02114
AFFILIATION: Massachusetts General Hospital, Boston (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1RO1ES01461-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$41,200
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Mercury compounds, especially alkyl mercurials, are extremely toxic to living organisms. The ability of bacteria to transform mercury compounds from the organic to the inorganic form and vice versa has been examined in freshwater sediment systems, saltwater sediment systems, and in the laboratory. We propose to study, in experimental animals, whether the presence in the intestine of bacteria that can reduce mercury compounds alters their toxicity, distribution in the body, or rate of elimination. The effect of ingestion of mercury compounds on the survival of mercury resistant bacteria in the mouse gut will also be investigated.
KEYWORDS: MERCURY;TOXICITY;MERCURY COMPOUNDS;BACTERIA;MICE;INTESTINES;TISSUE DISTRIBUTION;EXCRETION;METABOLISM;INGESTION;PATHOGENESIS

<0033240>
TITLE: Metallothionein in Metabolism and Toxicity of Cadmium
PROJECT NUMBER: 1RO1ES01448-01
PRINCIPAL INVESTIGATOR: Shaikh, Z.A.
ADDRESS: 601 Elmwood Avenue, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1RO1ES01448-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$47,600
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS/Cadmium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project deals with the metabolism of a toxic element cadmium in an animal model. The absorption, tissue distribution and excretion of an orally administered isotope of cadmium will be followed in rats. The biological half-life of cadmium in the rat in general, and in the critical organs liver and kidney in particular, will be determined. Retention of cadmium in the critical organs is brought about by metallothionein. The mechanism by which cadmium stimulates protein synthesis in these organs will be investigated. Cadmium is bound to metallothionein not only in liver and kidney, but also in other tissues like pancreas, spleen and placenta. The proteins from these organs will be isolated and purified and their properties will be compared with the hepatic protein. A radioimmunoassay procedure will be developed to measure metallothionein in tissues and biological fluids. It is postulated that intestinal absorption of cadmium and the passage of the element from the mother to fetus and newborn may be restricted by the presence of metallothionein and other metal-binding proteins in intestinal mucosa, placenta and mammary gland. The validity of this concept will be tested in animals experimentally exposed to cadmium. Involvement of cadmium in renal tubular dysfunction and hypertension has been suggested. The role of metallothionein in etiology of these diseases will be evaluated.
KEYWORDS: CADMIUM;METABOLISM;TOXICITY;TISSUE DISTRIBUTION;EXCRETION;RATS;LIVER;KIDNEYS;PROTEINS;BIOSYNTHESIS;PROTEINS;PANCREAS;SPLEEN;PLACENTA;RADIOIMMUNOASSAY;INTESTINAL ABSORPTION;PATHOGENESIS

<0033241>
TITLE: Preschool Subclinical Lead and School Age Performance
PROJECT NUMBER: 1RO1ES01442-01
PRINCIPAL INVESTIGATOR: Ernhart, C.B.
ADDRESS: Department of Psychology, Hempstead Turnpike, Hempstead, NY 11550
AFFILIATION: Hofstra Coll., Hempstead, N.Y. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1RO1ES01442-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$54,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Pb (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: In 1972 Perino and Ernhart tested 80 black preschool children and related these intelligence test scores to subclinical levels of blood lead obtained in the screening program of the Department of Health, New York City. Children of moderate lead level (.04 to .07 mg. lead per 100 ml. of whole blood) performed more poorly than those of lower lead values on general cognitive, verbal, and perceptual scales. The correlation of parent-child intelligence was significantly attenuated in the moderate lead group. The objective of the proposed research is to determine if these effects persist four years later in a reevaluation of the same 80 children. Intelligence, perceptual motor skills, behavior ratings and school achievement will be related to preschool blood lead levels, current blood lead levels, erythrocyte protoporphyrin and to the retrospective cumulative index of stored lead in shed deciduous teeth.
KEYWORDS: INTELLIGENCE TESTING;LEAD;CHILDREN;BLOOD;ECOLOGICAL CONCENTRATION;BEHAVIOR;ERYTHROCYTES;PROTOPORPHYRINS;TEETH;BIOLOGICAL EFFECTS;MEDICINE;TOXICITY

<033242>
TITLE: Metabolism and Toxicity of Organometallic Agents
PROJECT NUMBER: 1R01ES01675-01
PRINCIPAL INVESTIGATOR: Hanzlik, R.P.
ADDRESS: Department of Medicinal Chemistry, Lawrence, KS 66045
AFFILIATION: Kansas Univ., Lawrence (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01375-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$58,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Cr;METALS/Mg;METALS/Fe (50%);ORGANICS/Benzene;ORGANICS/Toluene;ORGANICS/Styrene (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Organometallic derivatives of transition metals are finding increasing use in numerous applications, particularly as additives in fuels and petroleum products, yet the biological properties of this class of compounds are virtually unknown. We propose a systematic investigation of the toxicity, pharmacological properties, and metabolism of a set of organometallic compounds of chromium, manganese, and iron. The compounds to be studied are analogs of simple organic compounds whose toxicity, pharmacology, and metabolism are very well known (e.g. benzene, toluene, styrene; amphetamine, ephedrine, diphenhydramine). The analogy is simply based upon replacement of a phenyl group by an aromatic organometallic equivalent such as (C5H5)FeC5H4/sup -/, (CO)3CrC6H5/sup -/, or (CO)3MnC5H4/sup -/. Both acute and prolonged toxicity will be evaluated using histological as well as biochemical techniques. Pharmacological studies as well as metabolism studies will be performed in vivo as well as in vitro, and any metabolites with an intact organometallic moiety will be isolated and fully characterized.
KEYWORDS: METABOLISM;TOXICITY;ORGANOMETALLIC COMPOUNDS;METALS;PETROLEUM;FUELS;CHEMICAL PROPERTIES;CHROMIUM COMPOUNDS;MANGANESE COMPOUNDS;IRON COMPOUNDS;HISTOLOGY;IN VIVO;IN VITRO;DISEASES

<033243>
TITLE: Studies of Oxidant-Induced Pulmonary Lesions
PROJECT NUMBER: 1R01ES01365-01
PRINCIPAL INVESTIGATOR: Montgomery, M.R.
ADDRESS: VA Hospital, 54th St. and 48th Avenue South, Minneapolis, MN 55417
AFFILIATION: Minnesota Univ., Minneapolis (USA). Medical School
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01365-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$31,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Ozone;NOXIOUS GAS/O2 (75%);ORGANICS/Paraquat (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is designed to investigate (1) The possibility of a common chemical mechanism responsible for the pulmonary lesions resulting from exposure of animals to oxygen, ozone, or paraquat. (2) The role of pulmonary fatty acid desaturation in the development of these lesions. (3) Identification of factors useful in design of rational therapy for the chronic lesion associated with acute exposure to these and other strong oxidants.
KEYWORDS:
LUNGS;OXIDIZERS;INJURIES;OXYGEN;OZONE;HISTOLOGY;PATHOLOGY;ENZYMES;MICROSOMES;CYTOCHROMES;BIOCHEMICAL REACTION KINETICS;CARBOXYLIC ACIDS;THERAPY;BIOLOGICAL EFFECTS;DISEASES;OXIDATION;PATHOGENESIS

<033244>
TITLE: Prolonged Exposure to Four Levels of Air Pollutants
PROJECT NUMBER: 1R01ES01361-01
PRINCIPAL INVESTIGATOR: Peir, D.J.
ADDRESS: Biology Department, St. Louis University, St. Louis, MO 63103
AFFILIATION: Saint Louis Univ., Mo. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01361-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$30,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)

POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/NO;NOXIOUS GAS/NO2;NOXIOUS GAS/CH4;NOXIOUS GAS/CO (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives are to determine the following effects of exposure of an insect species to 4 consistent levels of a complex mixture of air pollutants: (1) the effects on growth rate, reproduction, survivorship, and life span over 12 successive generations; (2) the effects of air pollutants on animals exposed only at certain stages of the life cycle; (3) possible synergistic actions of air pollutants and stress factors; and (4) the pathway or mechanism of action of the pollutants. Only two possible pathways will be investigated during the time of this study: effects on hormones controlling growth and development in insects and effects on metabolic rates.
APPROACH: The pollutants will be SO2, NO, NO2, CH4, CO, and (NH4)2SO4. The levels of the gases in the mixture will be approximately those found in a typical urban environment, those found under high or episodic conditions, and those found under emergency conditions. The levels of pollutants are maintained by a programmed monitoring system with feedback control.
RESULTS: These experiments will give us data which will allow predictions about certain effects of pollutants before those levels of pollutants actually have to be coped with.
KEYWORDS: AIR POLLUTION;INSECTS;REPRODUCTION;SURVIVAL CURVES;LIFE SPAN;GROWTH;LIFE CYCLE;SYNERGISM;BIOLOGICAL EFFECTS;HORMONES;SULFUR DIOXIDE;NITROGEN OXIDES;CARBON MONOXIDE;URBAN AREAS;MONITORING;INVERTEBRATES;TERRESTRIAL ECOSYSTEMS;GENETICS;MUTANTS

<033245>
TITLE: Effect of Atmospheric Pollutants on Pulmonary Defenses
PROJECT NUMBER: 1RO1ES01327-01
PRINCIPAL INVESTIGATOR: Goldstein, E.
ADDRESS: Department of Internal Medicine, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA). School of Medicine
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1RO1ES01327-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$42,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/NO2 (75%);PARTICULATES/Bacteria (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Because atmospheres containing submicron-sized sulfate or nitrate particles, and sulfur dioxide or nitrogen dioxide are considered potentially hazardous to health, studies are proposed which will assess the impact of these pollutants in combinations on pulmonary defense systems.
APPROACH: Exposure of rodents to ambient or near-ambient concentrations of sulfate particles + sulfur dioxide, and nitrate particles + nitrogen dioxide will be evaluated to determine if these pollutants act additively or synergistically to inhibit mucociliary transport (32P-labelled Staphylococcus aureus), phagocytic ingestion (histologic localization of bacteria), and killing of phagocytized bacteria (measurements of bacterial viability).
KEYWORDS: AIR POLLUTION;LUNGS;SULFATES;NITRATES;HEALTH HAZARDS;IMMUNE REACTIONS;SULFUR DIOXIDE;NITROGEN OXIDES;STAPHYLOCOCCUS;PHAGOCYTES;PHOSPHORUS 32;BIOLOGICAL EFFECTS;DISEASES;INHALATION

<033246>
TITLE: Accumulation of Guanine Due to Heavy Metals
PROJECT NUMBER: 1RO1ES01323
PRINCIPAL INVESTIGATOR: Farkas, W.R.
ADDRESS: 1924 Alcoa Highway, Knoxville, TN 37920
AFFILIATION: Tennessee Univ., Knoxville (USA). Memorial Research Center and Hospital
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1RO1ES01323-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$53,100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Pb;METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Renal toxicity and gouty arthritis are two of the multiple results of lead poisoning. In addition, lead causes degradation of nucleic acids and a study of the effects of lead on the enzymes of purine metabolism has been started in order to correlate the clinical observations with biochemical events. These preliminary studies showed that the enzyme, guanine aminohydrolase (guanase), was inhibited by Pb/sup 2+/ at 10/sup -7/M. The role of guanase is to convert guanine to xanthine. Since guanine is very insoluble, lead poisoning might lead to accumulation of guanine precipitates in vivo. Indeed, elevated levels of guanine have been found in lead-poisoned rabbits. These preliminary studies have shown that Hg/sup 2+/ and Ag/sup +/, but not Cd/sup 2+/ or any other metal tested, was inhibitory to guanase. This proposal, therefore, is to study the effects of these heavy metal pollutants at low levels (sub clinical) and at high levels characteristic of acute poisoning in vitro on the enzyme and in vivo on the metabolism of guanine. The study would also include administration of 14C guanine to poisoned and normal animals to determine in which organs free guanine accumulates. Another goal of this proposal will be to examine the deposits (accumulated in the joints) of patients with saturnine and normal gout in order to determine if guanine is present in the precipitates. Lead and mercury are volatile components of coal, and lead is an

atmospheric contaminant due to its continued use in gasoline. Mercury is also a water contaminant. Therefore, this study would give an indication of the extent to which these pollutants give rise to renal and metabolic problems related to the accumulation of the highly insoluble metabolite guanine.
WORDS: GUANINE;METALS;KIDNEYS;LEAD;TOXICITY;RHEUMATIC DISEASES;NUCLEIC ACIDS;ENZYMES;METABOLISM;POLLUTION;CARBON 14;MERCURY;BIOLOGICAL ACCUMULATION;INJURIES

<033247>
TITLE: Degradation of Aromatic Compounds by Bacillus Species
PROJECT NUMBER: 1R01ES01284-01
PRINCIPAL INVESTIGATOR: Crawford, R.L.
ADDRESS: P.O. Box 100, Navarre, MN 55392
AFFILIATION: Minnesota Univ., Navarre (USA). Freshwater Biological Inst.
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01284-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$57,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Bacteria of the genus Bacillus are among the most ubiquitous of microorganisms, being principal components of the microflora of most soil and water environments. It is imperative that microbial ecologists better understand the capabilities and limitations of this important microbial group in degrading the myriad of aromatic compounds being continually microbial introduced into the biosphere. The objective of the proposed research is to discover the major patterns by which Bacillus species dissimilate aromatic molecules. The range of aromatic compounds degraded by bacilli will be determined. The catabolic pathways for degradation of selected aromatic compounds will be delineated, and certain of the pathway enzymes will be purified and characterized. Compiled data will also be used to clarify the taxoncmic arrangement of certain species of Bacillus.
KEYWORDS: AROMATICS;BACILLUS;BIODEGRADATION;METABOLISM;BIOSPHERE;ENZYMES;TAXONOMY;WATER;SOILS;POLLUTION

<033248>
TITLE: Effects of Atmospheric Pollutants on Behavior
PROJECT NUMBER: 1R01ES01246-01
PRINCIPAL INVESTIGATOR: Geller, I.
ADDRESS: P.O. Box 28147, San Antonio, TX 78284
AFFILIATION: Southwest Foundation for Research and Education, San Antonio, Tex. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Extramural Program
MONITOR: Gardner, Edward
TELEPHONE: F629-3350
TYPE OF FUNDING: Grant No.-1R01ES01246-01
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$84,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO;NOXIOUS GAS/SO2;NOXIOUS GAS/NO2 (60%);ORGANICS/Ketones;ORGANICS/Acrolein (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The goals of this research are to apply operant technology for the evaluation of atmospheric pollutants on behavior of laboratory animals. A determination will be made of the minimal doses and exposure times required to produce alterations of behavior. Substances to be evaluated include carbon monoxide, nitrogen dioxide, ketones, sulfur dioxide, and acrolein.
KEYWORDS: EMISSIONS;OPERANT CONDITIONING;BEHAVIORAL STUDIES;AIR POLLUTION;BEHAVIOR;BIOLOGICAL EFFECTS;ANIMALS;CARBON MONOXIDE;NITROGEN OXIDES;SULFUR DIOXIDE;KETONES;ACROLEIN

<033249>
TITLE: Etiology of Pica in the Rat
PROJECT NUMBER: Z01 ES 70805-01 LET; EKR-A.76.49(c)
PRINCIPAL INVESTIGATOR: Mitchell, D.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
MONITOR: Mitchell, D.
TELEPHONE: F629-3299
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$16,000; Environmental Protection Agency FY77:$19,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;OS
PROJECT DESCRIPTION: This series of experiments seeks to determine the necessary and sufficient factors in the etiology of pica (the consumption of seemingly non-nutritive substances) and to validate the utility of pica as a behavioral assay of toxicosis. A variety of toxic substances have been shown to cause laboratory rats to engage in geophagia (earth eating). Moreover, rats poisoned with logarithmic doses of toxic substances consume amounts of non-nutritive substances proportionate to the amount of poisoned administered. Other factors demonstrated to be involved in the etiology of pica include gastrointestinal malaise and the acquisition of a conditioned illness. The objectives of this research are (1) to investigate the etiology of pica, (2) to evaluate pica as a behavioral assay of toxicosis in the rat, and (3) to assess the functional utility of pica during poison-induced illness.
APPROACH: Rats are maintained with food, water, and a non-nutritive mixture of pharmaceutical grade kaolin (hydrated aluminum silicate) and 1% acacia (Gum Arabic) ad libitum. After a period of adaptation to this

regimen, the animals are subject to a variety of illness-inducing treatments including motion sickness, and the administration of toxic substances such as cyclophosphamide, lithium chloride, and methyl mercury. In some cases the treatments are restricted to single acute exposures; in others repeated chronic exposures are employed. Following treatment the subsequent changes, if any, in food, water and kaolin consumption are recorded. Variations in this basic procedure include monitoring the temporal parameters of the various consummatory behaviors, adulteration of the kaolin with various concentrations of lead acetate, and the use of conditioning procedures during treatment.
RESULTS: In a continuing series of experiments it has been determined that simple gastrointestinal malaise in the absence of a deficiency state or acute toxemia will elicit pica, that different strains of both laboratory and wild rats show behavioral variation in their propensity to engage in pica, and that a variety of toxic substances (methyl mercury, cyclophosphamide, alcohol, lithium chloride, and various cardiac glycosides) administered either acutely or chronically will reliably cause laboratory rats to engage in a specific form of pica--geophagia or earth-eating. It has also been determined that in some cases the acquisition of a conditioned illness can be a mechanism whereby the habit of pica is maintained in the absence of a demonstrable physiological cause.
PROJECT MILESTONES: The potential significance of this research lies in three major areas: As a behavioral assay of toxicosis, as a laboratory model of pica, and as a strategy in rodent control. Knowledge of the rat's naturally occurring illness-response behaviors such as pica could suggest new techniques and enhance existent species-relevant behavioral assays of illness in the rat. The development of a laboratory model will not only clarify various aspects of the etiology of pica but hopefully reveal methods of mitigating its harmful effects, such as the lead poisoning which is often associated with pica among human infants. Finally, a knowledge of the naturally occurring illness related behaviors of the rat should enable one to devise control methods that circumvent the effectiveness of these behaviors in protecting the animal from poisoning and enhance the effectiveness of control strategies.
KEYWORDS: RATS;INGESTION;SOILS;BEHAVIOR;DIGESTIVE SYSTEM DISEASES;TOXIC MATERIALS;MONITORING;IN VIVO;LEAD;MERCURY;NEUROLOGY

<033250>
TITLE: Neurotoxicological Effects of Hexabrominated Biphenyls
PROJECT NUMBER: Z01 ES 70805-01 LET
PRINCIPAL INVESTIGATOR: Tilson, H.A.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
MONITOR: Tilson, H.A.
TELEPHONE: F629-3299
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$9,000; Environmental Protection Agency FY77:$12,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this project is to determine, as quantitatively as possible, the effects of oral, subacute doses of firemaster (a mixture of polybrominated biphenyls, PPBs) and 2,2', 4,4', 5,5'-hexabromobiphenyl (HBB) in a battery of simple, diagnostic tests designed to detect changes in various functions of the central nervous system (CNS).
APPROACH: Male and female albino rats are being given daily, oral doses of 0.03, 0.3, 3, or 30 mg/kg of firemaster, HBB, or vehicle for at least 60 days. The rats and those mice receiving 30 mg/kg/day of either compound or vehicle will be evaluated in a battery of tests of days 28 and 29 of dosing and then retested 30 days later. The test battery will measure drug-related changes in autonomic-parasympathetic nerve function, sensorimotor function and CNS excitability and emotionality.
RESULTS: It is expected that the test battery will reveal in animals the types of neurological effects which have been reported in humans.
PROJECT MILESTONES: Results from this project will be used in the development of appropriate methods to screen for neurotoxic effects following chronic low-level exposures to environmental agents (both energy related and non-energy related).
KEYWORDS: ANIMAL;HUMAN;IN VIVO;NEUROLOGY;TOXICOLOGY;TOXINS;CENTRAL NERVOUS SYSTEM;BIPHENYL;DIAGNOSTIC TECHNIQUES;RATS;ORAL ADMINISTRATION;MICE;DRUGS;TOXICITY;INJURIES

<033251>
TITLE: Neurochemical Correlates of Behavioral Toxicology
PROJECT NUMBER: Z01 ES 70800-01 LET
PRINCIPAL INVESTIGATOR: Wilson, W.E.
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DIVISION: Laboratory of Environmental Toxicology
MONITOR: Wilson, W.E.
TELEPHONE: F629-3459
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$81,000; Environmental Protection Agency FY77:$94,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: In order to obtain a better understanding of the neurochemical bases for behavior modification resulting from environmental stresses, we have undertaken studies concerned with (a) alterations in levels and characteristics of enzymes which, because they are rate limiting, may provide critical regulation of neurotransmitter levels (e.g. monoamine oxidase, tyrosine hydroxylase, etc.) and (b) the extents to which neurotransmitter concentrations may be modulated or altered in those parts of the central nervous system which are thought to be involved in behavior regulation. In the studies involving monoamine oxidase (MAO), we are investigating the behavioral consequences of inhibiting MAO types A and B as well as several of the characteristics of MAO types A and/or B responsiveness to various substrates and inhibitors.

APPROACH: Behavioral testing (i.e. locomotor activity in an open field) is performed prior to, then after, administration of type-specific monoamine oxidase (MAO) inhibitors to rats. Subsequently, levels of types A and B of MAO are determined in brain, heart, liver and kidney from the animals. MAO types A and B are determined in tissues by using a radioisotope technique. Additional techniques--namely, UV-spectrometry and fluorescence spectrometry--are employed to confirm the radioisotope technique and to establish kinetic characteristics of MAO in the presence of various substrates and inhibitors.
RESULTS: Our in vitro studies have permitted the following: (a) development of the first real separate quantitative determination of MAO types A and B in a single tissue analysis; (b) recognition of a technique which may permit activation of MAO activity; (c) accumulation of kinetic data which supports the hypothesis that the main difference between MAO types A and B concerns the geometry of the enzyme's binding sites. At present, efforts are underway to determine whether dimunition in brain MAO activity might lead to a transitory modification of locomotor activity for which compensatory alternate metabolic pathways might emerge and come into prominence.
PROJECT MILESTONES: Neurotoxic and behavioral effects may be associated with the alteration of cerebral biogenic amines, or their metabolism, or the disposition of their metabolites. This conclusion is based (1) on the wide occurrence of biogenic amines in the CNS, (2) on the transmitter function of several amines, and (3) on the clinical and pharmacological experience that modulations of the aminergic systems may lead to serious changes in the affective state and to neurologic and psychiatric disorders. The investigation cf aminergic systems, therefore, appears to be a promising approach to the elucidation of some phenomena of behavioral toxicology.
KEYWORDS: BEHAVIOR;ENZYMES;METABOLISM;RATS;DRUGS;RADIOISOTOPES;TRACER TECHNIQUES;AMINES;NERVOUS SYSTEM;TOXICITY;ANIMALS;BIOCHEMISTRY;HORMONES;IN VITRO;IN VIVO

<033252>
TITLE: Effects of Microwave Radiation on the Nervous System
PROJECT NUMBER: ERR-2.76.44
PRINCIPAL INVESTIGATOR: Lovely, R.H.;Guy, A.W.
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DIVISION: Laboratory of Environmental Health Sciences
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TYPE OF FUNDING: Contract No.-NO1-ES-6-2133;Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency National Inst. of Environmental Health Sciences FY77:$130,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to determine the effects of long-term, low-level, exposure to 2450 MHz microwave radiation on the central nervous system and behavior.
APPROACH: Rats will be exposed to 2450 MHz plane wave microwave fields at a power density of 500 uW/cm/sup 2/. The exposures will be for 8 hours per day for 3 months. The following indicators of biological effects will be made: (1) Biochemistry--Serum content for sodium, calcium, phosphorus, PTH, SH groups and cholorinesterase activity of the blood and 17-ketosteriods in urine will be measured. (2) Behavior--Animals will be evaluated for free-operant and free-repertoire behavior. Animals will be observed in the irradiation chambers and their specific orientation to the field, sleep, grooming, sniffing, rearing, drinking, eating, etc., will be recorded. (3) Electroencephalography--EEG recordings will be made on the animals following the four month irradiation period.
RESULTS: The effects of long-term, low-level microwave exposure on the nervous system will be measured. A duplicate project is being done in the Soviet Union. A comparison of the results obtained in the U.S. with results of the Soviet Union will be made. This project will assist in the validation of a large volume of Soviet literature which is a significant part of the data base for microwave bioeffects.
PROJECT MILESTONES: The microwave exposure system has been completed and dosimetric measurements have been made using thermographic techniques. The rats are presently being exposed to the microwave fields according to the protocol listed in the above approach section.
KEYWORDS: MICROWAVE RADIATION;CENTRAL NERVOUS SYSTEM;BEHAVIOR;RATS;BIOCHEMISTRY;BLOOD;BIOMEDICAL RADIOGRAPHY;BIOLOGICAL RADIATION EFFECTS;NEUROLOGY

<033253>
TITLE: Extrapolation of PCB Deposition
PROJECT NUMBER: ERR-6.76.52
PRINCIPAL INVESTIGATOR: Sipes, I.G.
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DIVISION: Laboratory of Pharmacology
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TYPE OF FUNDING: Contract No.-NO1-ES-7-2111;Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency National Inst. of Environmental Health Sciences FY77:$54,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to obtain sufficient information on the disposition of polychlorinated biphenyls (PCBs) in dogs and monkeys and to use this knowledge in the further development of a pharmacokinetic model which will predict for a number of species the distribution, accumulation, and excretion of PCBs and other chlorinated xenobiotics after different dose levels and routes of exposure.
PROACH: The distribution, accumulation, metabolism, and excretion of /sup 14/C-labeled PCBs (4,4'-dichloro-, 2,4,5,2',4',5'-hexachlora-, 2,3,6,2',3',6'-hexachloro-biphenyl) will be studied in Beagle dog and Fasciculous monkey. All major tissue and excreta (urine and feces) are sampled at various times after administration of the PCB. Biliary studies are also to be conducted to determine the necessary pharmacokinetic parameters needed for modeling. Flow rate to the major organ will be determined in the monkey by means of microsphere technique.
RESULTS: The contract has just been awarded and the reports are not in. Our proposed course is as follows:

(1) Determine the flow rates to the organs in the monkey, (2) determine the half-lives of the PCBs in dog and monkey, (3) examine the distribution of the PCBs and metabolites in various tissues in dog and monkey, (4) investigate the biliary clearance of PCBs, and (5) elucidate structures of PCB metabolites.
KEYWORDS: PHARMACOKINETICS;AROMATICS;ORGANIC CHLORINE COMPOUNDS;DOGS;MONKEYS;TISSUE DISTRIBUTION;BIOLOGICAL ACCUMULATION;EXCRETION;METABOLISM;TOXICITY

<033254>
TITLE: Developmental Toxicity Indicators
PROJECT NUMBER: ERR-1 (4).76.42
PRINCIPAL INVESTIGATOR: Dixon, R.L.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
MONITOR: Dixon, Robert L.
TELEPHONE: 629-3333
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000; Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (20%);GENERAL SCIENCE (80%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To establish a contracted research capability to assess the postnatal toxic effects of gestation chemical exposure.
APPROACH: Scientific teams are being sought who are broadly familiar with chemically-induced biochemical, physiologic, and histologic effects for the toxicologic evaluation of gestationally exposed offspring. Emphasis is placed on physiological and biochemical functions associated with various organs and tissues. The Fischer rat will be the test animal for routine studies. Other species such as mice, hamsters, guinea pigs, or rabbits might be used also in future attempts to define species variability. Female rats will be exposed to the test chemical for a defined period either prior to breeding or following conception. Chemical exposure will continue during gestation and will be discontinued one day prior to expected parturition.
RESULTS: Offspring will be examined for signs of toxicity at five defined postnatal periods. At each test period, various gross, chemical, hematological, and functional tests will be performed. Special emphasis should be directed to the following systems (or functions): bone marrow and blood; motor and sensory function of the nervous system (including pain, taste, olefaction, audition, and vision); behavior and ''memory''; cardiovascular responses; respiration; renal function and body fluid balance; digestive system; metabolism (energy exchange); endocrinology; reproduction; immunologic capacity; and pathology. Tests of overall hemostatis, physical endurance, and adaptation to stress are also desired.
PROJECT MILESTONES: This contracted research activity should be established during the next few months.
KEYWORDS: TOXICITY;PREGNANCY;NEONATES;RATS;BONE MARROW;BLOOD;NERVOUS SYSTEM;KIDNEYS;RESPIRATORY SYSTEM;CARDIOVASCULAR SYSTEM;TOXIC MATERIALS;BIOLOGICAL EFFECTS;PHYSIOLOGY;BIOCHEMISTRY;CARCINOGENS;REPRODUCTION;TERATOGENESIS

<033255>
TITLE: Early Detection of Lung Injury
PROJECT NUMBER: Z01 ES 30046-01 EBCB
PRINCIPAL INVESTIGATOR: Tombropoulos, E.G.;Van Stee, E.W.
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DIVISION: Environmental Biology and Chemistry Branch
MONITOR: Tombropoulos, E.G.;Van Stee, E.W.
TELEPHONE: 629-3404
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/General (80%);CONSERVATION/General (20%)
ENERGY CYCLE: COMBUSTION IN SITU (10%);COMBUSTION OR END USE (90%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is the search or evidence of early toxic lung injury that may shed light on subsequent events.
APPROACH: Animals will be exposed to gases and fibers that may be found as environmental contaminants. Exposures are carried out in dynamic flow through chambers of two types. One type provides whole body exposure and the other is a nose exposure unit. Pulmonary lavages are obtained and the cellular, lipoprotein and lipid components are isolated by differential centrifugation. The /sup 125/I-Wheat Germ Agglutinin binding to alveolar macrophages will be used as a probe of alteration in alveolar macrophage membrane structure. The lipids (those associated with surfactants and those that are free) will be separated into classes by T.L.C. and column chromatography and their fatty acid composition determined by G.L.C.
RESULTS: This is a new study. Activities to this date have been devoted to assembling the necessary equipment, organizing the laboratories, and establishing basic methodology. We propose to begin this project with a study of two types of gaseous materials: (1) nonrespiratory irritants such as organic solvent vapors, and (2) respiratory irritants such as nitrogen dioxide. As the project gets underway we hope to extend these studies to particulates. We have an interest in respirable glass fibers and asbestos. Some asbestos preparations are known to be cytolytic because of the relatively high ratio of magnesium to silica at the surface of the fibers. The amount of magnesium on the surface can be reduced by prewashing the fibers with oxalate solutions. Changes of the magnesium to silica ratio on the surfaces of asbestos fibers greatly reduces its cytolytic effect. A preliminary study will involve exposure of groups of rats to oxalate washed and unwashed respirable asbestos particles. Pulmonary lavages will be examined for evidence of early lung injury vis-a-vis the presence of the surface magnesium.
KEYWORDS: LUNGS;INJURIES;LIPIDS;LIPOPROTEINS;IODINE 125;AGGLUTININS;MACROPHAGES;AEROSOLS;ASBESTOS;GLASS;SILICA;BIOLOGICAL EFFECTS;NITROGEN OXIDES;AIR;INHALATION

<033256>
TITLE: Regulation of Gene Expression During Differentiation of Teratocarcinoma Cells
ECT NUMBER: Z01 ES 70047-01 LET
CIPAL INVESTIGATOR: Carter, D.B.
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DIVISION: Laboratory of Environmental Toxicology
MONITOR: Carter, D.B.
TELEPHONE: F629-3224
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$42,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The teratocarcinoma system has been described as a model system for the study of embryogenesis and neoplasia. A knowledge of the molecular species involved at the level of gene expression during differentiation or transformation would provide a rational basis for understanding those processes involved in preneoplastic transformation or events which interfere with the normal program of differentiation processes at the genomic level. The ability to detect those proteins which are responsible for the alteration of the normal program of differentiation may enable the development of sensitive and inexpensive assays for molecules having teratogenic potential.
APPROACH: Isolation of chromatin from 2.3 M sucrose, purified nuclei by washing nuclei in buffers of successively lower ionic strength, isoelectric focusing and subsequent SDS gel electrophoresis in a high resolution 2 dimensional gel system, autoradiography of S/sup 35/ methionine labeled nonhistone proteins, reconstitution of chromatin from high salt and urea buffers by direct dialysis to low ionic strength with subsequent removal of urea to physiological conditions, in vitro RNA transcription of various chromatin templates using mercurated nucleotides and subsequent sulfhydrylsepharose chromatography to isolate in vitro synthesized RNA transcripts, RNA-DNA hybridization of in vitro transcripts to probe c-DNA made from most abundant poly(A) RNA sequence classes in teratocarcinoma and embryoid body cells.
RESULTS: The differentiative transition of embryonal carcinoma to endoderm can be studied when well-defined marker gene products are obtained such as the c-DNA to alpha fetoprotein mRNA. We propose to utilize the technique of chromatin reconstitution in order to identify the class of proteins in teratocarcinoma chromatin and teratocarcinoma derived endoderm chromatin which control the expression of the alpha fetoprotein gene in the endodermal derivative.
KEYWORDS: MOLECULAR;TUMOR CELLS;GENES;CELL DIFFERENTIATION;BIOLOGICAL MODELS;NEOPLASMS;ONTOGENESIS;PROTEINS;TERATOGENESIS;CHROMATIN;ELECTROPHORESIS;AUTORADIOGRAPHY;SULFUR 35;RNA;NUCLEOTIDES;DNA;HYBRIDIZATION;CHEMICAL ANALYSIS

<033257>
TITLE: Sequence Complexity of Poly(A)-RNA Isolated from Mouse Embryoid Bodies and Teratomas
PROJECT NUMBER: Z01 ES 70045-01 LET
PRINCIPAL INVESTIGATOR: Harris, S.E.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
MONITOR: Harris, S.E.
TELEPHONE: F629-3224
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: An expanded knowledge of how normal and cancer cells function can hopefully in the future be used to apply to the more practical aspects of curing disease and evaluating the effect of the environmental factors on human health.
APPROACH: Embryoid bodies and teratomas were grown, collected and transferred into 129 Sy-Sl mouse peritoneal cavities every 2 to 3 weeks. Total nucleic acid extracts were prepared by phenol/chloroform SDS method. Poly(A)-containing RNA was prepared by affinity chromatography using oligo-dT cellulose. Poly(A) content was determined by hybridization with excess /sup 3/H-poly(dT) with known standards and determination of amount of hybrid using the Sl nuclease assay. The size of the poly(A)-containing RNA was determined on 70% formamide sucrose gradients by hybridization across the gradient with the /sup 3/H poly(dT). By RNaseA and T-1 treatment of the RNA preparations and native polyacrylamide gel electrophoresis with known standards, the length of the A tract was determined. /sup 3/H-complementary DNA was synthesized using reverse transcriptase, sized and fractionated on alkaline sucose gradients. Nucleic acid hybridizations were carried out under standard conditions. The hybridization curves were resolved into a number of first order reactions (RNA excess).
RESULTS: The poly(A)-RNA preparation contains 2.5 to 3% poly(A), a number average size of 1800 to 2100 nucleotides and a poly(A) tract length of 60 nucleotides (NT). The /sup 3/H-complementary DNA synthesized was about 350 NT for both preparations, and a cut was taken from the alkaline gradient of material 400-600NT. These /sup 3/H-C-DNAs were then used in the hybridization analysis. The embryoid body hybridization curve was resolved by computer into 3 classes of sequences. The first or most abundant class represented 10% of the total sequences and from its rate of hybridization is only one or two sequences (of approximate complexity of 2,000NT). The second or middle class represents 60% of the total sequences and is some 100 different 2,000NT long sequences. Finally, the last or most complex class represents about 25% of the total hybridization and some 3,000 different RNA sequences. A similar analysis of the terotoma total poly(A)-containing RNA hybridization curve indicated again three major classes of sequences: (1) first class representing 20% and containing 2 different sequences; (2) middle class representing 54% and some 300 different sequences; and (3) the high complexity class representing some 7,000 different sequences and about 20% of the total sequences expressed.
ORDS: MOLECULAR;RNA;MICE;TUMOR CELLS;NEOPLASMS;NUCLEIC CIDS;HYBRIDIZATION;DNA;BIOSYNTHESIS;TRITIUM;BIOCHEMICAL REACTION KINETICS

<033258>
TITLE: Excretion of Xenobiotics by Selected Marine and Terrestrial Species
PROJECT NUMBER: Z01 ES 80032-01 LP
PRINCIPAL INVESTIGATOR: Pritchard, J.B.;Maguire, J.
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DIVISION: Laboratory of Pharmacology
MONITOR: Pritchard, J.B.;Maguire, J.
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TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$49,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: An understanding of the mechanisms controlling the ability of marine organisms to eliminate the many foreign compounds reaching the marine environment is vital in predicting the hazards of subsequent consumption of the species by man. Special objectives follow: (1) To examine the importance of renal and hepatic organic anion transport in the rate of elimination of xenobiotics or their metabolites; (2) to assess the role of intracellular binding proteins, such as glutathione S-transferases, in transport and toxicity of organic ions; and (3) to evaluate membrane transport-related cellular accumulation in the development of the xenobiotic toxicity in target organs.
APPROACH: Transport of organic ions is measured in vitro using the isolated renal tubules of winter flounder and slices of rat and rabbit kidney or liver. Intracellular compartmentalization and binding are determined from efflux studies on the isolated tissue preparations after loading in vitro or in vivo. These studies are complemented by clearance measurements in the intact animals. The binding properties of glutathione S-transferases isolated according to published procedures are determined in vitro for comparison with the intact cell data generated above. The isolated rabbit choroid plexus is used to examine the interaction of xenobiotics with the transport of endogenous and exogenous compounds from the brain.
RESULTS: (1) Studies in winter flounder, rat, and rabbit demonstrate that organic anion transport, an active membrane process, plays a major role in the elimination of DDA, 2,4-D, and similar compounds from the organism. In addition, both DDA and 2,4-D show competition in vitro and in vivo with other organic anions known to be carried by this system. Sites of such interaction include kidney, liver, and choroid plexus (see below). (2) Autoradiography shows that this transport leads to extensive intracellular accumulation of these compounds, suggesting the potential for both competition with the normal handling of other endogenous organic acids and direct cellular toxicity by the accumulated xenobiotic. (3) Efflux studies show that for the model compound DDA most of the xenobiotic (85%) is bound to cellular components. The role of such binding in determining the transcellular transport of the compound and in reducing its toxicity during transport are under investigation. Initial attention is focused upon the cytoplasmic binding proteins, such as ligandin (glutathione S-transferases). (4) Cellular effects of accumulated DDA upon the respiration of slices and isolated mitochondria from rat kidney were measured. Concentrations of 0.1 mM and above caused uncoupling of mitochondria and the appearance of negative acceptor control ratios. Accompanying the respiratory changes were altered ATPase activities
KEYWORDS: EXCRETION;AQUATIC ORGANISMS;SEAS;HAZARDS;POLLUTION;PROTEINS;TRANSFERASES;IONS;TOXICITY;ANIMAL CELLS;RATS;RABBITS;KIDNEYS;BINDING ENERGY;BIOLOGICAL ACCUMULATION;TOXIC MATERIALS;LIVER;VERTEBRATES;DDT

<033259>
TITLE: Teratogenicity of Acylating Agents
PROJECT NUMBER: Z01 ES 70001-01 LET
PRINCIPAL INVESTIGATOR: Dixon, R.L.
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DIVISION: Laboratory of Environmental Toxicology
MONITOR: Dixon, R.L.
TELEPHONE: F629-3333
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$140,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We hypothesize the acylation is a mechanism of chemical teratogenesis; to test this idea, the teratogenicity of selected anhydrides and imides is being studied. If acylation is a mechanism of teratogenicity, then acylating agents such as anhydrides (and imides) should be teratogenic. Additionally, their teratogenicity should correlate with their spontaneous reactivity; covalent binding of anhydrides (and imides) to fetal macromolecules should be demonstrated. Our preliminary results suggest that this hypothesis is valid and could become an important factor in defining chemicals which have a teratogenic potential. These studies also contribute greatly to an understanding of molecular mechanisms which account for birth defects.
APPROACH: Pregnant CD-1 mice received selected anhydrides or imides by i.p. injection on either days 8, 9, and 10 or days 11, 12, and 13 of gestation. The chemicals were suspended on 0.5% methylcellulose and administered soon after preparation. Controls received only the vehicle. Mice were sacrificed by cervical dislocation on day 18 of gestation (copulatory plugs being Day 1). The young were delivered by Cesarean section, designations made between live and dead fetuses, and resorptions counted. All live young were weighed and examined for grossly observable malformations. The viscera of each were examined by a soft tissue visceral technique described by Staples and the sex noted. The heads were fixed in Bouins for examination by Wilson's free hand slicing. Some fetuses were then cleared and stained by the KOH-Alizarin Red S method for skeletal examination.
RESULTS: The embryotoxicity and teratogenicity of a variety of anhydrides (acetic, propionic, succinic, maleic, and phthalic) were evaluated following intraperitoneal administration on gestation days 8, 9, and 10 or 11, 12, and 13. Each anhydride tested was both embryotoxic and teratogenic. The most common congenital abnormalities induced by treatment on days 8, 9, and 10 were rib and vertebral malformations. Treatment on gestational days 11, 12, and 13 produced predominantly cleft palate. Succinimide was also demonstrated to be embryotoxic and teratogenic. Binding of the test chemicals to macromolecules was studied in vivo and in vitro. In vitro studies demonstrated covalent binding to various purified proteins.

In vivo studies indicated that phthalic anhydride was bound to macromolecules of maternal liver, lung, kidney, and spleen as well as the uterus, placenta and fetuses. These results suggest a correlation between these acylating reagents, teratogenic potential and chemicobiological interactions.
WORDS: EMBRYOTOXICITY;TERATOGENESIS;ACYL
RADICALS;ACYLATION;MICE;PREGNANCY;PROGENY;FETUSES;TOXICITY;ANHYDRIDES;MALFORMATIONS;IN VIVO

<033260>
TITLE: Development of In Vitro Translation Systems for Specific Messenger RNA's and for Total Poly(A)-containing RNA Preparations
PROJECT NUMBER: Z01 ES 70049-01 LET
PRINCIPAL INVESTIGATOR: Silverberg, A.B.
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DIVISION: Laboratory of Environmental Toxicology
MONITOR: Silverberg, A.B.
TELEPHONE: F629-3224
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The research is important to the understanding of the molecular events during differentiation and understanding of the mechanism of gene expression in normal, damaged, and cancerous tissues.
APPROACH: Lysates of wheat germ and rabbit reticulocytes will be used to translate mRNA in vitro. O'Farrell gels will be used to analyze the protein products of translation. Scintillation fluorography and radioautography will be used to analyze the protein products synthesized both in vitro and in vivo.
RESULTS: We have completed a preliminary analysis of the in vivo pattern of protein synthesis in embryoid bodies and teratomas. We have determined that the wheat germ translation system has difficulty synthesizing proteins greater than 20,000 mol. wt. We have partially purified alpha-feto protein from rat aminiotic fluid and we have begun the characterization of fetal rat liver total poly(A)-containing mRNA. This research plan will be continued. Plans include production of antibody to rat AFP and isolation of teratcma specific protein called glial fibrillar acidic protein (GFA) and production of GFA antibodies. These antibodies will then be used in the in vitro translation system for detection of specific protein synthesis and for purification of these proteins associated with specific messenger RNAs.
KEYWORDS: RNA;IN VITRO;GENES;WHEAT;RABBITS;RETICULOCYTES;PROTEINS;MOLECULAR BIOLOGY;ANTIBODIES;NEOPLASMS;BIOSYNTHESIS;GENETICS;BIOCHEMICAL REACTION KINETICS

<033261>
TITLE: Role of Chemical-Receptor Interactions in Reproduction and Transplacental Toxicity
PROJECT NUMBER: Z01 ES 70065-01 LET
PRINCIPAL INVESTIGATOR: Korach, K.S.
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DIVISION: Laboratory of Environmental Toxicology
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TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$91,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The association of in utero DES exposure and reproductive tract cancer in human subjects is well documented. Recent development of a mouse model to study these same effects will allow us to investigate this problem more fully in the laboratory. The objectives of this laboratory are to investigate the role of receptor protein-chemical interactions and the biochemical mechanisms associated with the toxicologic responses observed in the reproductive tract following in utero exposure to hormonally active environmental chemicals.
APPROACH: Hormonal effects were studied with receptor binding techniques including saturation binding, competition studies, Scathard plot analysis, sucrose gradient centrifugation, glucose oxidation/utilization, polyacrylamide gel electrophoresis, dual isotope labeling and protamine sulfate precipitation. Biochemical studies employed spectrophotometric enzyme assays and routine chemical isolation and extraction techniques.
RESULTS: Female offspring given prenatal injections of DES result in two distinct groups: those with hormonally nonresponsive uteri and those that are hyperstimulated. To understand why some uteri were not hormonally responsive, we first examined the concentration of estrogen receptors in these animals. Results from our laboratory have shown that those animals in the non-responsive group have significantly lower levels of estrogen receptor than controls. Cytosol receptor concentrations in vaginal tissue were not significantly different from controls. Further experiments with the uterus and vagina from DES exposed mice will be continued to determine which step in the mechanism of hormone action is altered.
KEYWORDS: REPRODUCTION;TOXICITY;PLACENTA;MICE;NEOPLASMS;UTERUS;HORMONES;BIOCHEMICAL REACTION KINETICS;PROGENY;STILBESTROL;CARCINOGENS;IN VIVO

<033262>
TITLE: Chemical Conjugation of Specific 13C-Labeled Benzo[a]pyrene Oxides to Glutathione: Regiospecificity and Stereospecificity
OJECT NUMBER: Z01 ES 30050-01 EBCB; ERR-3.76.46
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TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$56,000; Environmental Protection Agency
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Certain arene oxides are known to bind covalently to nucleic acids, and they have been implicated as carcinogens and mutagens which can be derived from the parent compounds. The abundant detoxifying glutathione S-transferase enzyme system is also likely to covalently bind these oxides. Mechanistic elaboration of the process will aid in understanding, preventing, and predicting the mechanism(s) of action of these compounds.
APPROACH: Fourier transform 13C and 1H nuclear magnetic resonance (NMR) spectroscopy; organic syntheses, in vitro biological experiments.
RESULTS: Several benzo[a]pyrene derivatives of high purity and definition including two oxides labeled at specific positions and known enrichments with non-radioactive 13C have been obtained. Studies with benzo[a]pyrene-4,5-oxide-4,5-13C2 have been initiated to determine the preferred position of attack on the arene oxide by glutathione and the stereospecificity of the addition product. The detoxifying glutathione S-transferase enzyme system previously shown to covalently bind certain epoxides will be used. Future studies should include competition experiments to determine which biological nucleophiles are most reactive and the enzymatic versus non-enzymatic nature of the ring opening process and, if possible, elucidation of the required microenvironment for the covalent binding of such arene oxides. 13C-NMR spectra of the various oxygenated derivatives will be recorded routinely for reference purposes.
KEYWORDS: MOLECULAR;CARBON 13;BENZOPYRENE;GLUTATHIONE;TRANSFERASES;SPECTROSCOPY;OXIDES;FOURIER TRANSFORMATION;BIOCHEMICAL REACTION KINETICS;CARCINOGENS;HYDROCARBONS;MUTAGENESIS

<033263>
TITLE: Use of Salmonella in an Intrasanguinous Host-Mediated Assay for Measuring Mutagenic Chemicals in Mice
PROJECT NUMBER: Z01 ES 60051-01 LEM
PRINCIPAL INVESTIGATOR: Zeiger, E.
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DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Zeiger, E.
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TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: A large number of chemical mutagens require mammalian activation in order to be mutagenic for bacteria. The primary way of looking at this metabolism at present is by the use of liver homogenates in vitro. However, there are a number of chemicals which do not appear to be activated in vitro but are activated in vivo. Also, there is concern that in vitro metabolism does not always mimic in vivo metabolism, and results obtained in vitro may not give a true indication of what is happening in the intact animal. This program is designed to see whether the intrasanguinous host-mediated assay can be used for routine mutagen testing and to examine the correlation between in vitro and in vivo results.
APPROACH: Salmonella typhimurium strains are being used in an intrasanguinous host-mediated assay in mice to see if this in vivo system is capable of detecting a wide variety of chemical mutagens which require metabolic activation for their genetic activity. The effective dose ranges of the chemicals will be determined and compared with results obtained using in vitro activation techniques.
RESULTS: This project has been recently initiated and chemical testing has not yet begun. Preliminary studies have shown that if 10/sup 9/ cells are injected, 10 to 30% recovery can be obtained in one hour. Chemicals belonging to different classes of known mutagens - polycyclic aromatic hydrocarbons, aromatic amines, nitro and nitroso compounds, mycotoxins, and chlorinated hydrocarbons, which have been previously tested using an in vitro metabolic activation system, will be tested in this in vivo system. Additionally, a number of chemical carcinogens which are not mutagenic in vitro will be tested to see if the in vivo system can detect them.
KEYWORDS: SALMONELLA TYPHIMURIUM;MUTAGENS;MICE;BIOASSAY;CHEMICAL ACTIVATION;METABOLISM;LIVER;IN VITRO;IN VIVO;CARCINOGENS;BIOLOGICAL INDICATORS;MUTAGENESIS

<033264>
TITLE: Development of an Intrasanguinous Host-Mediated Assay Using Yeast
PROJECT NUMBER: Z01 ES 60050-01 LEM
PRINCIPAL INVESTIGATOR: Frezza, D.
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DIVISION: Laboratory of Environmental Mutagenesis
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TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It has been well documented that different organs are capable of metabolizing different chemicals at different rates. Using this system the organ specific metabolism of mutagens can be determined in vivo and possibly have predictive value for other in vivo toxic effects. Also, it is hoped that this procedure would be useful for routine assay of potential mutagens.
APPROACH: Yeast suspensions (0.2 ml of 3 x 10/sup 8/ cells/ml) are injected into the tail vein of mice and the chemical to be tested is given orally. The yeast is retained in the liver, lungs, kidneys, and testes. At selected times, the mice are sacrificed and the organs removed and homogenized in a tissue grinder to free the yeast from the tissue. Mutation and mitotic gene conversion and recombination can then be determined using routine procedures.
RESULTS: Mice of strain CD-1 appear to be the most resistant to the stress of the procedure. The distribution

of the cells in the various organs is time-dependent. Right after the injection, most of the cells are found in the lungs; after 10 minutes an increasing number of cells are found in the liver and the spleen, and finally up to 40% of the total injected number of cells can be recovered from the liver. The mouse does not appear to have any pathological reaction toward the presence of the yeast in the body. The recovery of cells from liver, kidneys, and lungs is sufficient to perform mutagenesis tests with Saccharomyces cerevisiae strains as D4 and D5 up to 18 hours after the injection. We will begin testing specific chemicals of different chemical classes whose organ distribution is known in order to determine the sensitivity of the system. In addition the results will be compared to results in an in vitro metabolic activation system to see if the types of genetic activity obtained varies between the in vivo and in vitro systems.
KEYWORDS: YEASTS;METABOLISM;MUTAGENS;IN VIVO;TOXICITY;MICE;LIVER;LUNGS;KIDNEYS;TESTES;MUTATIONS;GENE RECOMBINATION;IN VITRO;INTRAVENOUS INJECTION

<033265>
TITLE: Genetic Effects of Crocidolite Asbestos in Chinese Hamster Lung Cells
PROJECT NUMBER: Z01 ES 60048-01 LEM
PRINCIPAL INVESTIGATOR: Huang, S.
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DIVISION: Laboratory of Environmental Mutagenesis
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TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$91,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The importance of asbestos dust and submicroscopic materials has become widely recognized. These submicroscopic particles might be an important dimension in the carcinogenesis by asbestos. In contrast with the abundant literatures on the carcinogenicity of asbestos in both men and animals, there are virtually no reported studies on its mutagenicity. The study of the genetic effects of asbestos will help explicate the relationship between mutagenesis and carcinogenesis.
APPROACH: The methodologies of culturing mammalian cells, cytological preparations, electron microscopic slide preparations and induction of 6-thioguanine resistance were used.
RESULTS: Chinese hamster lung cells cultured in the presence of crocidolite asbestos displayed inhibition of cell growth. Cell death was directly associated with the phagocytosis of larger fibres. Water soluble components of asbestos did not appear to inhibit cell growth. Chromosomal aberrations were induced and were confined mainly to structural aberrations--breaks and fragments. Electron microscopic preparation indicated that asbestoses were readily contained in phagosomes. Phagocytosed asbestos did not appear to induce gene mutation at the hypoxanthine-guanine phosphoribosyl transferase locus. The evidence of the induction of gene mutation was rather weak. We propose to continue our study with other species of asbestos.
KEYWORDS: HAMSTERS;LUNGS;ANIMAL CELLS;ASBESTOS;DUSTS;PARTICLES;CARCINOGENESIS;MUTAGENESIS;GENETIC EFFECTS;CHROMOSOMAL ABERRATIONS;ELECTRON MICROSCOPY;MUTATIONS;GENES;IN VITRO

<033266>
TITLE: Role of Enzyme Induction in the Metabolism of Mutagens
PROJECT NUMBER: Z01 ES 60049-01 LEM
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DIVISION: Laboratory of Environmental Mutagenesis
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TELEPHONE: F629-3414
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This study will demonstrate whether mutagenicity in the Salmonella plate test can be used as reliable correlate of liver enzyme activity. Also, it will provide us with data on strain differences in mutagen metabolism and responses to Arochlor 1254 induction.
APPROACH: This project is designed to measure the effects of Arochlor-1254 induction of Sprague-Dawley and Fisher 344 rats. A 9000 x g post mitochondrial supernatant of livers from these rats is used to activate benzo(a)pyrene (BP), dimethyl-nitrosamine (DMN), and 2-amino anthracene (2AA) to mutagens in the Ames Salmonella plate test. Simultaneously, BP hydroxylase and DMN demethylase activities are being measured, as well as Cytochrome P448/450, aminopyrine demethylase, and analine hydroxylase. An attempt is being made to see if mutagenicity is an accurate correlate of microsomal enzyme activity.
RESULTS: This project has been recently initiated and definitive results are not yet available. The future plans include completing the study of the effects of Arochlor 1254. We expect to expand the study to study other inducers such as phenobarbital and 3-methylcholanthrene, alone, and in combination to see how their effects compare with the effects of Arochlor-1254.
KEYWORDS:
MUTAGENS;ENZYMES;METABOLISM;SALMONELLA;RATS;MITOCHONDRIA;BENZOPYRENE;ANTHRACENE;CYTOCHROMES;MICROSOMES;BIOLOGICAL EFFECTS;MUTAGENESIS

<033267>
TITLE: Mutation Induction in Chinese Hamster Cultured Cells
PROJECT NUMBER: Z01 ES 60047-01 LEM
PRINCIPAL INVESTIGATOR: Huang, S.
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DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Huang, S.
TELEPHONE: F629-3405
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The induction of 8-azaguanine and 6-thioguanine resistant mutants in cultured mammalian cells is now well established, and there are indications that the system may prove useful as a screening test for environmental mutagens. There are, however, variations in the response of the system. Any of these variations, if not properly overcome, will influence the estimation of mutation frequencies, and at worse could lead to a false negative determination of the mutagenicity of an agent. It is our objective to identify and elucidate the sources of variation in this genetic testing system.
APPROACH: The methodologies of culturing mammalian cells, drug-resistant selective systems, enzyme assays, protein determination, and population genetics were used.
RESULTS: Over a range of doses, a longer expression time is required for mutant cells from a more damaged population to reach their maximum frequency. Diminution in the level of HGPRTase was considered to be a major factor for the recovery of mutants in the selective medium. None of a large number of mutants sampled from those isolated had HGPRT activity. It is suggested that this cell line is suitable for mutagenicity testing in the induction of mutation in the screening of environmental mutagens and carcinogens. We propose to characterize this system further with regard to other agents and the nature of the genetic lesions.
KEYWORDS: MUTATIONS;HAMSTERS;CELL CULTURES;ANIMAL CELLS;MUTAGENS;MUTATION FREQUENCY;TESTING;GENETICS;ENZYMES;IN VITRO;MUTAGENESIS

<033268>
TITLE: Effects of Environmental Factors on Programming Steroid Metabolizing Enzymes
PROJECT NUMBER: Z01 ES 70138-01 LET
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DIVISION: Laboratory of Environmental Toxicology
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TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is the intention of this work to examine the phenomenon of programming (imprinting) steroid metabolizing enzymes in the rat in an effort to determine the role of the endocrine system in this process.
APPROACH: Initial studies examine the ontogenesis of selected steroid metabolizing enzymes (i.e., 5 alpha-reductase and 16 alpha-hydroxylase), noting in particular the programmed divergence in these enzyme activities in the male and female after puberty. Studies will then be performed to determine whether exposure to various hormonally-active xenobiotics can alter the normal process of hepatic and gonadal enzyme programming. The critical period of development will be determined by exposing animals to the xenobiotics either prenatally or postnatally. Particular attention will be given to the enzyme 5 alpha-reductase, which has a dual localization, i.e. in the endoplasmic reticulum and the nucleus. The programming studies on this enzyme are conducted in both subcellular fractions to determine if enzyme localization alters the sensitivity to the programming process. The hormonally-active agents of interest include DES, various PCB isomers, zearanol, and the normal endogenous steroids.
RESULTS: These studies attempt to characterize how xenobiotics affect normal neonatal hepatic or testicular enzyme programming mechanisms, to define what role such alterations play in developmental toxicity, and to determine whether such a system can be used as a model for predicting development toxicity.
KEYWORDS: ENZYMES;METABOLISM;STEROIDS;ONTOGENESIS;POLLUTION;LIVER;GONADS;BIOLOGICAL LOCALIZATION;STILBESTROL;RATS;BIOLOGICAL EFFECTS;HORMONES;REPRODUCTION;TOXICITY

<033269>
TITLE: Transplacental Pathology of Environmental Chemicals
PROJECT NUMBER: Z01 ES 70070-01 LET
PRINCIPAL INVESTIGATOR: Peters, M.A.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Toxicology
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TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is designed to evaluate the effect of environmental chemicals on offspring of female rats subjected to totigestational exposure.
APPROACH: Selected biochemical, histological and behavioral parameters are monitored for transplacental

pathology. To date studies on four chemicals have been initiated: methyl-n-butyl ketone, enflurane (ethrane), methylglyoxal, and ethchlorvynol (placidyl).
RESULTS: New project-no definite conclusions as yet.
KEYWORDS: TRANSPLACENTAL EFFECTS;PLACENTA;PATHOLOGY;RATS;POLLUTION;PROGENY;BEHAVIOR;BIOLOGICAL EFFECTS;REPRODUCTION;TERATOGENESIS;TOXICITY

<033270>
TITLE: Role of Altered Membrane Function in Xenobiotic Toxicity
PROJECT NUMBER: Z01 ES 80031-01 LP
PRINCIPAL INVESTIGATOR: Pritchard, J.B.;Neufeld, G.
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TELEPHONE: F629-3308
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$84,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (30%);PARTICULATES (30%);ORGANICS (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The use of sensitive organisms may permit identification of systems particularly prone to disruption by environmental contaminants. Such studies may then (a) point to systems which might also be particularly prone to damage in man and (b) serve as indicators or warning systems to the accumulation of contaminants in the environment, particularly the marine environment which serves as a sink for persistent pollutants.
APPROACH: Na,K-ATPase is measured in freeze-dried, reconstituted homogenates of gill tissue. Ion fluxes are determined in isolated gill filaments using isotopic techniques. Hemolymph osmolarity is measured by vapor pressure osmometry and ion content determined by flame photometry.
RESULTS: (1) Optimum conditions for blue crab gill Na,K-ATPase have been determined (pH 7.4, 100 mM Na/sup +/, 10 mM K/sup +/, 6 mM Mg/sup ++/). Under these conditions the K/sub m/ for ATP is 0.133 mM. In addition, a phase transition in membrane lipids at 22 degrees is suggested by the Arrhenius plot of the temperature sensitivity of the enzyme. (2) Na,K-ATPase activity varies from gill pair to gill pair, with pairs 6 and 7 most active in both sexes. After acclimation to full-strength seawater, the specific activity of Na,K-ATPase was nearly twice as high in these gill pairs from female crabs. (3) When exposed to DDT in vitro, significant inhibition of Na,K-ATPase was seen at 1 ppM. Peak inhibition was reached by 9 ppM. There was little sex difference in sensitivity to DDT. Greater inhibition was observed at 19 degrees (i.e., below the phase transition) than at 30 degrees.
KEYWORDS: POLLUTION;MEMBRANES;TOXICITY;BIOLOGICAL ACCUMULATION;ATP-ASE;PHOTOMETRY;SEAS;GILLS;OSMOSIS;MEASURING METHODS;CRUSTACEANS;LIPIDS;METABOLISM;DDT;ION EXCHANGE;WATER

<033271>
TITLE: Co-oxygenation of Xenobiotics by the Prostaglandin and Thromboxane Synthetase
PROJECT NUMBER: Z01 ES 80035-01 LP
PRINCIPAL INVESTIGATOR: Anderson, M.W.;Eling, T.E.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Pharmacology; Biometry Branch
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TELEPHONE: F629-3448
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$84,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Many xenobiotics are thought to exert their toxicity by means of reactive metabolites which are generated in vivo with very short half-lives. These reactive metabolites react with tissue macromolecules to produce toxicity such as carcinogenesis, mutagenesis, teratogenesis, etc. The prostaglandin synthetase system is found in most mammalian tissues and has particularly high levels of activity in the lung and kidney. Moreover, arachidonic acid can be released from its phospholipid storage sites by various types of stimulation, for example, irritation of lung tissue by inhaled pollutants. The subsequent metabolism of arachidonic acid by prostaglandin synthetase and the simultaneous co-oxygenation of xenobiotics could produce toxic metabolites of xenobiotics. It is the long-range goal of this project to study the co-oxygenation of xenobiotics by prostaglandin synthetase, particularly the pulmonary prostaglandin synthetase. The generation of toxic intermediates, carcinogens, mutagens, etc., during the co-oxygenation of benzopyrene during the metabolism of arachidonic acid by guinea pig lung and ram seminal vesicle microsomes. The involvement of cytochrome P-450 in this process is also under investigation.
APPROACH: Microsomal preparations of various tissues, such as guinea pig lung and ram seminal vesicles, were used to examine the co-oxygenation of xenobiotics during prostaglandin synthesis. The xenobiotic metabolites were isolated from the incubation medium by extraction and by a preliminary separation by thin-layer chromatography techniques. Prostaglandin and thromboxane products were also isolated. The effect of substrate concentration, cofactors, and time on the co-oxygenation was investigated. The carcinogen benzopyrene is oxygenated during the conversion of arachidonic acid to prostaglandins and thromboxanes by guinea pig lung and ram seminal vesicle microsomes. This co-oxygenation is particularly interesting in lung since this carcinogen enters the lung via the airways, and the release and subsequent metabolism of arachidonic acid by lung tissue is produced by numerous stimuli. Thus, exposure to benzopyrene coupled with the stimulation of prostaglandin synthesis, for example, by irritation of lung tissue, could result in the formation of toxic benzopyrene metabolites.
RESULTS: Preliminary identification of the metabolites suggests that quinones are the major type of products

produced from benzopyrene during its co-oxygenation by prostaglandin synthetase. The metabolites appear to be qualitatively similar but quantitatively different from those generated from benzopyrene by NADPH-dependent cytochrome P-450.
KEYWORDS: PROSTAGLANDINS;LIGASES;POLLUTION;TOXICITY;LUNGS;KIDNEYS;ARACHIDONIC ACID;MICROSOMES;BENZOPYRENE;OXYGEN;BIOCHEMICAL REACTION KINETICS;CARCINOGENS;METABOLISM;MUTAGENS

<033272>
TITLE: Species-To-Species Carcinogenesis Extrapolation
PROJECT NUMBER: ERR-676.51
PRINCIPAL INVESTIGATOR: Williams, G.M.
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DIVISION: Biometry Branch
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TYPE OF FUNDING: Contract No.-N01-ES-6-2130;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$21,000; Environmental Protection Agency
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The primary focus of this contract is on the quantitative extrapolation between various animal species (including man) for which reliable carcinogenesis data exists (in the literature) attempting to account for factors modifying the effect of dose in cases where substantial species differences have been reported.
APPROACH: The published carcinogenesis literature is being searched in order to construct a data summary. Initial attention is being restricted to 6 compounds that have been identified as potentially carcinogenic in man and at least on other species. (aflatoxin B1, diethylstilbesterol, chlornaphazine, benzidine, vinyl chloride, and dimethylnitrosamine.)
RESULTS: By evaluating factors other than species that are known to affect carcinogenicity (e.g., age, sex, diet, absorption, distribution, metabolism, and clearance, etc.). The contractors hope to conclude definitely whether or not there are data explaining species differences in risk. Such data could provide very useful insight into the general problem of extrapolation.
PROJECT MILESTONES: The literature search discussed above has been completed, and the 6-month progress report (containing a detailed review for aflatoxin B1) has been submitted.
KEYWORDS: RISK ASSESSMENT;CARCINOGENESIS;ANIMALS;DOSE-RESPONSE RELATIONSHIPS;BIOLOGICAL VARIABILITY;DATA COMPILATION;CARCINOGENS;EXTRAPOLATION

<033273>
TITLE: Mutagenesis Testing Program
PROJECT NUMBER: Z01 ES 60052-01 LEM
PRINCIPAL INVESTIGATOR: Valcovic, L.R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Valcovic, L.R.
TELEPHONE: F629-3413
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/General (80%);SOLAR/General (5%);CONSERVATION/General (15%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (10%);STORAGE (20%);PROCESSING, CONVERSION (50%)
POLLUTANTS: METALS (20%);PARTICULATES (30%);ORGANICS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: There are literally thousands of chemicals in use and the number is ever increasing. The majority of these substances has not been evaluated for the potential to induced heritable genetic alterations; and, hence, the possible risk to future human generations is unknown. This program will develop an efficient coordinated system for mutagenesis testing and should serve as a model system. The data obtained from this program will be useful for decision making on the safety of various classes of chemicals to which man is exposed.
APPROACH: The primary objective of this effort is to develop a program which will have the ultimate capability of testing 1000 chemicals per year using microbial systems, and as-yet-undetermined smaller numbers of chemicals in higher in vitro and in vivo test systems. With this level of testing, it will be necessary to develop the ability for chemical management and analyses of compounds tested. A computerized system for data handling and statistical analysis will also be developed. Substances which are mutagenic in the microbial tests will be tested further using higher systems which serve to affirm or refute the microbial data and more precisely define the types of mutagenic events induced.
RESULTS: This program is a new effort and will be conducted utilizing the contract mechanism. The staff to develop these contracts is currently being recruited. It is anticipated that the chemical repository will be operational and will develop an efficient inventory and chemical management system. Tier-1 microbial testing will begin with 150 chemicals in early FY78. Test systems for Tiers 2 and 3 will be selected. Additionally, an on-line computerized data handling system will be developed.
KEYWORDS: MUTAGENESIS;TESTING;HEALTH HAZARDS;DATA COMPILATION;MICROORGANISMS;IN VITRO;IN VIVO;STATISTICS;COMPUTERS;MUTAGENS

<033274>
TITLE: Biochemical Characterizations of Genetic Variants and Isozymes in Mouse
PROJECT NUMBER: Z01 ES 60061-01 LEM
PRINCIPAL INVESTIGATOR: Lee, C.Y.
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AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Lee, C.Y.
TELEPHONE: F629-3462
TYPE OF FUNDING: Agency in-house effort

77 FUNDING: National Inst. of Environmental Health Sciences FY77:$84,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
OJECT DESCRIPTION: The purpose of this study is to conduct a model study to differentiate the enzyme variants in mice by simple biochemical assays.
APPROACH: For the purification of the enzymes, a two-step procedure has been employed, involving affinity chromatography as a major step in the purification. The purified enzymes have been characterized biochemically and the kinetics of inactivation under several experimental conditions have been studied.
RESULTS: Two isozymes of phosphoglycerate kinase and isocitrate dehydrogenase have been characterized by kinetic studies, thermal and urea denaturation and iodoacetate inactivation. The conditions to find maximum difference by thermal and urea denaturation were established. Two genetic variants of cytoplasmic isocitrate dehydrogenase and 3-phosphoglycerate kinase-2 were also compared biochemically in details. Differential thermal stability was also observed for each pair of enzyme variants under certain temperatures and pH's. From this model study we think that relative thermostability of enzyme variants could be a useful tool for the detection of mutant enzymes in mutagen-treated mouse population.
KEYWORDS: MICE;BIOASSAY;ENZYMES;PURIFICATION;CHROMATOGRAPHY;DEHYDROGENASES;THERMAL STRESSES;PH VALUE;TEMPERATURE EFFECTS

<033275>
TITLE: Forward-Mutation Induction by Tritiated Water in a Two-Component Heterokaryon of Nerospora crassa
PROJECT NUMBER: Z01 ES 60056-01 LEM
PRINCIPAL INVESTIGATOR: Harvey, R.C.;de Serres, F.J.;Cumming, R.B.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Harvey, R.C.;de Serres, F.J.;Cumming, R.B.
TELEPHONE: F629-3242
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$14,000
TECHNOLOGY: NUCLEAR/Fusion (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Tritium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Tritium, in the form of tritiated water, is one of the primary pollutants resulting from nuclear power production. It is difficult and expensive to contain. Since it is unimpeded by biological barriers, tritiated water rapidly achieves an equilibrium concentration in living organisms that is equal to that in the environment. Genetic analysis of induced mutants will make possible a qualitative as well as quantitative characterization of tritiated water mutagenicity.
APPROACH: The biological effectiveness of the tritium beta-particle is the primary consideration in hazard evaluation. This beta-particle is emitted at a very low energy by tritium decay, the average track length being only 0.9 mu in biological materials. As a consequence of its very short track length, the energy is expended in a very localized region. The tritium decay product is, therefore, a weakly penetrating but high linear energy transfer radiation.
RESULTS: Only pilot experiments have been completed to date. However, preliminary data tend to indicate that the relative biological efficiency of tritiated water for inactivation is rather high, and that the relative efficiency for ad-3 forward-mutation induction may approximate unity. Additional experiments will be conducted to determine the relative biological efficiencies of tritiated water for the induction of a variety of genetic lesions within the same test organism.
KEYWORDS: MUTATIONS;TRITIUM OXIDES;NEUROSPORA;POLLUTION;NUCLEAR POWER;MUTAGENESIS;BETA PARTICLES;HAZARDS;DECAY;RBE;RADIOINDUCTION;BIOLOGICAL EFFECTS

<033276>
TITLE: Effects of Chromosomal Aberrations on Embryonic Development
PROJECT NUMBER: Z01 ES 60059-01 LEM
PRINCIPAL INVESTIGATOR: Sheridan, W.
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AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Sheridan, W.
TELEPHONE: F629-3287
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The project is designed to study the effects of chromosomal aberrations on fetal mortality and development. Comparisons will be made between in vivo effects and effects on mouse embryos grown in culture. Chemical mutagens are known to be capable of inducing chromosomal aberrations such as translocations which may be transmitted to the next generation. Increased rates of fetal death are usually observed among offspring to translocation heterozygotes. It is our purpose to investigate the rates of transmission of such aberrations, and the processes of fetal mortality by direct observation of the development of embryos.
APPROACH: Known translocation bearing mice are mated and the F1 sons studied to determine the frequency of translocation heterozygotes. In other matings the females are killed shortly after fertilization and two cell embryos are retrieved from the oviducts and established in culture. Stage of development arrest is determined.
RESULTS: F1 males are currently being analyzed to determine whether they are translocation heterozygotes. Cytogenetic analysis will be conducted in attempts to correlate the nature of the aberration and the effect on embryonic development.
KEYWORDS: CHROMOSOMAL ABERRATIONS;FETUSES;MORTALITY;ONTOGENESIS;EMBRYOS;MICE;MUTAGENS;BIOLOGICAL EFFECTS;TERATOGENESIS

<033277>
TITLE: Molecular Characterization of Isozymes and Mutant Enzymes from Mouse
PROJECT NUMBER: Z01 ES 60062-01 LEM
PRINCIPAL INVESTIGATOR: Li, S.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Li, S.
TELEPHONE: F629-3405
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$54,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Various isozymes and mutant enzymes in mouse are detected by difference in electrophoretic mobility and/or kinetic parameters in a biochemical specific locus mutation system. Molecular characterization of these mutant proteins will elucidate the nature of genetic mutations in mammals.
APPROACH: Various dehydrogenases are purified from mouse by AMP-sepharose affinity column. Tryptic peptides of these proteins will be analyzed on thin-layer and paper by chromatography and electrophoresis. Some of peptides will be eluded, and then amino acid composition and sequences will be determined.
RESULTS: Various isozymes and mutant enzymes, namely, phosphoglycerate kinase, isocitrate dehydrogenase and glucose-6-phosphate dehydrogenase from mouse have been purified, and their amino acid substitutions will be characterized.
KEYWORDS: ENZYMES;MICE;CHEMICAL ANALYSIS;CHEMICAL PROPERTIES;MUTATIONS;PROTEINS;DEHYDROGENASES;AMP;PEPTIDES;ELECTROPHORESIS;AMINO ACIDS;PURIFICATION;MOLECULAR STRUCTURE

<033278>
TITLE: Complete Amino Acid Sequence Determination of Sperm-Specific Lactate Dehydrogenase from Mouse
PROJECT NUMBER: Z01 ES 60063-01 LEM
PRINCIPAL INVESTIGATOR: Marciniszyn, J.
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AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Marciniszyn, J.
TELEPHONE: F629-3243
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$77,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The amino acid sequence differences among different isozymes of lactate dehydrogenases will be correlated with their antigenic determinants. This information is essential for mutation monitoring program using monospecific antibodies against this enzyme.
APPROACH: Sperm-specific lactate dehydrogenase from mouse are purified by AMP-sepharose column. The protein will be cleaved into peptides with trypsin and CNBr, and these peptides will be purified by gel filtration and ion-exchange chromatography. Amino acid sequences of pure peptides will be determined by automatic Edman degradation on Beckman sequencer.
RESULTS: Sperm-specific lactate dehydrogenase from mouse has been purified, and the complete primary structure will be determined. Various submolecular fragments of this enzyme will also be used to purify monospecific antibodies.
KEYWORDS: LACTATE DEHYDROGENASE;AMINO ACIDS;MICE;MUTATIONS;MONITORING;ANTIBODIES;PURIFICATION;PEPTIDES;SPERMATOZOA

<033279>
TITLE: Non-Human Primates in Mutagenicity Testing: Host-Mediated Assay
PROJECT NUMBER: Z01 ES 60065-01 LEM
PRINCIPAL INVESTIGATOR: Malling, H.V.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Malling, H.V.
TELEPHONE: F629-3378
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: After apes, the Macaques are among man's closest relatives. The chimpanzee is more than 99% related to man on the molecular level, while Macaques follow closely. Therefore, non-human primates should provide the most relevant animal model when the genetic safety of environmental contaminants, drugs, and food additives is evaluated. Due to limitations of animal availability and cost, genetic safety evaluation of chemical substances in monkeys is necessarily limited to special cases when a large body of information is already available from traditional animal tests. The present experiments have established methodology which can be used if the evaluation of a chemical's genetic safety is of great human importance.
APPROACH: For the intrasanguineous HMA inject i.v. approximately 10 to the 9th power E. coli per ml blood. Inject animals i.m. with MC in saline or with saline. Recover cells from liver or testes. For in vitro blood assay incubate 10 to the 9th power cells/ml blood with or without MC for 30 minutes. Recover cells. For intraperitoneal HMA enclose 3 to 5 ml of 10 to the 9th power cells/ml Nutrient Broth in dialyzing tubing and implant in intraperitoneal cavity. Inject with MC. Recover cells 3 hours later. For all methods the recovered cells were plated on selective media to determine mutation frequency to arginine and galactose prototrophy. Appropriate in vitro experiments with E. coli and MC were performed.
RESULTS: In the Rhesus monkey intrasanguineous HMA and blood-mediated assay is impossible due to the

immediate and strong immune response of the host against E. coli. The number of cells that could be recovered from either liver, blood or testicular tissues was so low after 30 minutes exposure that determination of mutation frequencies was not possible. This difficulty was overcome when cells were enclosed in diffusion bags made from dialyzing tubing (cut off of 6000 to 8000 MW). In the HMA significant increase in mutation frequency was observed at 0.5 mg/kg b.w. (lower doses were not tested). Mutation frequencies were higher at 1.5 mg/kg, but further increase in dose resulted in a slight decrease in mutation frequency. Ten times higher in vivo doses over in vitro doses induced similar mutation frequencies. The same animals used for the HMA have also been used in cytogenetic experiments reported on elsewhere in the annual report. No further experiments are planned since the feasibility of using monkeys in mutagenicity testing with the HMA has been demonstrated.
KEYWORDS: PRIMATES;MUTAGENESIS;BIOASSAY;GENETICS;SAFETY;DRUGS;POLLUTION;ADDITIVES;ESCHERICHIA COLI;LIVER;TESTES;BIOLOGICAL INDICATORS;MUTATION FREQUENCY;IN VIVO;IN VITRO;TESTING

<0 33280>
TITLE: Non-Human Primates in Mutagenicity Testing: Somatic and Germinal Cytogenetic Tests wih Mitomycin C
PROJECT NUMBER: Z01 ES 60066-01 LEM
PRINCIPAL INVESTIGATOR: Malling, H.V.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Malling, H.V.
TELEPHONE: F629-3378
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Molecular and cytogenetic research of the past 25 years revealed that non-human primates and man show greater evolutionary relatedness than was suggested by earlier morphologic and paleontologic evidence. Therefore, it appears self evident that non-human primates need to be used in research which intends to determine the genetic safety of environmental contaminants, drugs and food additives to man. We believe that with the methods developed for monkeys in this investigation we will be able to provide genetic safety evaluation of chemicals to man more accurately than would be possible with animals less closely related to man.
APPROACH: Mitotic metaphase spreads from blood and bone-marrow or meiotic and spermatogonial metaphases from testes biopsy samples were made following standard procedures. Samples from the same animals were collected 14 days before and 1, 2, 14, 16, 17, 18 days and 3 and 5 months after treatment with Mitomycin C. The micronucleus test was also performed with methods developed for rodents by others.
RESULTS: When the sensitivities of the three cytogenetic methods applicable to somatic cells in vivo were compared, we found that the bone-marrow cytogenetic test and the micronucleus test were about equally sensitive, and were also comparable in sensitivity to the host-mediated assay. That the lymphocyte cytogenetic test failed to detect chromosome aberrations was attributed to the known dependence of MC-mutagenesis on DNA replication. In a more general testing scheme, which includes chemicals or physical agents that are not dependent on DNA replication for mutagenesis, we still recommend the use of lymphocyte cytogenetics since blood can be readily obtained with minor disturbance to the animals or from humans. On the other hand we have reservations about the applicability of the micronucleus test in an experimental situation when it is highly desirable to keep the animals alive following sample taking. When we attempted to analyze bone marrow obtained from live animals the scoring of micronuclei was impossible due to excessive invasion by mature erythrocytes from blood. Bone-marrow cytogenetics suffered from none of the short-comings of the other somatic cell based cytogenetic tests we performed.
KEYWORDS: PRIMATES;MUTAGENESIS;GENETICS;MITOMYCIN;DRUGS;ADDITIVES;BIOLOGICAL EVOLUTION;SAFETY;POLLUTION;MITOSIS;BLOOD CELLS;BONE MARROW CELLS;SPERMATOGONIA;RODENTS;LYMPHOCYTES;CHROMOSOMAL ABERRATIONS

<0 33281>
TITLE: Effects of Environmental Agents on Male and Female Reproductive Tract Function
PROJECT NUMBER: NIEHS N01-ES-6-2111
PRINCIPAL INVESTIGATOR: Davis, J.
ADDRESS: Endocrine Labs of Madison, Madison, WI 53707
AFFILIATION: Endocrine Labs. of Madison, Inc., Wis. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory for Environmental Toxicology
MONITOR: Lucier, G.W.;McLachlan, J.A.
TELEPHONE: F629-3376
TYPE OF FUNDING: Contract No.-N01-ES-6-2111;Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$206,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of the proposed study is to determine the differential effect of environmental chemicals on the reproductive capacity of male and female mice. Reproductive capacity is to be evaluated by the repetitive forced breeding method for females and by a serial mating technique for males. These studies are done in such a way as to support existing programs in the Laboratory of Environmental Toxicology concerned with developmental toxicity and transplacental toxicity. The purpose of the contract is two-fold; to identify environmental chemicals that have potential developmental toxicity emphasizing reproductive tract lesions; and to identify chemicals to Intramural scientists that are toxic and need to be studied from a mechanistic viewpoint.
APPROACH: In females the contractor will primarily evaluate the effect of each compound on: the length of the estrous cycle, number of matings and litters per reproductive lifetime, number of young per litter, number of abnormal young produced, average weight of young. Secondary information which will be collected and evaluated will be levels of reproductive hormone and pathologic condition and neoplastic changes in affected animals. In males the contractor primarily evaluates the effect of prenatal treatment effect of each compound on: number of successful matings, number of successful litters sired, number of young per

litter sired, number of abnormal young sired. Secondary information collected and evaluated will be levels of reproductive hormones and pathologic conditions in affected male animals.
RESULTS: Completed protocols are not available for any compound since these are lifetime (18 month) studies and the contract was initiated 12 months ago.
KEYWORDS: REPRODUCTION;POLLUTION;MICE;LITTER SIZE;BIOLOGICAL EFFECTS;PROGENY;HORMONES;FERTILITY

<033282>
TITLE: Studies on the Host-Mediated Assay Using Neurospora crassa as Indicator Organism
PROJECT NUMBER: Z01 ES 60053-01 LEM
PRINCIPAL INVESTIGATOR: Whong, W.
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AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Whong, W.
TELEPHONE: F629-3242
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: A large number of chemicals are not mutagenic unless they are converted enzymatically to active metabolites. The host-mediated assay is a useful and versatile tool for determining whether chemical agents are being converted to mutagenic metabolites by the host animals. This assay has been well established and employed extensively with indicator organisms such as bacteria and yeast. In Neurospora crassa, the host-mediated system has also been developed. However, no extensive studies have been carried out. It is, therefore, necessary to extend the host-mediated assay system using Neurospora as an indicator organism to different animal species, different organs and different procarcinogens.
APPROACH: For increasing sensitivity to chemicals, an excision-repair deficient strain of N. crassa (H-59) was employed as an indicator organism. 0.2 ml of the conidial suspension (2 x 10/sup 9/ conidia/ml for rats, 10/sup 9/ conidia/ml for mice) was injected into the tail vein of each animal. The chemical solution was administered into animals by intramuscular injection. The animals were sacrificed after 16 hours of treatment. Conidia were harvested from different organs of the host. The ad-3 forward-mutation frequency of N. crassa was measured by the direct method of F.J. de Serres.
RESULTS: In mice, dimethylnitrosamine (DMNA) appears to be converted to highly mutagenic metabolites in liver. This is in agreement with that of Malling's finding. A significant increase in mutation frequency was also found among the conidia recovered from the lung of DMNA-treated mice. In the liver of rats, DMNA is also converted to highly mutagenic in Neurospora. Studies will be extended to (1) different animal species, (2) other organs (kidney, lung and testis) and (3) other procarcinogens from different chemical classes.
KEYWORDS: NEUROSPORA;BIOASSAY;MUTAGENS;METABOLITES;MUTATION FREQUENCY;MICE;LIVER;BIOLOGICAL INDICATORS;MUTAGENESIS;METABOLISM

<033283>
TITLE: Primary Structure Characterization of Muscular Lactate Dehydrogenase from Mouse
PROJECT NUMBER: Z01 ES 60064-01 LEM
PRINCIPAL INVESTIGATOR: Li, S.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Li, S.
TELEPHONE: F629-3405
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$56,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Amino acid sequence differences among different isozymes of lactate dehydrogenases from mouse will be correlated with their antigenic properties. This is a part of the program to evaluate the molecular events which result in mutations in mammals.
APPROACH: Muscular lactate dehydrogenase from mouse is purified by affinity chromatography. Peptides of this protein derived from enzymatic and chemical cleavage will be purified by gel filtration and ion-exchange chromatography. Amino acid sequences of these peptides will be determined by automatic Edman degradation.
RESULTS: A large quantity (1.5 g) of muscular lactate dehydrogenase from mouse has been purified, and the primary structure of this enzyme based on peptide sequences will be compared with that of sperm-specific lactate dehydrogenase from mouse.
KEYWORDS: LACTATE DEHYDROGENASE;MICE;AMINO ACIDS;MUTATIONS;MUSCLES;PEPTIDES;PURIFICATION;ION EXCHANGE;MOLECULAR STRUCTURE;ANIMALS;BIOCHEMISTRY;MUTAGENESIS

<033284>
TITLE: Statistical Development of Multistage Carcinogenesis Models
PROJECT NUMBER: ERR-6.77.55
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Biometry Branch
MONITOR: Hoel, David G.
TELEPHONE: F629-3441
TYPE OF FUNDING: Contract No.-NIH-ES-77-22;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To improve methods for estimating human cancer risks from environmental contaminants. These risk estimates are to be based upon laboratory data typically from chronic feeding studies in rodents.
APPROACH: The multistage model for carcinogenesis is used to represent the dose response curve for extrapolation of high dose effects to low dose effects.

RESULTS: The following results are expected: (a) effects of competing risks are to be investigated; (b) development of statistical designs of experiments for low dose estimation; (c) goodness-of-fit comparisons of several models.
KEYWORDS: RISK ASSESSMENT;CARCINOGENESIS;STATISTICS;HAZARDS;POLLUTION;RODENTS;FEEDING;DOSE-RESPONSE RELATIONSHIPS;BIOLOGICAL MODELS;DNA;GENETICS;IN VIVO;SAFETY

<033285>
TITLE: Effects of Microwave Radiation on the Nervous System
PRINCIPAL INVESTIGATOR: Gandhi, O.P.
ADDRESS: University of Utah, Salt Lake City, UT
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Biophysics
MONITOR: McRee, D.I.
TELEPHONE: F629-3382
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$98,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: RADIATION/Microwave (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to determine the effects of long-term, low-level exposure to 915 and 2450 MHz microwave radiation on the central nervous system and behavior.
APPROACH: Long Evans male rats will be exposed to a CW plane wave microwave field at frequencies of 915 and 2450 MHz and power density of 5 mW/sq. cm. The animals will be exposed for 8 hours a day, 5 days a week for 16 weeks. An eight week recovery period will follow the exposure period. The following measurements will be made: (1) Biochemistry - biochemical analysis of the cholinesterase activity of the blood, the SH group in the blood, and ketosteroids in the urine will be measured. (2) Behavior - rodent activity will be measured using a rodent activity wheel. Water and food intake will be measured. Rats will be trained to lever press for food reward on a FR-DRL multiple schedule. Total response and reinforcement for each schedule component as well as response during time out between each component will be recorded. Interresponse times on each schedule component will be recorded. (3) EEG - EEG will be recorded biweekly using epidural removable stainless steel electrodes. These recordings will be made while the microwave radiation is turned off.
RESULTS: Construction of radiation chambers and microwave field distributions have been measured and determined to be no greater than 10 percent. Training of ten rats on the multiple fixed-ratio-differential reinforcement at low rates (FR-DRL) schedule has been completed. Activity chambers have been built and tested and baseline data obtained. Problems with EEG recording cannula implants were initially encountered but have been standardized and is now functional. Bioassays for cholinesterase, sulfhydryl groups, and corticosterone have been tested giving satisfactory results.
KEYWORDS: MICROWAVE RADIATION;NERVOUS SYSTEM;BIOLOGICAL RADIATION EFFECTS;BEHAVIOR;RATS;BIOCHEMISTRY;BIOMEDICAL RADIOGRAPHY

<033286>
TITLE: Assessment of Health Hazards from Lead
PROJECT NUMBER: Z01 ES 20006-01 (A)OHHA
PRINCIPAL INVESTIGATOR: Martin, A.E.
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AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Office of Health Hazard Assessment (OHHA)
MONITOR: Falk, Hans L.
TELEPHONE: F629-3471;C(919)541-3471
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Review and assessment of hazards to health resulting from lead in the human environment.
APPROACH: Bibliographical research and assessment of the degree of hazard associated with the various sources of lead in the human environment. Assessment of the effects on man and the relative importance of the various sources. Recommendations for action to reduce their hazards.
RESULTS: During FY 1976-77 the Report of the Committee on Human Health Consequences Due to Lead Exposure from Automotive Emissions has been revised and enlarged for publication as a series of separate related papers to be published in Environmental Health Perspectives. A wider study has been undertaken of atmospheric lead and environmental lead dusts derived from automotive fumes (lead in gasoline) and lead from industrial emissions including the burning of fossil fuels, smelter emissions, lead in the human diet and in drinking water, and accidental exposures to lead from other sources. The results of this study were used to assist in the preparation of the EPA draft document, ''Air Quality Criteria for Lead.''
KEYWORDS: LEAD;HEALTH HAZARDS;ENVIRONMENTAL EFFECTS;RECOMMENDATIONS;AUTOMOBILES;EXHAUST GASES;DUSTS;AIR POLLUTION;INDUSTRIAL WASTES;FOSSIL FUELS;TOXICITY;EPIDEMIOLOGY

<033287>
TITLE: Low Dose Toxicological Estimation
PROJECT NUMBER: ERR-6(3).77.56
PRINCIPAL INVESTIGATOR: Hoel, D.G.
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AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Biometry Branch
MONITOR: Hoel, D.G.
TELEPHONE: F629-3441
TYPE OF FUNDING: EPA pass-thru funding

77 FUNDING: Environmental Protection Agency FY77:$12,500
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop statistical methods for estimating low-dose toxic effects based upon high-dose experimental data.
APPROACH: (1) Examine existing methods of obtaining ADI values. (2) Study various statistical dose-response models for toxicological extrapolation. (3) Develop statistical low-dose estimation methods and apply them to sample data.
RESULTS: New methodologies for estimating low-dose toxic effects of environmental agents.
KEYWORDS: TOXIC MATERIALS;BIOLOGICAL EFFECTS;STATISTICS;DATA;DOSE-RESPONSE RELATIONSHIPS

<033288>
TITLE: Assessment of Health Hazards from Burning of Fossil Fuels
PROJECT NUMBER: Z01 ES 20006-01(B) OHHA
PRINCIPAL INVESTIGATOR: Martin, A.E.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Office of Health Hazard Assessment (OHHA)
MONITOR: Falk, Hans L.
TELEPHONE: F629-3471;C(919)541-3471
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (30%);PARTICULATES (30%);ORGANICS (40%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Review and assessment of human hazards associated with environmental pollutants (including sulfur dioxide, sulfuric acid, sulfates, nitrogen oxides, carbon monoxide, carbon dioxide, ozone, oxidants, hydrocarbons, unspecified particulate matter) resulting from the burning of fossil fuels.
RESULTS: Information accumulated as a result of this continuing study has been used during FY 1976-77 to review the following draft documents prepared by other agencies: (1) Federal Energy Administration, Coal Conversion Program, Environmental Impact Statement; (2) EPA Draft Sulfates Research Plan; (3) EPA Proposed Standards for Performance for Petroleum Refining Sulfur Recovery Plants; and (4) EPA Draft Assessment of Amount of Ill-Health which will be caused by pollutants in future years. In addition, NIEHS (OHHA) cooperated in the Brookhaven National Laboratory Workshop on Sulfates which was called to assess the difficulties anticipated in the setting of sulfate standards in the ambient air and the methods available for controlling sulfur emissions which may be increased as a result of the coal conversion program.
KEYWORDS: HEALTH HAZARDS;FOSSIL FUELS;COMBUSTION;POLLUTION;ENVIRONMENTAL EFFECTS;HYDROCARBONS;SULFUR COMPOUNDS;NITROGEN OXIDES;OZONE;PARTICLES;AEROSOLS;OXIDATION

<033289>
TITLE: Carcinogenesis of Fossil Fuel Related Combustion Products
PROJECT NUMBER: ERR-1.77.54
PRINCIPAL INVESTIGATOR: Nettesheim, P.
ADDRESS: National Institute of Environmental Health Sciences (NIEHS), Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Pulmonary Function and Toxicology
MONITOR: Nettesheim, Paul
TELEPHONE: F629-3141
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION IN SITU (10%);COMBUSTION OR END USE (90%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The by-products of fossil fuel combustion are a complex mixture of compounds which include polycyclic aromatic hydrocarbons (PAHs). Many of these PAHs (for example benzo(a)pyrene) are known to be potent carcinogens. When complex mixtures of PAHs are assayed for carcinogenic activity, they are highly active. In fact, the activity of the mixture often greatly exceeds the activity of each of the isolated components. This suggests that certain non-carcinogenic or weakly carcinogenic compounds in the mixture act to enhance or to promote the activity of the carcinogenic agents. In an effort to assess the hazard of fossil fuel combustion products, one must therefore consider not only the carcinogenic factors in the by-products, but also their interaction with other by-products.
APPROACH: A theoretical basis for this interaction is lacking and a better understanding of the basic mechanisms of carcinogenesis is required. Our studies on this problem are centered on two levels. The first level is the initiation of carcinogenesis, while the second level is how the initiated cell develops into a malignant cancer and what factors modulate this development. An understanding of this entire process will allow a better assessment of how to eliminate factors which induce cancer. Our approach to these problems has been to study the effect of carcinogens and promoters of carcinogenesis on cells grown in culture. By studying the interaction of chemicals and cells in culture rather than in animals, we temporarily ignore the in vivo factors influencing carcinogenesis and focus on the problem as a cellular event. This enables us to understand the molecular and cellular mechanisms involved. Specifically, we are interested in: (1) how chemicals such as benzo(a)pyrene initiate carcinogenesis and whether this initiation is analogous to other biological responses such as mutation; (2) how initiated cells develop as malignant cells; and (3) how do normal cells differ from malignant cells.
RESULTS: The development of malignant cells from normal cells following initiation with carcinogens is known

to proceed as a progressive phenomenon through many qualitatively different stages. These different stages can be promoted by non-carcinogenic compounds. Understanding the mechanisms of this progression will allow identification of compounds which enhance the activity of carcinogens as well as offer a potential means for development of chemo-preventive drugs which might modulate or prevent this development.
KEYWORDS: CARCINOGENESIS;FOSSIL FUELS;COMBUSTION PRODUCTS;HYDROCARBONS;BENZOPYRENE;HEALTH HAZARDS;TUMOR CELLS

<033290>
TITLE: Inactivation and Mutagenesis in Doubly Repair-Deficient Strains of Neurospora crassa
PROJECT NUMBER: Z01 ES 60055-01 LEM
PRINCIPAL INVESTIGATOR: Inoue, H.;Harvey, R.
ADDRESS: National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Inoue, H.;Harvey, R.
TELEPHONE: F629-3242
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Many genetic factors are involved in the responses of an organism to pre-lethal and pre-mutagenic lesions. Earlier studies have shown that the presence of repair deficiencies in test organisms alters the effects of lethal and mutagenic agents both quantitatively and qualitatively. In order to understand the complex biological processes involved in DNA repair and mutagenesis, it is important to consider the interactions of these gene products. The types of interactions of multiple repair deficiencies within the cell indicate the role and significance of particular gene products in the various repair pathways that are available in response to lesions in the DNA.
APPROACH: We have constructed homokaryotic double-mutant strains of N. crassa which bear in various pair-wise combinations the radiation sensitive mutant alleles: upr-1, uvs-2, uvs-3, and uvs-6. Inactivation and forward-mutation induction at two loci by UV and x-ray irradiation have been determined by use of the ad-3 system.
RESULTS: Our data for the double-mutant strain bearing the two excision repair deficient alleles, upr-1, and uvs-2, have shown that these interact epistatically with respect to the lethal and mutagenic effects of UV irradiation. However, they show an additive type of interaction for both inactivation and mutagenesis by ionizing irradiation. This additive interaction indicates that, in response to the lesions induced by ionizing irradiation, the gene products from the wild type upr-1(+) and uvs-2(+) alleles are involved in repair processes that are to some extent independent. The uvs-2, uvs-6 combination of mutant alleles results in an increased sensitivity to inactivation by both UV and x-ray irradiation. We have determined that the interaction of the uvs-2 and uvs-6 alleles results in a reduction in the frequencies of ad-3 mutants (forward-mutation frequency per survivor, relative to the frequencies obtained for the more sensitive of the two single-mutant parental strains) for both UV and x-ray irradiation. The combination of the uvs-3 and uvs-6 mutant alleles has been shown by tetrad analysis to be inviable.
KEYWORDS: NEUROSPORA;MUTAGENESIS;INACTIVATION;MUTAGENS;DNA;BIOLOGICAL REPAIR;MUTANTS;ULTRAVIOLET RADIATION;X RADIATION;BIOLOGICAL RADIATION EFFECTS;MUTATIONS;RADIOINDUCTION

<033291>
TITLE: Chemically Induced Mutations at Biochemical Loci in Mice
PROJECT NUMBER: Z01 ES 60054-01 LEM; (ERR-5(1).75.29)
PRINCIPAL INVESTIGATOR: Johnson, F.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: National Institute of Environmental Health Sciences
MONITOR: Valcovic, Lawrence R.
TELEPHONE: F629-3413;C(919)541-3413
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000; Environmental Protection Agency FY77:$246,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All chemicals (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;OS
PROJECT DESCRIPTION: Although in theory alkylating agents such as TEM should be capable of inducing gene mutations in mammals, only a relatively small amount of data are available supporting this hypothesis. The objective of this study was to test the effectiveness of a chemical mutagen in inducing mutations at a number of different enzyme loci in the mouse. Strain DBA/2J male mice were exposed to triethylenemelimine (TEM) by i.p. injection. Control males were injected with the carrier (HBSS). Males were mated to C57BL/6J females. Kidneys and blood were obtained from all F1 offspring and said tissues were analyzed by starch gel electrophoresis for the occurrence of mutations at the various enzyme loci. A number of putative mutants have been identified in this experiment and progeny testing is underway to confirm these mutations.
APPROACH: DBA/2J male mice were treated by i.p. injection with TEM. Control males were treated with HBSS. All males were mated to C57BL/6J females. Tissues (kidneys and blood) were sampled from all F1 offspring of the abcve matings. Using standard gel electrophoresis techniques, all samples were electrophoresed and the gels analyzed for the occurrence of aberrant zymogram patterns. Such aberrant patterns were considered indicative of putative mutations. Animals bearing putative mutations will be studied by standard progeny testing techniques.
RESULTS: Several putative mutations have been recovered at the following loci, Es-1, PGM-1, LDH, Es-3. Animals bearing the suspect mutations are presently undergoing progeny testing. This experiment will be completed shortly.
PROJECT MILESTONES: A knowledge and understanding of the types of genetic lesions induced in mammals by chemical mutagen and the relationship between the genetic effects of known mutagens and environmental agents which are potentially mutagenic is vital to our understanding of the risk posed to humans by such

environmental agents. This study will aid in our understanding these genetic effects and will provide basic information regarding the mechanism of action of a known potent chemical mutagen.
KEYWORDS: DBA/2J;TRIETHYLENEMELIMINE(C CHEMICAL MUTAGEN USED IN CHEMOTHERAPY);MUTATIONS;MICE;ALKYLATING AGENTS;MUTAGENS;KIDNEYS;BLOOD;PROGENY;ELECTROPHORESIS;MALES;FEMALES;BIOLOGICAL EFFECTS;TESTING;CHEMICAL EFFLUENTS;ELEMENTS

<033292>
TITLE: Use of Enzyme Heat Denaturation for Detection of Mutations
PROJECT NUMBER: Z01 ES 60060-01 LEM
PRINCIPAL INVESTIGATOR: Malling, H.V.
ADDRESS: P.O. Box 12233, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Mutagenesis
MONITOR: Malling, Heinrich V.
TELEPHONE: C(919)541-3378;FTS629-3378
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All chemical (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to develop a system to detect induced mutations in mice by using high speed rate analyzers to monitor the thermal stability of enzymes. Pilot experiments are in progress to determine the biochemical conditions necessary to screen crude homogenates of mouse tissues for thermal stabiliy mutants of 20 enzymes. Preliminary results indicate that enzyme heat denaturation is closely correlated to pH, ionic strength, and endogenous concentrations of substrates and cofactors. In addition naturally occurring variants of isocitrate dehydrogenase and phosphoglucose isomerase have been found to be detectable with heat stability techniques.
APPROACH: The thermal stabilities or purified enzymes and enzymes in crudely homogenized tissues are being comparatively studied to understand the relationship that exists between thermal stability of an enzyme based upon structure alone and thermal stability of the enzyme as a function of physiological environment and method of preparation. The knowledge of these relationships will be applied to defining a limited number of conditions that are feasible for use in a large scale experiment. The major premise of this methodology is that for a given inbred mouse population, these exists a normal relative thermal stability for a given set of experimental conditions for each enzyme. Data on control and mutagen-treated mice could be accumulated with the Miniature Centrifugal Past Analyzer and integral PDP11 Computer, then transferred to the Institute's computer. In-depth statistical analysis could be accomplished through the Statistical Analysis System in Washington, DC.
RESULTS: Conditions such as pH, ionic strength and substrate concentration have been found to alter thermal stability of mouse kidney enzymes at constant time and temperature in both crudely homogenized and purified enzymes. Homogenates of naturally occurring electrophoretic variants that are indistinguishable by thermal stability at neutral pH (7.5) may be resolved at a lower pH (6.0); the resolution can be improved by variation of ionic strength. Model studies to demonstrate these effects are being completed and 20 enzymes are being tested to establish the best conditions for subsequent studies. Computer programs to complement this methodology are being developed. Relative thermal stability will be determined for individual mice within and between litters for a selected number of kidney enzymes. The system will then be tested on a mutagen-treated population to evaluate its capacity to quantitate the frequency of mutation induction. Development of an analytical system based on the erythrocyte will be concurrent.
PROJECT MILESTONES: Development of this system is important because it could provide a rapid means to screen mammalian populations for mutational events at many loci. In addition, measurements of enzyme thermal stability can potentially distinguish regulatory variations as changes in specific activity and structural variations as changes in relative thermal stability.
KEYWORDS: MUTATIONS;THERMAL DEGRADATION;MICE;ENZYMES;TISSUES;PH VALUE;DEHYDROGENASES;HEAT;DATA COMPILATION;COMPUTERS;STATISTICS;TEMPERATURE EFFECTS;GENETICS;MUTAGENESIS

<033293>
TITLE: Interaction of Chemical Agents Present in Oil Shale with Biological Systems
PROJECT NUMBER: ERR-7.77.57
PRINCIPAL INVESTIGATOR: Chignell, C.F.
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MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Biophysics
MONITOR: Chignell, Colin F.
TELEPHONE: FTS629-3240
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$80,000; Environmental Protection Agency FY77:$51,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS (25%);ORGANICS (75%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are to: (1) study the role of free radical intermediates formed during the metabolism of polynuclear hydrocarbons in the toxicity of these agents; (2) study the mechanisms by which light (UV and visible) synergizes the tumorigenicity of polynuclear hydrocarbons on skin; and (3) study the binding of heavy metal ions to plasma and tissue proteins on the body distribution of the metal ions.
APPROACH: The formation and characterization of free radical intermediates will be done using electron spin resonance (ESR) spectroscopy. ESR spectroscopy can detect unpaired electrons present both in free radicals (organic or inorganic) and in paramagnetic metals. In some cases, spin trapping techniques will be used to transform reactive free radical intermediates to form stable radicals which can then be identified.
RESULTS: (1) The project will attempt to detect and quantify free radical intermediates of polynuclear hydrocarbon metabolism, and hopefully, provide information on the mechanisms involved. (2) Studies on the binding of metals to protein should provide information on the nature of the functional groups to which

the metal is coordinated, as well as the binding parameters for the metal-protein interactions.
PROJECT MILESTONES: Interim reports expected.
YWORDS: HEAVY METALS;OIL SHALES;HYDROCARBONS;METABOLISM;TOXICITY;ULTRAVIOLET RADIATION;VISIBLE RADIATION;SKIN;BLOOD PLASMA;PROTEINS;IONS;TISSUE DISTRIBUTION;EPR SPECTROMETERS;BIOCHEMISTRY;RADICALS;BIOLOGICAL EFFECTS;ELECTRON SPIN RESONANCE;ELECTRON SPECTRA;METALS

<033294>
TITLE: Effect of NOx Air Pollutants on Membranes
PROJECT NUMBER: ERR-7.77.58
PRINCIPAL INVESTIGATOR: Chignell, C.F.
ADDRESS: NIEHS, Research Triangle Park, NC 27709
AFFILIATION: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
DIVISION: Laboratory of Environmental Biophysics
MONITOR: Chignell, Colin F.
TELEPHONE: F629-3240
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: National Inst. of Environmental Health Sciences FY77:$55,000; Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to examine the effects of NO2 on model membranes, e.g., liposcmes, lecithin multilayers; biological membranes, e.g., those from a alveolar macrophages or erythrocytes; and the lung surfactant lipoprotein.
APPROACH: The electron spin resonance (ESR) spectrometer will be used to detect free radical intermediates formed as a result of reactions with NO2. If such intermediates are not detected, the effect of NO2 on membrane structure would be ascertained with the aid of spin-labeled analogs of steroids, fatty acids and phospholipids.
RESULTS: Several of the biochemical changes found in lung following exposure to NO2 may result from lipid peroxidation. Since NO2 itself is paramagnetic and has been shown to produce free radical intermediates when reacted with unsaturated lipids, we would expect ESR spectroscopy should confirm this effect in biological membranes and provide information as to the mechanism of toxicity.
PROJECT MILESTONES: Interim report expected.
KEYWORDS: AIR POLLUTION;NITROGEN OXIDES;MEMBRANES;BIOLOGICAL EFFECTS;LECITHINS;LUNGS;LIPOPROTEINS;EPR SPECTROMETERS;RADICALS;PHOSPHOLIPIDS;BIOCHEMICAL REACTION KINETICS;TOXICITY;INHALATION

Department of Health, Education and Welfare/National Cancer Institute

<034003>
TITLE: DNA Repair Synthesis in Human Diploid Fibroblasts
PROJECT NUMBER: Z01-CP-04508-04
PRINCIPAL INVESTIGATOR: Poirier, M.C.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Experimental Pathology Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This investigation reflects an overall interest in the interactions of carcinogenic agents with DNA in vitro, including mechanisms of damage and repair. The time-course of DNA repair synthesis induced by ultraviolet irradiation has been extensively studied in several cell lines, however, data on the duration of DNA repair synthesis induced by chemical carcinogens is not so complete. These studies were designed to compare the kinetics of DNA repair synthesis induced by ultraviolet irradiation (UV, 254 nm) and N-acetoxy-2-acetylaminofluorene (NA-AAF) in human diploid fibroblasts (WI-38) over a time course of 76 hr after damage.
APPROACH: Confluent WI-38 cells, given 10/sup -2/ M Hydroxyurea (HU) to suppress any remaining DNA replicative synthesis, were damaged with either 45 erg/mm/sup 2/ UV or 10/sup -5/ M NA-AAF and allowed to repair in the presence of /sup 3/H-TdR. Specific activities of the repaired DNAs were obtained after CsCl buoyant density gradient centrifugation. Unscheduled DNA synthesis was also determined by autoradiography. Cell survival was studied by cloning and trypan blue dye exclusion.
RESULTS: Up to 4 hr after damage the UV-treated cells showed an almost linear increase in repair synthesis, while the NA-AAF-treated cells showed a lag from 0 to 1/2 hr, followed by linear incorporation from 1/2 to 4 hr with a slope steeper than that for UV. Thus, in WI-38 cells, DNA repair synthesis after NA-AAF damage starts more slowly and continues for a longer time than after UV damage.
KEYWORDS: DNA;CARCINOGENS;BIOLOGICAL REPAIR;BIOLOGICAL EFFECTS;ULTRAVIOLET RADIATION;TIME DEPENDENCE;FIBROBLASTS;DNA REPLICATION;INHIBITION

<034004>
TITLE: Model Systems for the Study of Chemical Carcinogenesis of the Cellular Level
PROJECT NUMBER: Z01-CP-04504-04
PRINCIPAL INVESTIGATOR: Yuspa, S.H.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Experimental Pathology Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.

TECHNOLOGY: GENERAL SCIENCE (20%);SPECIFIED OTHER TECHNOLOGIES/Cancer (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop model systems which can be utilized to study cellular events which occur during stages of chemical carcinogenesis. Systems studied are directed to give both general information regarding malignant transformation within a mammalian cell and specific requirements of specialized cells which might shed light on events necessary for tumor development in a particular organ.
APPROACH: Cell culture systems have been developed for studying mechanisms involved in chemical carcinogenesis in epithelial cells. A model system of mouse epidermal cell culture, which closely parallels the in vivo model of skin carcinogenesis, has been most intensively studied. WI-38 cells, a diploid human fibroblast line, has been used to study DNA repair after damage with chemical carcinogens and UV light. Repair synthesis and specificity of carcinogen-nucleic acid interaction are also being studied utilizing an immunological approach.
RESULTS: A comparison of the kinetics of DNA repair synthesis induced by NA-AAF and ultraviolet light in human WI-38 cells has revealed the following. When doses of each agent were chosen to give equal repair incorporation of /sup 3/H-TdR after 4 hours, NA-AAF induced repair continued at a high rate 72 to 76 hours after damage while UV-induced repair was complete 24 to 28 hours after damage. At time points up to 4 hours NA-AAF-induced repair reached linearity after a 1/2 hour lag while UV repair was linear immediately.
KEYWORDS: CHEMICAL;ANIMAL CELLS;CARCINOGENESIS;CELL CULTURES;FIBROBLASTS;DNA;BIOLOGICAL REPAIR;ULTRAVIOLET RADIATION

<034005>
TITLE: Growth of Epidermal Cells in Culture; A Model System for Studying Chemical Carcinogenesis
PROJECT NUMBER: Z01-CP-04502-05
PRINCIPAL INVESTIGATOR: Hennings, H.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Experimental Pathology Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To optimize culture conditions for growth differentiation and maintenance of epidermal cells; to examine chemical carcinogen-induced repair of DNA.
APPROACH: In most experiments, primary cultures of epidermis from newborn BALB/c mice were grown in Medium 199 supplemented with 11% fetal bovine serum (FBS). In repair experiments, the cells were lysed in 1% sarkosyl, homogenized, and centrifuged in a cesium chloride-cesium sulfate gradient in a Beckman L2-65B ultracentrifuge to separate DNA from RNA and protein. In experiments in which the rate of DNA synthesis was estimated by thymidine-/sup 3/H incorporation into DNA, a nucleic acid hydrolysate was prepared by cold perchloric acid (PCA) precipitation of macromolecules and hot PCA hydrolysis.
RESULTS: Primary cultures of newborn mouse epidermal cells have been grown at 37 degrees in Medium 199 supplemented with 11% fetal bovine serum (FBS). Guanine-specific repair of DNA was found previously in mixed epidermal cell-fibroblast cultures treated with the skin carcinogens beta-propiolacetone and N-methyl-N'-nitro-N-nitrosoguanidine (MNNG). This type of repair is characterized by the incorporation of deoxyguanosine-/sup 3/H, but not thymidine-/sup 3/H, into non-replicating DNA after treatment with low, relatively non-toxic doses of the carcinogens.
KEYWORDS: ANIMAL CELLS;CELL CULTURES;CARCINOGENESIS;DNA;BIOLOGICAL REPAIR;EPIDERMIS

<034006>
TITLE: Metabolism of Chemical Carcinogens by Cultured Human Tissues
PROJECT NUMBER: Z01-CP-04513-01
PRINCIPAL INVESTIGATOR: Harris, C.C.;Autrup, H.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Experimental Pathology Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (30%);GENERAL SCIENCE (70%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study the metabolic pathways of chemical carcinogens in human target tissues.
APPROACH: Explant culture of human tissues; quantitative high-resolution light microscopic autoradiography; isolation of cellular macromolecules; high-pressure liquid chromatography; enzyme assays.
RESULTS: In the initial studies cultured human bronchial mucosa explants were found to be capable of metabolizing carcinogenic polynuclear aromatic hydrocarbons, (PAH) including 7,12-dimethylbenz[a]anthracene, 3-methylcholanthrene, benzo[a]pyrene, and dibenz[a,h]anthracene, into forms that tightly bind to DNA and other macromolecules. The binding of benzo[a]pyrene (BP) to DNA in cultured human bronchus was measured in specimens from 38 patients. The binding values ranged from 2 to 151 pmole BP per mg DNA with an overall mean +- S.E. of 34.2 +- 5.2. This 75-fold interindividual variation in binding of BP to DNA is similar in magnitude to that found in pharmacogenetic studies of drug metabolism.
KEYWORDS: PATHWAYS;CARCINOGENS;METABOLISM;TISSUES;MAN;TISSUE CULTURES;POLYCYCLIC AROMATIC HYDROCARBONS;BENZOPYRENE;DNA

<034007>
TITLE: Studies on the Mechanism of Induction of Aryl Hydrocarbon Hydroxylase
PROJECT NUMBER: Z01-CP-04595-01
PRINCIPAL INVESTIGATOR: McIntosh, P.R.
ADDRESS: NCI, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.

TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
OBJECT DESCRIPTION: To elucidate the mechanism of the induction of aryl hydrocarbon hydroxylase activity in rat liver and cultured rat liver cells by carcinogens.
APPROACH: Currently, the multiple forms of cytochrome P-450 in rat liver are being separated by electrophoretic techniques.
RESULTS: Clear differences in the composition of liver microsomal proteins from carcinogen-treated and untreated rats have been distinguished. It is proposed to investigate whether the increased accumulation of a particular P-450 species is the rate-limiting event in the induction of aryl hydrocarbon hydroxylase activity, and whether such accumulation is the result of an increase in the net rate of de novo synthesis of this species or due to the metabolic-conversion of a pre-existing P-450 species.
KEYWORDS: BIOCHEMICAL REACTION KINETICS;HYDROCARBONS;METABOLISM;LIVER;PROTEINS;RATS;ARYL RADICALS;CARCINOGENS

<034008>
TITLE: DNA Repair Deficiency and Increased Probability of Cancer in Certain Human Genetic Diseases
PROJECT NUMBER: Z01-CP-04598-01
PRINCIPAL INVESTIGATOR: Scudiero, D.A.
ADDRESS: NCI, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To examine the DNA repair capacities of cell lines derived from persons with various genetic diseases which have a high probability for cancer. Specifically, to measure repair synthesis in these cells after treatment with a variety of chemical carcinogens.
APPROACH: A simple methodology utilizing benzoylated naphthoylated DEAE cellulose chromatography (BND-cellulose) for the rapid quantitative estimation of excision repair and the rigorous separation of repair synthesis from semi-conservative replicative synthesis has recently been developed.
RESULTS: Repair synthesis has also been measured in KD cells following treatment with mitomycin C and methyl methanesulfonate. Similar experiments are now being initiated with cell lines derived from patients with ataxia telangiectasia, Fanconi's anemia, and Downs syndrome, all diseases with an enhanced frequency of malignancy.
KEYWORDS: ANIMAL CELLS;MAN;DNA;BIOLOGICAL REPAIR;CARCINOGENS;GENETICS;CARCINOGENESIS

<034009>
TITLE: The Role of DNA Repair Mechanisms in In Vitro Chemical Transformation
PROJECT NUMBER: Z01-CP-04558-03
PRINCIPAL INVESTIGATOR: Kakunga, T.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To learn more about the mechanisms involved in the malignant transformation of cells. In particular, to clarify the relation of the DNA repair efficiency of various cell strains to their property of undergoing malignant transformation in vitro in response to various chemical and physical agents.
APPROACH: Our previously developed method (based on the alkaline sucrose gradient technique) of measuring the size of the single-strands of DNA is used to assess DNA repair, particularly, DNA strand incision and its rejoining. The cells used were various human cells obtained from normal or patients genetically predisposed to higher cancer incidence and mouse cell lines which have been found to differ in the ease which they can be transformed with chemicals in vitro. They were examined for DNA repair activity in response to UV-irradiation or treatment with chemical carcinogens.
RESULTS: The analysis on the average molecular size of a single-strand DNA from unirradiated and UV-irradiated BALB/3T3, A31-714, normal human and the cells derived from xeroderma pigmentosum (XP) patient of complementation group A, B, C, D, E and variant revealed that UV-irradiation to the cells caused single-strand DNA breaks in all the cells tested. Furthermore, knowledge of the relationship between the probability of malignant transformation in various kinds of cells and the qualitative and quantitative difference in DNA repair activity in these cells will provide: (1) Information about the involvement of DNA repair mechanism in chemical carcinogenesis. (2) Basic information needed to develop assay for chemical carcinogens using mammalian cells including human cells.
KEYWORDS: TRANSFORMATION;ANIMAL CELLS;CARCINOGENESIS;DNA;BIOLOGICAL REPAIR;CARCINOGENS;ULTRAVIOLET RADIATION;CELL CULTURES;IN VITRO

<034010>
TITLE: Inducers and Inhibitors of Aryl Hydrocarbon Hydroxylase Activity and Tumorigenesis
PROJECT NUMBER: Z01-CP-04779-06
PRINCIPAL INVESTIGATOR: Wiebel, F.J.
ADDRESS: NCI, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop and test compounds that will selectively induce or inhibit different forms of

microsomal mono-oxygenases involved in carcinogenic polycyclic hydrocarbon metabolism and to assess their effect in polycyclic aromatic hydrocarbon tumorigenesis.
APPROACH: Cell culture techniques, spectrophotofluorometry, high pressure liquid chromatography.
RESULTS: Feeding of butylated hydroxytoluene and anisole to male rats for several days induced the oxidative metabclism of benzo(a)pyrene in liver microsomes but decreased the metabolism in lung in vitro. Butylated hydroxytoluene was tested as potential radical scavenger during the inactivation of adenovirus by 6-hydroxy-benzo(a)pyrene. The presence of the antioxidant did not reduce the inactivation rate of adenovirus by the hydrocarbon.
KEYWORDS: MONO-OXYGENASES;CARCINOGENESIS;POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;NEOPLASMS;BIOCHEMICAL REACTION KINETICS;ANIMAL CELLS;LUNGS;PATHOLOGICAL CHANGES;CATALYSTS;BIOLOGICAL REPAIR;CHROMATOGRAPHY

<034011>
TITLE: Identification of the Ultimate Carcinogenic Form of Benzo[a]pyrene
PROJECT NUMBER: Z01-CP-04597-01
PRINCIPAL INVESTIGATOR: Yang, S.K.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To develop analytical methods for detection of secondary metabolites of benzo[a]pyrene; (2) to determine the structure and property of the metabolites; (3) to test the carcinogenic and mutagenic activity of the metabolites; and (4) to develop an assay for the detection of carcinogenic metabolites.
APPROACH: Gravity-flow and high-pressure liquid chromatography, UV and fluorescence spectrometry, mass spectrometry, liquid scintillation counting, organic synthesis.
RESULTS: A highly mutagenic metabolite, r-7,t-8-dihydroxy-t-9,10-oxy-7,8,9,10-tetrahydro-benzo[a]pyrene has been found enzymatically and stereospecifically formed from benzo[a]pyrene by the liver microsomes from 3-methylchol-anthrene-treated rats. This metabolite may be the ultimate carcinogenic form of benzo[a]pyrene.
KEYWORDS: BENZO[A]PYRENE;BENZOPYRENE;METABOLISM;CARCINOGENESIS;CARCINOGENS;MUTAGENESIS;CHROMATOGRAPHY

<034012>
TITLE: Development of an Assay for Glutathione (GSH) S-Transferase-Polycyclic Hydrocarbon Oxides
PROJECT NUMBER: Z01-CP-04588-02
PRINCIPAL INVESTIGATOR: Nemoto, N.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To understand the metabolic path of carcinogen detoxification.
APPROACH: Enzymology.
RESULTS: Glutathione transferase is a route of detoxification.
KEYWORDS: DETOXIFICATION;ENZYMOLOGY;CARCINOGENS;METABOLISM;ENZYMES;TRANSFERASES

<034013>
TITLE: Genetic and Epigenetic Regulation of Mixed-Function Mono-oxygenases
PROJECT NUMBER: Z01-CP-04586-01
PRINCIPAL INVESTIGATOR: Wiebel, F.J.
ADDRESS: NCI, Bethesda, MD 20014
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MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To analyze the genetic and epigenetic regulatory mechanisms of microsomal mono-oxygenase activity in mammalian cells in culture.
APPROACH: Somatic cell hybridization, fluorospectrophotometry, gel electrophoresis.
RESULTS: The activity of the mixed-function oxygenase, aryl hydrocarbon hydroxylase, was assigned to a human chromosome by synthetic relationship with the expression of human isozymes in somatic mouse-man cell hybrids. The results suggested that the gene(s) regulating the rate of synthesis of the oxygenase is in close proximity to the structural gene.
KEYWORDS: EPIGENETICS;MONO-OXYGENASE;GENETICS;FOSSIL FUELS;BIOLOGICAL EFFECTS;GENETIC EFFECTS;HEALTH HAZARDS;CYTOLOGY;GENETIC CONTROL;ENZYMES;MAMMARY GLANDS;BIOCHEMICAL REACTION KINETICS;CHROMOSOMES;ANIMAL CELLS

<034014>
TITLE: Benzo[a]pyrene-4,5-Oxide Hydratase
PROJECT NUMBER: Z01-CP-04559-03
PRINCIPAL INVESTIGATOR: Leutz, J.C.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To investigate the role of BPO hydratase in the in vitro and in vivo metabolism of carcinogenic polycyclic aromatic hydrocarbons. To purify BPO hydratase. To measure BPO hydratase activity in mouse target tissue and in human tissues and to relate this activity to the mixed-function oxygenase aryl hydrocarbon (benzo[a]pyrene) hydroxylase (AHH).
APPROACH: Thin layer, column and high-pressure liquid chromatography, UV spectroscopy, and spectrofluorometry.
RESULTS: Rat liver microsomal BPO hydratase has been purified eleven-fold. The purified enzyme is free of AHH activity. BPO hydratase and AHH have been measured in liver, lung, and skin of five strains of mice and in human liver microsomes and in cultured bronchial explants. In liver BPO hydratase activity is ten-fold higher than AHH activity and in both lung and skin it is 100-fold higher. The AHH inhibitor 7,8-benzoflavone stimulates BPO hydratase.
KEYWORDS: BPO HYDRATASE;POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;ENZYMES;MICROSOMES;CARCINOGENS;IN VITRO;IN VIVO

<034015>
TITLE: Studies on the Metabolism of Chemical Carcinogens
PROJECT NUMBER: Z01-CP-04619-11
PRINCIPAL INVESTIGATOR: Grantham, P.H.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Carcinogen Metabolism and Toxicology Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (20%);SPECIFIED OTHER TECHNOLOGIES/Cancer (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The aim of this research is to gather data relevant to the etiology of neoplasia at the molecular level. To this end chemical carcinogens, especially those of the aromatic amine type, are being utilized. Their metabolism and interaction with host tissues and specific targets are studied.
APPROACH: Biochemical and pharmacological techniques are applied to determine the metabolism of N-hydroxy-N-2-fluorenylacetamide and related compounds in various animal species. This includes study of the enzyme systems concerned with certain metabolic steps.
RESULTS: (1) Metabolism of 2-fluorenylacetamide (FAA) in resistant and susceptible mice. Despite their resistance to the carcinogenic action of FAA, the X/Gf strain of mouse excretes a level of the activated metabolite, N-hydroxy-2-fluorenylacetamide (N-OH-FAA) comparable to that excreted by the susceptible Swiss mouse. The metabolism of FAA by liver microsomes from X/Gf mice is being studied in order to explore further the differences between the strains.
KEYWORDS: NEOPLASIA;NEOPLASMS;ETIOLOGY;CARCINOGENS;METABOLISM;ENZYMES;LIVER;MICROSOMES;TISSUES

<034016>
TITLE: Development and Application of In Vitro Systems Involving Epithelial Cells
PROJECT NUMBER: Z01-CP-04680-07
PRINCIPAL INVESTIGATOR: Wilson, M.J.
ADDRESS: NCI, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Carcinogen Metabolism and Toxicology Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Successful culture of epithelial-like cells derived from livers of 8 to 10 day old Fischer strain 344 rats and malignant transformation of such cultured cells by a variety of chemical carcinogens has been achieved. Our principal aim is to further determine the potential of in vitro epithelial systems for use in rapid bioassay procedures for chemical carcinogens and in examining the biochemical mechanisms of carcinogenesis.
APPROACH: Cell culture methods designed for selection of epithelial cells were employed to initiate cell cultures from livers of 8 to 10 day old Fischer rats. The method for selection of epithelial cells developed in this laboratory was modified by detaching and transferring islands of epithelial cells so that many homogenous sublines could be cultured from one primary culture.
RESULTS: These epithelial cells will be carefully examined for suitability as a carcinogen screening system. The relevant morphological properties in both normal and carcinogen treated cells will be investigated thoroughly. Extensive efforts will deal with the biochemical properties of both the normal and the transformed cells in culture. Basic biochemical mechanisms of the system will be investigated.
KEYWORDS: EPITHELIUM;ANIMAL CELLS;RATS;NEOPLASMS;CARCINOGENESIS;BIOASSAY;BIOCHEMICAL REACTION KINETICS;LIVER;BIOLOGICAL INDICATORS;PATHOLOGICAL CHANGES;CARCINOGENS;IN VITRO

<034017>
TITLE: The Role of DNA Repair Mechanisms in the Etiology of Cancer
PROJECT NUMBER: Z01-CP-04785-06
PRINCIPAL INVESTIGATOR: Day, R.S. III
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Chemistry Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To learn more about DNA repair mechanisms in human cells and about their role in carcinogenesis. In particular, to determine the nature of the biochemical defects in human cell strains grown from biopsies taken from persons having extreme susceptibility to carcinogenesis, and to determine the biological consequences of the repair defects of these cells.
APPROACH: The difference in survival of treated virus measured using normal cells (proficient in repair of DNA damage due to 254nm ultraviolet irradiation) from that measured using cells from patients having xeroderma pigmentosum (deficient in such repair) is used as our index of the amount of repairable DNA damage produced by the physical or chemical treatments.
RESULTS: Preliminary studies concerning the inactivation of adenovirus 5 by 7,8-diol-9, 10 epoxy benzo[a]pyrene (the most mutagenic of all benzo[a]pyrene metabolites so far studied by others) show that this compound kills the virus by a mechanism that produces DNA damage that is repaired in a manner very similar to that by which DNA damage produced by 254nm UV is repaired.
KEYWORDS: BIOPSY;HUMAN;ANIMAL CELLS;DNA;BIOLOGICAL REPAIR;CARCINOGENESIS;ULTRAVIOLET RADIATION;XP CELLS;ADENOVIRUS

<034018>
TITLE: Analytical Applications of Mass Spectroscopy to Carcinogenesis Problems
PROJECT NUMBER: Z01-CP-04581-01
PRINCIPAL INVESTIGATOR: Roller, P.P.
ADDRESS: NCI, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Carcinogen Metabolism and Toxicology Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (20%);GENERAL SCIENCE (80%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To apply the mass spectrometry method for the analysis and identification of metabolites in carcinogen activation and metabolism studies. (2) To study in some detail the mass spectra of carcinogens and of some of their possible metabolites, such as aromatic hydrocarbons and N-nitroso compounds, with the aim of applying this knowledge to develop appropriate analytical methods.
APPROACH: A high resolution double focusing mass spectrometer system was used, interfaced with a gas chromatograph, and run in the electron impact ionization mode. A number of synthetic and metabolic samples were also prepurified by collaborators using high pressure liquid chromatography. In some cases suitable chemical characterizations were necessary.
RESULTS: In collaboration with Midwest Research Institute (J.F. Engel, NCI Contract No. N01-CP-33387), the laboratory has been involved in mass spectral analysis of synthetic polycyclic aromatic hydrocarbons (35 of them to date). Also, in collaboration with the chemistry branch of our division, mass spectral analysis has been put to valuable use in characterizing metabolic products of benzo(a)pyrene and of trans-7,8-dihydrobenzo(a)pyrene. (Project No. Z01-CP-04597-01-CH)
KEYWORDS: CARCINOGENS;METABOLISM;MASS SPECTROSCOPY;POLYCYCLIC AROMATIC HYDROCARBONS;BENZOPYRENE

<034019>
TITLE: Chemistry of N-Nitroso Compounds
PROJECT NUMBER: Z01-CP-04542-04
PRINCIPAL INVESTIGATOR: Keefer, L.
ADDRESS: National Cancer Institute, Bethesda, MD 20014
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
DIVISION: Carcinogen, Metabolism and Toxicology Branch
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To investigate mechanisms by which metal ions might promote the formation of N-nitroso compounds in the environment. (2) To study mechanisms of metabolism and carcinogenesis by N-nitroso compounds using the deuterium isotope effect. (3) To synthesize possible metabolites of certain N-nitroso compounds for comparisons of their physical, chemical, and biological properties with those of the parent procarcinogens. (4) To elucidate mass spectrometric fragmentation mechanisms for N-nitroso compounds, especially by study of selectively deuterated substrates. (5) To study the circular dichroism of optically active nitrosamines with the goal of clarifying the sector rule for this series of compounds.
APPROACH: In addition to the standard methods of synthetic and mechanistic chemistry, considerable use has been made of the deuterium isotope effect as a pharmacological probe. This method has not been widely exploited elsewhere, and it is possible that this project may in the long run demonstrate the technique's general utility in pharmacological investigations.
RESULTS: Metallic species can serve as effective promoters of N-nitrosation reactions. Specifically, ferricyanide ion is catalytic for the reaction of secondary amines with nitrite. Also, a variety of metals at high oxidation states, which have been reported in the earlier literature to promote nitrosation of

amines by nitric oxide, are being reinvestigated with an eye toward assessing the potential environmental/biological significance of this reaction pathway. Finally, theoretical considerations have been advanced and documented from the literature to suggest that a wide variety of nitrogen oxidation states must be considered possible precursors for N-nitroso compounds.
KEYWORDS: NITROSO COMPOUNDS;METABOLISM;CARCINOGENESIS;CHEMICAL PROPERTIES

<034020>
TITLE: Aryl Hydrocarbon Hydroxylase in Human Lymphocytes and the Relationship to Chemical Carcinogenesis
PROJECT NUMBER: N01-CP-55629
PRINCIPAL INVESTIGATOR: Paigen, B.
ADDRESS: Roswell Park Memorial Institute
AFFILIATION: Health Research, Inc., Albany, N.Y. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Weibel, Friedrich
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$16,100
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To confirm that aryl hydrocarbon hydroxylase (AHH) inducibility is a common polymorphism inherited as a single gene and that persons with intermediate or high inducibility have a higher risk of lung cancer.
APPROACH: AHH inducibility will be determined in patients with lung cancer and their progeny.
RESULTS: Aryl hydrocarbon hydroxylase inducibility was found to be highly heritable (H = .7) in a study of 48 pairs of monozygotic and dizygotic twins. Moreover the data from the twin study suggest that AHH inducibility is most likely determined by a single gene. AHH inducibility cannot be determined in a population of lung cancer patients because the lymphocytes of 60 percent of these patients die during the three-day culture period. Thus AHH inducibility in lung cancer patients will have to be inferred by determining the inducibility in the progeny of lung cancer patients and an appropriately matched control population. This study is underway.
KEYWORDS: ENZYMES;CARCINOGENESIS;MAN;GENETICS;LUNGS;NEOPLASMS;CARCINOGENS

<034021>
TITLE: Molecular Processes Involved in the Carcinogenic Action of Polycyclic Aromatic Hydrocarbons
PROJECT NUMBER: Y01-CP-50203
PRINCIPAL INVESTIGATOR: Calvin, M.
AFFILIATION: California Univ., Berkeley (USA). Dept. of Zoology
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Peacock, Andrew C.
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$22,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To define the chemically reactive positions of polycyclic hydrocarbons and to determine the interaction of the reactive intermediates with cell macromolecules and the nature of interaction with oncogenic viruses.
APPROACH: The kinetics of the toxicity of benzo[alpha]pyrene (BP) to a liver epithelial cell line (NMuLi) derived from Namru mice has been studied. The covalently linked BP to poly G has also been characterized. BP was covalently linked to poly G with liver microsomes from rats pre-treated with 3-methylcholanthrene.
RESULTS: Growth curves of NMuLi in BP showed that the carcinogen markedly depressed the saturation density and growth rate of the cells. These effects were dose-dependent. Absorption and fluorescence excitation and emission spectra (corrected for artifacts due to excitation source, monochromators and detectors) of the digests fit that of a red-shifted pyrene aromatic system and is, therefore, consistent with metabolism occurring at the 7, 8, 9, 10-positions of BP.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;CARCINOGENESIS;BENZOPYRENE;TOXICITY;LIVER;MICROSOMES;RATS;CARCINOGENS;ANIMAL CELLS;VIRUSES

<034022>
TITLE: Nature of Polycyclic Hydrocarbon-Nucleic Acid Compound in Hydrocarbon Carcinogenesis
PROJECT NUMBER: N01-CP-33367
PRINCIPAL INVESTIGATOR: Brookes, P.
AFFILIATION: Institute of Cancer Research, Sutton (UK). Surrey Branch
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Gelboin, Harry V.
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is believed that the chemistry of the in vivo reaction of the potent carcinogen BP and DNA is the initiating event leading to cancer induction. The knowledge of the nature of the ultimate carcinogen and the mechanism of its metabolic generation will suggest possibilities for inhibiting this sequence of events.
APPROACH: To understand the chemistry of the reaction between carcinogenic hydrocarbons and the DNA of mammalian cells which results when these compounds are metabolized by the cells. Furthermore, since it now seems probable that more than one reaction product is present in the DNA, the significance of each reaction will be considered in relation to mutagenesis and transformation.
RESULTS: It was established that rat liver microsomal metabolism of 7,8-dihydroxy-7,8-dihydro-benzo[alpha]pyrene (BP-7,8-diol) in the presence of added DNA yields the same product as obtained when BP was bound to the DNA of tissues to which this carcinogen was applied. The implication that this ''in vivo product,'' (i.v.p.) which is thought to be responsible for the

carcinogenic event, results from reaction with DNA of BP-7,8-diol,9,10-epoxide has been fully established. It has also been shown that the i.v.p. is predominantly a guanine derivative probably involving attachment of the hydrocarbon moiety through the 10-position to the 2-amino group of guanine. The question as to which of the geometrical isomers of BP-trans-7,8-diol-9,10-epoxide is involved in the formation of the i.v.p. in cells is under investigation.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;CARCINOGENESIS;DNA;BENZOPYRENE;METABOLISM;CARCINOGENS;ANIMAL CELLS;IN VIVO;MUTAGENESIS

<034023>
TITLE: Significance to Mutagenesis in Carcinogenesis
PROJECT NUMBER: N01-CP-55713
PRINCIPAL INVESTIGATOR: Ts'o, P.O.P.;Barrett, C.
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Day, Rufus;Peacock, Andrew C.
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$208,800
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project concerns three aspects related to research and control of cancer: (1) it provides basic knowledge and techniques for the establishment of in vitro neoplastic transformation assay and somatic mutation assay which may be useful in the detection and investigation of environmental and industrial carcinogens; and (2) this project will provide the basic understanding concerning the structure and function of the genetic apparatus as related to somatic mutation and to malignant transformation.
APPROACH: (1) To develop the necessary techniques and an understanding of the in vitro neoplastic transformation system and somatic mutation system, employing a single cell type (Syrian embryonic fibroblasts) so that both systems can be investigated concurrently using the same cell and with the same perturbation (carcinogens, mutagens, etc.), if needed. (2) To study the mutagenic and the transformation effects of the environmental carcinogens (benzo(alpha)pyrene (BP) and its metabolites), laboratory carcinogens (MNNG), and a perturbation specifically toward cellular DNA (incorporation of 5-bromodeoxyuridine followed by near UV irradiation. (3) To investigate the relationship between neoplastic transformation and somatic mutation.
RESULTS: The first major achievement is the establishment of a cellular system through which both the neoplastic transformation and the somatic mutation can be measured concurrently under the same perturbation or stimulus. Such a system has been established for the early passage Syrian hamster embryo cells, which can be cloned in the absence of a feeder layer for both morphological transformation and somatic mutation studies. In somatic mutation studies the 8-azaguanine (40 mu g/ml) resistant clones were selected. Comparison of the morphological transformation frequency and the somatic mutation frequency which is based on the number of 8-azaguanine resistant (40 mu g/ml) clones indicates that the mutation frequency (approximately 10/sup -2/) is 2-3 orders lower than the morphological transformation frequency (approximately 10/sup -2/), as induced by BP or MNNG.
KEYWORDS: CARCINOGENESIS;MUTAGENESIS;FIBROBLASTS;BENZOPYRENE;CARCINOGENS;NEOPLASMS;ANIMAL CELLS;GENETICS;IN VITRO

<034025>
TITLE: Studies of Microsomal Enzyme Systems Metabolizing Polycyclic Hydrocarbons in Experimental Animals and Humans
PROJECT NUMBER: N01-CP-55604
PRINCIPAL INVESTIGATOR: Shaw, C.R.
AFFILIATION: Texas Univ., Houston (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Gelbon, Harry V.; Wiebel, Friedrich J.
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$78,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Recent animal studies continue to indicate a relationship between high AHH inducibility and susceptibility to cancer caused by polycyclic hydrocarbons. The establishment of similar findings in a human cell system may help to identify those individuals at high risk to certain cancers and may point to directions for specific preventive procedures.
APPROACH: (1) To improve the reproducibility of the assay for measuring aryl hydrocarbon hydroxylase (AHH) in human lymphocytes; (2) to determine the activity and inducibility of AHH in a normal population and in cancer patients, particularly those with bronchogenic carcinoma; and (3) to measure AHH levels in families in an effort to understand the control of this enzyme.
RESULTS: The levels of AHH activity and inducibility were measured in approximately 500 normal individuals and included over 100 separate assay determinations. Frequency distribution of inducibility resembled a unimodal curve, skewed to the low inducible end. In addition, over 350 cancer patients were tested, of whom approximately 100 were diagnosed as having some form of lung cancer. At this point differences between lung cancer and normal populations are not significant. However, even under strictly controlled culture and assay conditions some individuals continued to vary more than others. This may be a reflection of the heterogeneity in the lymphocyte population itself. Of the two major subpopulations of lymphocytes, T cells appeared to have a higher AHH level of activity than B cells.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;ENZYMES;LYMPHOCYTES;MAN;NEOPLASMS;CARCINOGENS;ANIMAL CELLS

<034026>
TITLE: Investigative Aspects of Enzyme Induction and Chemical Carcinogenesis
PROJECT NUMBER: N01-CP-02217
PRINCIPAL INVESTIGATOR: Sachs, L.
AFFILIATION: Weizmann Inst. of Science, Rehovoth (Israel)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Gelboin, Harry
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$226,000

TECHNOLCGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
ESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
ROJECT DESCRIPTION: An understanding of these biochemical processes is necessary to understand carcinogenesis in humans.
APPROACH: To clarify the role of polycyclic metabolism in carcinogenesis.
RESULTS: (1) Regulation of Aryl Hydrocarbon (Benzo(a)pyrene) Hydroxylase Activity in Mammalian Cells. Aryl hydrocarbon (benzo(a) pyrene) hydroxylase is important in chemical carcinogenesis, since this enzyme metabolically activates chemically-inert carcinogens into metabolites that can be mutagenic and carcinogenic. It has been found that induction of aryl hydrocarbon hydroxylase can be mediated by cAMP. (2) Mutability of Different Genetic Loci in Mammalian Cells by Metabolically-Activated Carcinogenic Polycyclic Hydrocarbons. The relationship between carcinogenesis and mutagenesis in mammalian cells has been determined with 10 polycyclic hydrocarbons with different degrees of carcinogenicity.
KEYWORDS: CARCINOGENESIS;POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;ENZYMES;MUTAGENESIS;ANIMAL CELLS;CARCINOGENS

<034028>
TITLE: Study of Pulmonary Tumors in Mice for Carcinogenic and Co-Carcinogenic Bioassay
PROJECT NUMBER: N01-CP-33232
PRINCIPAL INVESTIGATOR: Shimkin, M.B.;Kniazeff, A.J.
AFFILIATION: California Univ., San Diego (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Weisburger, Elizabeth K.
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$55,100
TECHNOLOGY: FOSSIL FUEL/General (10%);GENERAL SCIENCE (90%)
POLLUTANTS: METALS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are twofold: (1) to test environmental compounds for carcinogenic activity using the strain A mouse pulmonary tumor-induction-technique and (2) to evaluate the effect of virus infections on the chemical induction of pulmonary tumors in strain A mice.
APPROACH: Bioassay - The strain A mouse lung tumor system was applied to the bioassay of 13 metals.
RESULTS: The tumor response of chemically treated mice was compared to that of the appropriate controls with the following results: Metals, 4 of the 13 metal salts tested were carcinogenic and these and the doses of the compounds required for 1 lung tumor per mouse are: lead subacetate, 0.13 mmol/kg; nickelous acetate, 1.15 mmol/kg; manganous sulfate, 3.3 mmol/kg; and molybdenum trioxide, 29 mmol/kg. The metal compounds which were not carcinogenic in this bioassay system are: cadmium acetate, calcium acetate, chromium sulfate, cobalt acetate, cupric acetate, iron(II),2,4-pentanedione, stannous chloride, 2,4-pentanedione vanadium(III) complex and zinc acetate.
KEYWORDS:
METALS;CARCINOGENESIS;LUNGS;MICE;BIOASSAY;LEAD;NICKEL;MANGANESE;MOLYBDENUM;VIRUSES;CARCINOGENS;NEOPLASMS

<034029>
TITLE: Development of In Vitro Methods for the Detection of Cell-Mediated Immunologic Reactivity to Chemical Compounds
PROJECT NUMBER: N01-CP-43353
PRINCIPAL INVESTIGATOR: Thor, D.E.
AFFILIATION: Texas Univ., San Antonio (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Rapp, Herbert
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (30%);GENERAL SCIENCE (70%)
POLLUTANTS: ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the feasibility of devising in vitro immunologic tests for the detection of prior exposure to known chemical carcinogens.
APPROACH: To date three chemical carcinogens, producing immunological specific percutaneous reactions, are being evaluated, namely, dimethylbenz[a]anthracene (DMBA), methylcholanthrene (MCA), and benzpyrene (BP). These carcinogens behave as haptens and an antigenic structure that shows in vitro reactivity can be provided by a carcinogen-protein carrier complex. Three systems are being studied in parallel to couple carcinogens with carrier proteins.
RESULTS: (1) Multiple carriers bind carcinogen including albumin, transferrin, immunoglobulins and skin proteins to represent approximately 60% of protein bound carrier while to date, 40% of carrier proteins remain unidentified. (2) In vitro complexes are obtained by an induced and isolated liver microsomal aryl hydrocarbon hydroxylase enzyme system. Multiple carcinogen-protein carrier conjugates are necessary in vitro to stimulate reactions. Using cavine whole serum for in vitro carrier-coupling, our data shows specific MIF indexes of 60+-8 vs controls 90+-9 for DMBA and only 78+-7 for the promimal carcinogen, MCA in DMBA immunized guinea pigs. (3) Basic in vitro complexes may be formed by the addition of carcinogen (DMBA in DMSO) to Human AB serum.
KEYWORDS: CELLS;CHEMICAL;CARCINOGENS;IMMUNOLOGY;IN VITRO;BIOASSAY;ALBUMINS;TRANSFERRIN;IMMUNOGLOBULINS;PROTEINS

<034030>
TITLE: Production and Detection of Antibodies to Chemical Carcinogens and Other Small Molecules
PROJECT NUMBER: N01-CP-23243
PRINCIPAL INVESTIGATOR: Van Vunakis, H.
AFFILIATION: Brandeis Univ., Waltham, Mass. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Rapp, Herbert
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$88,600
TECHNOLOGY: FOSSIL FUEL/General (10%);GENERAL SCIENCE (90%)
POLLUTANTS: ORGANICS (10%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To obtain antibodies that react specifically with chemical carcinogens and other small molecules of interest in cancer research. The antibodies will be used as reagents to develop immunoassays capable of detecting the corresponding haptens in body fluids and tissues. Haptens attached to appropriate carriers will be used as antigens to detect presence of antibodies in the serum of animals and humans. These reagents will be tested for their suitability to detect exposure to environmental agents that may be related to cancer causation.
APPROACH: This work may provide a way to determine the degree to which individuals in different environments have been exposed to known chemical carcinogens. The immunologic approach does not require that the carcinogen be present in the individual at the time of testing. A metabolite, which is longer lived in physiological fluids than the parent compound and/or which may be responsible for the biological effect, may provide a more reliable base for epidemiological studies. Demonstration that different groups are at risk may provide the impetus to remove certain agents from the environment.
RESULTS: Polycyclic aromatic hydrocarbons: Two differently substituted derivatives of BP and a 7,12-DMBA derivative were used to prepare conjugates for immunization. While the antibodies react more effectively with the homologous haptens, they cross react to varying degrees with structurally related compounds. Analyses of sera indicate that BP and DMBA, if they occur at all, are present in concentrations of less than 500 pg/ml. If immunoassays which depend upon the host's cellular responses are required to monitor populations for exposure to PCHs, the serological activities described may serve as a guide for evaluating the specificities of such responses. Also, multivalent conjugates, such as those prepared for this study, may be necessary to elicit such responses in sensitized animals.
KEYWORDS: CARCINOGENS;ANTIBODIES;ANTIGEN-ANTIBODY REACTIONS;POLYCYCLIC AROMATIC HYDROCARBONS;IMMUNOLOGY;NEOPLASMS

<034031>
TITLE: In Vitro Study of the Nature of the Interaction Between Chemical and Viral Carcinogens
PROJECT NUMBER: N01-CP-45615
PRINCIPAL INVESTIGATOR: Casto, B.C.
ADDRESS: Biolabs, Inc.
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: DiPaolo, Joseph A.
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$47,600
TECHNOLOGY: FOSSIL FUEL/General (20%);GENERAL SCIENCE (80%)
POLLUTANTS: METALS (10%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The specific objective of this contract is to study the process whereby chemical carcinogens promote viral oncogenesis and to determine if oncogenic and non-oncogenic viruses may similarly promote oncogenesis by known chemical carcinogens. This contract is part of a program to develop in vitro screening methods for detection of potential carcinogenic hazards, either viral or chemical.
APPROACH: This study has established that treatmnt of cells with chemical carcinogens will increase the frequency of viral transformation in vitro. A total of 83 chemicals including polycyclic hydrocarbons, aromatic amines, alkylating agents, metal salts, drugs, certain fuel or food additives, pesticides, herbicides, organic solvents, and other industrial chemicals are being tested for toxicity on human and hamster cells and for their capacity to enhance viral transformation, induce breaks in cell DNA, stimulate unscheduled DNA (repair) synthesis, induce mutations in Chinese hamster cells, and transform Syrian hamster cells in vitro.
RESULTS: Carcinogenic polycyclic hydrocarbons and alkylating agents enhanced transformation of hamster cells by a simian adenovirus, SA7, but non-carcinogens did not. The sequence of addition of virus and chemical was found to be a critical factor for enhancement to occur. Pretreatment of cells for 18 hours with salts of arsenic, beryllium, cadmium, chromium, lead and nickel enhanced viral transformation, but treatment with manganous chloride, mercuric chloride, or titanic oxide did not enhance transformation.
KEYWORDS: CHEMICAL EFFLUENTS;VIRUSES;BIOCHEMICAL REACTION KINETICS;CARCINOGENESIS;POLYCYCLIC AROMATIC HYDROCARBONS;HEALTH HAZARDS;DRUGS;FUELS;ADDITIVES;FOOD;PESTICIDES;HERBICIDES;SOLVENTS;TOXICITY;HAMSTERS;ANIMAL CELLS;ARSENIC;BERYLLIUM;CADMIUM;CHROMIUM;LEAD;MERCURY;NICKEL;CARCINOGENS

<034033>
TITLE: Evaluation of the Significance of Experimental Chemical Carcinogenesis Data to Man
PROJECT NUMBER: N01-CP-55630
PRINCIPAL INVESTIGATOR: Tomatis, L.
ADDRESS: International Agency for Research on Cancer
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Cooper, John A., II
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$202,100
TECHNOLOGY: FOSSIL FUEL/General (10%);GENERAL SCIENCE (90%)
POLLUTANTS: ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The goal of this research activity is to develop objective criteria for the extrapolation of animal data to the human situation. This would allow for the identification in a straightforward manner of those chemical exposures in the environment of man for which substantive risk exists. Only in such a context can meaningful risk-benefit evaluations be carried out. To assess the significance of experimental data to man, the research focuses on three major topics: (1) comparative metabolism of carcinogens in human and animal systems; (2) chemical carcinogenesis in vitro; and (3) mutagenesis testing.
RESULTS: In a study on polycyclic aromatic hydrocarbon carcinogenesis, the mutagenic effects of a series of metabolites or synthesized intermediates of benz(a)anthracene, benzo(a)pyrene, 7-methylbenz(a)anthracene and 7,12-dimethylbenz(a)anthracene were investigated. With S. typhimurium strain TA100, non-K-region dihydrodiol epoxides of benzo(a)pyrene and benz(a)anthracene were found to be only slightly less active than the corresponding K-region epoxides. These data support the hypothesis that, for the hydrocarbons

studied, non-K-region dihydrodiols may be converted through epoxidation of the adjacent olefinic double bond into non-K-region dihydrodiol epoxides which are mutagenic for S. tryphimurium TA100.
KEYWORDS: CHEMICAL EFFLUENTS;CARCINOGENESIS;MAN;DATA;HEALTH HAZARDS;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL EFFECTS;BIOLOGICAL RECOVERY;BIOLOGICAL REPAIR;ANIMALS;METABOLISM;POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;MUTAGENESIS;CARCINOGENS;IN VITRO

<034034>
TITLE: Resource for Carcinogenesis Bioassays and Related Research
PROJECT NUMBER: N01-CP-33278
PRINCIPAL INVESTIGATOR: Clayson, D.B.
AFFILIATION: Nebraska Univ., Lincoln (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Gori, Gio B.
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$1,722,300
TECHNOLOGY: FOSSIL FUEL/General (10%);GENERAL SCIENCE (90%)
POLLUTANTS: ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The bioassay of suspected chemical carcinogens, definition of the biological and chemical mechanisms of the carcinogenesis process and the analysis of trace levels of environmental carcinogens are three principal research aims under this contract.
RESULTS: Polycyclic Aromatic Hydrocarbon Carcinogenesis: Evidence for the involvement of one-electron oxidation in polycyclic hydrocarbon carcinogenesis is steadily amassing. It is suggested that the radical cations formed by one-electron oxidation may be among the intermediates concerned in initiation of the carcinogenic process. The evidence for this hypothesis is: (1) the existence of inducible cytochrome P-450-linked nuclear monooxygenase, which catalyzes the covalent binding of carcinogenic hydrocarbons to DNA under conditions where oxygenation of the hydrocarbon cannot occur; (2) mechanistic details pertaining to nucleophile trapping of PAH radical cations, which suggest possible binding site(s) of hydrocarbons in biological systems; (3) the loss of (H-3) in 3-methylcholanthrene (3-MC) specifically tritiated at C-1 after binding to DNA in rat liver nuclei which indicates ca. 95% of the hydrocarbon bound to that position; (4) the quantitative skin tumorigenesis of 3-MC and its oxygenated derivatives at the 1- and 2-position, which implies C-1 as the critical binding site; and (5) the quantitative skin tumorigenesis of several 6-substituted benzpyrenes in relation to the parent compound, which suggests involvement of the 6-position as the critical binding site.
KEYWORDS: CARCINOGENESIS;BIOASSAY;FOSSIL FUELS;HEALTH HAZARDS;CHEMICAL EFFLUENTS;TRACE AMOUNTS;POLYCYCLIC AROMATIC HYDROCARBONS;BIOCHEMICAL REACTION KINETICS;RATS;CARCINOGENS

<034035>
TITLE: Carcinogenesis and Control of the Cell Cycle
PROJECT NUMBER: N01-CP-33405
PRINCIPAL INVESTIGATOR: Holley, R.
AFFILIATION: Salk Inst. for Biological Studies, San Diego, Calif. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Peacock, Andrew
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst.
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Carcinogenesis changes the relationship between the cell and the extracellular agents such that growth rates greater than normal occur. However, it has been found that some regulations of growth still remain in chemically-induced tumor cells and the residual controls in these malignant cells are the subject of the present study. The overall objective of this study is to determine the kinds of changes that accompany chemical transformation of cells. The present project contributes to that goal but focuses on mechanisms whereby the growth rate in chemically-induced tumors might be checked.
RESULTS: Major efforts during the last year have been directed toward understanding the changes in growth control that take place when 3T3 cells are transformed by benzpyrene. The work has been carried out with two clones of benzpyrene-transformed 3T3 cells. Major findings can be summarized as follows. Benzpyrene-transformed 3T3 cells (BP3T3) have growth behavior very similar to that of viral-transformed 3T3 cells when cultured under the usual laboratory conditions in medium with 10% serum. The two transformed cell lines have similar, low serum requirements. Both transformed cell lines are tumorigenic. However, the growth of BP3T3 cells still shows ''normal'' controls. Except for a decrease to one-tenth in the serum requirement, growth controls are very similar to those seen in normal 3T3 cells.
KEYWORDS: CHEMICAL;CYTOLOGY;CARCINOGENESIS;ANIMAL CELLS;BIOCHEMICAL REACTION KINETICS;BENZOPYRENE;HEALTH HAZARDS;CARCINOGENS;TUMORS

<034036>
TITLE: Carcinogenesis by Radiation Plus Estrogen
PROJECT NUMBER: N01-CP-43229
PRINCIPAL INVESTIGATOR: Segaloff, A.
ADDRESS: Alton Ochsner Medical Foundation
AFFILIATION: National Cancer Inst., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Page, Norbert P.;Taylor, D. James
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$94,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To investigate interaction or synergism of radiation and hormones in the induction of mammary tumors.
APPROACH: Both irradiation and ovarian hormones, given individually in large dose, have been implicated in causing an increase in breast cancer of both laboratory animals and women. It has been speculated that x-rays, routinely used for diagnosis and radiotherapy, plus estrogens and progesterones, now being widely used in birth control pills or for post menopausal therapy, may interact synergistically and be

contributing to the alarming rise in the incidence of breast cancer.
RESULTS: The contractor has been able to show that a single dose of x-ray delivered to one mammary chain of AxC inbred rats which had also received a continuous exogenous source of diethylstilbestrol (DES) resulted in a significant increase in mammary tumors over that resulting from the estrogen alone. None of the non-estrogen treated control animals developed cancers. Those which were irradiated alone developed cancers at a much later time. There is a dosage response between radiation in the range used (50, 150 or 450 r) and tumor induction in the DES-treated rats. The greatest synergism was attained with 150 r.
KEYWORDS: X RADIATION;CARCINOGENESIS;ESTROGENS;SYNERGISM;MAMMARY GLANDS;BIOLOGICAL RADIATION EFFECTS;NEOPLASMS;RADIOINDUCTION;CARCINOGENS

<0340037>
TITLE: Synergistic Interaction of Hormones and Neutron Radiation on Mammary Gland Carcinogenesis
PROJECT NUMBER: Y01-CP-30213
PRINCIPAL INVESTIGATOR: Shellabarger, C.J.
ADDRESS: Brookhaven National Laboratory
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Page, Norbert P.;Taylor, D. James
TYPE OF FUNDING: Contract No.
77 FUNDING: National Cancer Inst. FY77:$119,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine if the synergistic interaction between x-irradiation and estrogen on mammary gland carcinogenesis in the female AxC rat can also be observed for neutron radiation; and to understand the mechanism of such synergism.
APPROACH: Because it has been reported that women exposed to repeated fluoroscopic examinations, women survivors of atomic bombings and possibly women treated with x-ray for acute postpartum mastitis, all have an increased risk of developing breast cancer, radiation exposure is now associated with breast cancer of the human female. This project is an attempt to develop an animal model, and to understand the model itself, so that the qualitative aspects of mammary carcinogenesis in man may be evaluated in terms of cause and prevention of breast cancer.
RESULTS: A synergistic interaction between diethylstilbestrol (DES) and x-rays on mammary adenocarcinoma formation in AxC female rats has been reported. This synergism was found to obtain also for DES and neutron radiation in AxC female rats. In female rats of the Sprague-Dawley strain, no such synergism was found. DES has been found to induce much higher levels of serum prolactin in AxC rats than in Sprague-Dawley rats. Thus prolactin is implicated in the synergistic interaction of DES and radiation on mammary adenocarcinoma formation. As the dose of DES is lowered in AxC rats synergism with radiation is delayed and may even be absent. Prolactin levels will be correlated with DES dose and carcinogenic response. When the time between neutron radiation and DES treatment is lengthened synergism of mammary adenocarcinoma formation is maintained suggesting that there is little or no recovery or repair of radiation injury.
KEYWORDS: NEUTRONS;ESTROGENS;SYNERGISM;BIOLOGICAL RADIATION EFFECTS;MAMMARY GLANDS;NEOPLASMS;RADIOINDUCTION;CARCINOGENESIS;CARCINOGENS;X RADIATION

<0340038>
TITLE: NCI-ERDA Carcinogenesis Program and Respiratory Carcinogenesis (Program 1)
PROJECT NUMBER: Y01-CP-50200-1
PRINCIPAL INVESTIGATOR: Griesemer, R.A.;Nettesheim, P.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Heim, Allen H.
TYPE OF FUNDING: Interagency agreement-NCI
77 FUNDING: National Cancer Inst. FY77:$760,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: PARTICULATES (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To analyze cocarcinogenic effects of physical and chemical agents in the induction of lung cancer. (2) Identification and study of those environmental agents (e.g., irritant gases and dusts, infectious microbes) which may increase the susceptibility of respiratory tissues to normally ineffective doses of carcinogen or which may alter the ''effective'' tumorigenic dose by affecting distribution, deposition and/or clearance of inhaled carcinogenic particulates. (3) To study host factors, which affect tumor induction and tumor progression. (4) To identify the major steps in the morphogenesis of lung cancer on the histological and cytological level. (5) To develop new experimental models for co-factor studies.
APPROACH: Epidemiologic data indicate a multifactorial etiology in human lung cancer. This work is a study, using animal models, of the role of inhaled chemicals and of physical and biological agents influencing the respiratory tract in the development of lung cancer. It is expected that this approach will help to define the decisive environmental and host factors in the pathogenesis of lung cancer.
RESULTS: An inhalation carcinogenesis study is underway to determine whether reactive gases produced during combustion of fossil fuels, namely nitrogen dioxide, formaldehyde, and acrolein, enhance the carcinogenic potency of benzo(a)pyrene given by intratracheal injection. The time relationship. Studies on clearance of benzo(a)pyrene attached to carbon particles from the respiratory tract were carried out using radioactively tagged carbon. It was found that, in vivo, the BaP is quickly eluted from the surface of small carbon particles (1 to 5 mu), but only very slowly from the surface of large carbon particles (20 mu). In the latter case, the carcinogen is cleared at the same rate as the carrier particles. This finding elucidates an important role of carrier particles in respiratory carcinogenesis studies.
KEYWORDS: LUNGS;CARCINOGENESIS;CARCINOGENS;DUSTS;GASES;MICROORGANISMS;EPIDEMIOLOGY;BENZOPYRENE;RESPIRATORY SYSTEM;LUNG CLEARANCE;NEOPLASMS;RESPIRATION

<034039>
TITLE: NCI-ERDA Carcinogenesis Program: DNA Repair Mechanisms in Chemical Carcinogenesis (Program 3)
PROJECT NUMBER: Y01-CP-50200-3
PRINCIPAL INVESTIGATOR: Griesemer, R.A.;Regan, J.D.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
MONITOR: Heim, Allen H.
TYPE OF FUNDING: Interagency agreement-NCI
77 FUNDING: National Cancer Inst. FY77:$113,200
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objectives are to define and characterize the various kinds of DNA repair that occur in human cells after treatment with representative carcinogens and metabolites of carcinogens, in an effort to understand the relationship between the lesions induced in DNA, their alteration by repair enzymes, and the ultimate consequences of these events.
APPROACH: In all experiments involving the treatment of cells or organisms with chemical carcinogens, repair of the lesions induced by the agents is a significant chemical event and should be investigated. It is conceivable that carcinogenesis may occur as a result of residual, i.e., unrepaired lesions, in the DNA. Thus it is most essential that there be, as an integrated part of this program, a laboratory working exclusively on DNA repair after treatment with chemical carcinogens.
RESULTS: Using the bromodeoxyuridine photolysis assay, two modes of DNA repair in human cells have been described; the short, or ionizing, type repair and the long, or UV, type repair. These two repair modes are observed in human cells after treatment with a variety of chemical carcinogens. In further experiments DNA damage and repair has been examined with 1,1-bis(phenyl)-2-proponyl-N-cyclohexylcarbamate and 1'acetoxy safrole. The diaryl carbamate is a long repair inducing agent with defective repair in xeroderma pigmentosum (X.P. cells). The safrole is a classical short repair agent, with repair patterns identical to normal and X.P. cells even at long time, i.e., 18 hours after treatment. The 4,5 epoxide of benzo(a)pyrene induces short repair while the non-K region, 7,8 epoxide, appears to induce cross links in DNA upon irradiation with the 313 nm light used in our assay. Further results suggest that while patch size may be similar for different carcinogens, some chemical agents may induce UV-endonuclease sensitive sites (and show defective repair in X.P. cells) while others do not.
KEYWORDS: DNA;BIOLOGICAL REPAIR;CARCINOGENESIS;ANIMAL CELLS;MAN;CARCINOGENS;XP CELLS;BENZOPYRENE;NEOPLASMS

<034041>
TITLE: Study of Polycyclic Hydrocarbon Metabolism
PROJECT NUMBER: N01CP33363 (Contract)
PRINCIPAL INVESTIGATOR: Ernster, L.
ADDRESS: Box 6409, Pack S-104 05, Stockholm 50, Sweden, XX
AFFILIATION: Stockholm Univ. (Sweden)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$360,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The basic objectives are to study: various properties of the aryl hydrocarbon hydroxylase enzyme system in rat lung tissue including the distribution of aryl hydrocarbon hydroxylase and the substrate and products of this enzyme system, subcellular localization, assay in homogenates and subcellular fractions, relation to the microsomal mixed function oxidase, general properties, products, inhibitors, and induction; characteristics of aryl hydrocarbon hydroxylase activity of human lung tissue; and the relationship between the properties of aryl hydrocarbon hydroxylase of lung tissue and carcinogenesis.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;RATS;LUNGS;BIOASSAY;ENZYMES;HYDROXYLASE;CARCINOGENS;HUMAN POPULATIONS;BIOLOGICAL EFFECTS;HEALTH HAZARDS

<034042>
TITLE: Study of Cancer Mortality
PROJECT NUMBER: N01CP33325 (Contract)
PRINCIPAL INVESTIGATOR: Schuman, L.M.
ADDRESS: 1325 Mayo Memorial, Minneapolis, MN 55455
AFFILIATION: Minnesota Univ., Minneapolis (USA). School of Public Health
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$46,900
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
PROJECT DESCRIPTION: The contract objectives are to study the relative role of host and environmental factors in determining the incidence of cancer and cardiorespiratory disease.
APPROACH: The contract with the University of Minnesota extends and complements ongoing work among the Norwegian-born in Norway and the United States, supported in part by Research Contract PH43-64-499 with the Cancer Registry of Norway, by collection of observations on U.S.-born offspring.
KEYWORDS: HUMAN POPULATIONS;NEOPLASMS;CARDIOVASCULAR DISEASES;RESPIRATORY SYSTEM DISEASES;EPIDEMIOLOGY;USA;NORWAY;ETIOLOGY

<034043>
TITLE: Bioassays of Environmental Carcinogenesis
PROJECT NUMBER: N01CP33278 (Contract)
PRINCIPAL INVESTIGATOR: Sparks, R.D.
ADDRESS: 42nd and Dewey Avenues, Omaha, NE 68105
AFFILIATION: Nebraska Univ., Omaha (USA). Coll. of Medicine
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$1,298,000
PROJECT DESCRIPTION: Scrutinize selected materials for possible environmental hazards.
APPROACH: Included is testing in various materials for carcinogenicity, and fundamentals studies in carcinogenesis. Selection of compounds for testing is jointly determined by NCI and the Epply Inst., and

testing capacity has been made available from time to time for compounds requiring urgent national attention. More fundamental studies are principally related to improve screening and testing methodologies but also include research in mechanisms of action and in the chemistry and pharmacology of metabolized carcinogens and related compounds.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;CARCINOGENS;METABOLISM;PHARMACOLOGY;BIOCHEMICAL REACTION KINETICS;BIOASSAY

<0340044>
TITLE: Study of Etiology of Cancer
PROJECT NUMBER: N01CP43240 (Contract)
PRINCIPAL INVESTIGATOR: Vernon, M.L.
ADDRESS: 4733 Bethesda Avenue, Bethesda, MD 20014
AFFILIATION: Microbiological Association, Inc., Bethesda, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$937,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Develop, evaluate, standardize, and apply in vitro systems for studying the effects of known and suspected carcinogens in the environment.
APPROACH: Define the events, with special emphasis on the role of endogenous type C RNA viral genomes, associated with activation of viruses in tissue culture by chemicals, DNA, viruses, or spontaneously, and characterization of endogenous viral isolates. Utilize cell systems to study potential anticancer products, including viral vaccines, viral inhibitors, interferons, etc. Utilize and adapt subhuman mammalian transformation and viral induction procedures to studies of human tumor and transformed cell lines for assaying suspected environmental carcinogens, and in efforts to detect and ''rescue'' human type C RNA viruses or viral genomes. Study the effect of viral vaccines, viral inhibitors, interferon, etc., on naturally occurring and chemically induced tumors. Study the role of the enzyme aryl hydrocarbon hydroxylase (AHH) in chemical carcinogenesis.
KEYWORDS: AIR POLLUTION;CARCINOGENS;ONCOGENIC VIRUSES;SYNERGISM;NEOPLASMS;ETIOLOGY;CARCINOGENESIS;IN VITRO

<0340045>
TITLE: Microsomal Enzyme Studies
PROJECT NUMBER: N01CP55606 (Contract)
PRINCIPAL INVESTIGATOR: Peisach, J.
ADDRESS: 1300 Morris Park Avenue, Bronx, NY 10461
AFFILIATION: Yeshiva Univ., New York (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Study the structural configurations as measured by the optical and EPR absorption changes, characteristics of low and high spin species of cytochrome P-450 induced by the administration of aryl hydrocarbons.
APPROACH: (1) Prepare a soluble cytochrome P-450 from rat liver microsomes obtained from animals treated with polycyclic hydrocarbons such as 3-methylcholanthrene. (2) Characterize the P-450 preparation optically and magnetically, and, using various biophysical probes, determine the chemical structure in the vicinity of the heme. (3) Assay the characterized material optically and magnetically in rat liver, in liver homogenates, and in liver microsomes, and correlate the arylhydrocarbon hydroxylase activity with the specific content of this particular cytochrome P-450. (4) Assay the same material in livers from other animals.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;BIOCHEMICAL REACTION KINETICS;CHEMICAL EFFLUENTS;CHEMICAL PROPERTIES;LIVER;CELL CONSTITUENTS;ENZYMES;CYTOCHROMES;ANIMAL CELLS

<0340046>
TITLE: Induce Aryl Hydrocarbon Hydroxylase in Human Lymphocytes
PROJECT NUMBER: N01CP65734 (Contract)
PRINCIPAL INVESTIGATOR: Kellerman, G.
ADDRESS: 307 N. Charter Street, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: (1) To continue the causes of variability in AHH activities revealed in five subjects during the previous reporting period. (2) To establish a monocyte cell culture system and compare results in this system with lymphocyte culture system used during the previous reporting period (30 donors, 3 samples each). (3) To compare AHH activity in vitro with oxidation rates of certain drugs in vivo in 30 human male subjects age 18 to 35. (4) To develop ways to improve culture quality for lymphocytes from lung cancer patients.
KEYWORDS: HYDROXYLASE;BIOSYNTHESIS;BIOCHEMICAL REACTION KINETICS;LYMPHOCYTES;CELL CULTURES;TUMOR CELLS;LUNGS

<0340047>
TITLE: Fetal Sensitivity to Intrauterine Radiation
PROJECT NUMBER: P01-CA-11489-080013
PRINCIPAL INVESTIGATOR: Lilienfeld, A.M.
ADDRESS: 615 N. Wolfe Street, Baltimore, MD 21205
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). School of Hygiene and Public Health
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst.
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: This project is part of a broader program (CA 11489-08) whose summary states: This grant supports a program of research including the following research projects: (1) prospective study of the

relationship of endocrine factors and other selected components of the serum to the development of cancers of different sites; (2) study of mortality and morbidity experience among workers in an arsenic plant; (3) study of mortality and morbidity experience among workers in a chromate plant; (4) epidemiological study of prostate cancer; (5) a retrospective study of brain tumors; (6) an epidemiological study of mortality emphasizing cancer of the cervix in the Amish and non-Amish populations of selected counties in Indiana and Ohio; and (7) study of breast cancer incidence among women with a history of infertility.
KEYWORDS: BIOLOGICAL RADIATION EFFECTS;FETUSES;RADIOSENSITIVITY;CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;ARSENIC;TOXICITY;PERSONNEL;EPIDEMIOLOGY;CHROMATES;NEOPLASMS;BRAIN;PROSTATE;MAMMARY GLANDS;UTERUS

<034048>
TITLE: Carcinogenesis Bioassay of Propylene
PROJECT NUMBER: Contract
PRINCIPAL INVESTIGATOR: Lindberg, D.
ADDRESS: 1601 Research Blvd., Rockville, MD 20850
AFFILIATION: Tracor, Inc., Rockville, Md. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst.
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Propylene (C50077 in the Carcinogenesis Bioassay Data System) will be tested for two years by inhalation in the Fischer 344 rat and the B6C3F1 mouse. Prechronic testing, already underway, will determine the maximum tolerated dose (MTD). During the chronic phase, 50 animals/species/sex/dose level will be exposed to the MTD and 1/2 MTD.
APPROACH: Controls will be pooled with those for two other chemicals being tested under the subcontract. Assignment of pooling partners has not yet been made. For each group of three chemicals, there will be a positive chemical control to test the species and strain for sensitivity to a known carcinogen--dimethylnitrosamine. Fifty animals/species/sex/dose level will be used in the positive chemical control test. All animals will be sacrificed at the end of the chronic test for histopathological evaluation; no clinical chemistry, teratogenesis, or mutagenesis evaluations will be undertaken.
KEYWORDS: RATS;PROPYLENE;BIOLOGICAL EFFECTS;CARCINOGENS

<034049>
TITLE: Carcinogenesis and Mutagenesis of Polycyclic Hydrocarbon
PROJECT NUMBER: N01CP75874 (Contract)
ADDRESS: 1629 K Street, NW, Washington, DC
AFFILIATION: Courtesy Associates, Inc., Washington, D.C. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$1,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: No summary has been provided to the Smithsonian Science Information Exchange.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;BIOLOGICAL EFFECTS;CARCINOGENESIS;MUTAGENESIS;NEOPLASMS;MUTATIONS;ETIOLOGY

<034050>
TITLE: Radiation Protection and Measurements
PROJECT NUMBER: R01-CA-18001-12
PRINCIPAL INVESTIGATOR: Ney, W.R.;Sinclair, W.K.;Wyckoff, H.O.;Taylor, L.S.
ADDRESS: 7910 Woodmont Avenue, Suite 1016, Bethesda, MD 20014
AFFILIATION: National Council on Radiation Protection and Measurements, Washington, D.C. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$45,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The National Council on Radiation Protection and Measurement (NCRP) and the International Commission on Radiation Units and Measurements (ICRU) seek to collect, analyze, develop, and disseminate information and recommendations on radiation protection and measurement.
APPROACH: After identification of an area in which NCRP or ICRU recommendations would constitute a significant contribution, the Council or the Commission initiates research aimed at (1) assessment of the available information which is pertinent to the problem; (2) identification of areas where more information is needed; and (3) synthesis of present knowledge relevant to the problem area into practical recommendations on radiation protection and measurement which also highlight areas in need of further study.
KEYWORDS: RADIATION PROTECTION;MAN;IRRADIATION;MEASURING METHODS;DATA COMPILATION;US NCRP;ICRU;RECOMMENDATIONS

<034051>
TITLE: Repair of Radiation-Induced Lesions in DNA
PROJECT NUMBER: R01-CA-02896-21
PRINCIPAL INVESTIGATOR: Smith, K.C.;Youngs, D.A.;Hamelin, C.;Barfknecht, T.R.
ADDRESS: School of Medicine, Palo Alto, CA 94305
AFFILIATION: Stanford Univ., Calif. (USA). School of Medicine
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$88,000
TECHNOLOGY: NUCLEAR/General (100%)
GY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
UTANTS: RADIATION (100%)
ECT DESCRIPTION: To extend our studies on the effects of ultraviolet (UV) radiation and x-rays upon the nucleic acids in vitro and in vivo; to elucidate the biochemical bases and genetic control of the multiple pathways of the repair of radiation damage in bacterial and mammalian cells; to study the interaction and/or overlap of these different repair pathways, their possible induction by radiation, their selective inhibition by drugs, and to determine which pathways are error free and which are error prone (i.e., mutagenic).

RESULTS: These studies will contribute to a better understanding of the molecular biology of DNA repair, of the mechanism of mutagenesis (and carcinogenesis), and may possibly indicate ways in which radiation can be even more effectively used in the treatment of cancer (e.g., by the selective chemical inhibition of repair).
KEYWORDS: X RADIATION;ULTRAVIOLET RADIATION;NUCLEIC ACIDS;CHEMICAL RADIATION EFFECTS;BIOLOGICAL RADIATION EFFECTS;IN VIVO;IN VITRO;BACTERIA;CELL CULTURES;ANIMAL CELLS;BIOCHEMICAL REACTION KINETICS;MOLECULAR BIOLOGY;DNA;STRAND BREAKS;BIOLOGICAL REPAIR;MUTAGENESIS;CARCINOGENESIS

<034052>
TITLE: Biological Aspects of Carcinogenesis by Radiation
PROJECT NUMBER: R01-CA-03352-21
PRINCIPAL INVESTIGATOR: Kaplan, H.S.;Lieberman, M.;Decleve, A.
ADDRESS: School of Medicine, Palo Alto, CA 94305
AFFILIATION: Stanford Univ., Calif. (USA). School of Medicine
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$90,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Further characterization of the endogenous C-type viruses of mice, especially the radiation leukemia virus (RadLV), a leukemogenic endogenous virus extractable from x-ray-induced thymic lymphomas of strain C57BL/Ka mice; studies of the factors which determine the inducibility, kinetics of replication, and host range of these viruses in vitro; and studies of the complex interactions among (1) external physical or chemical leukemogenic agents, (2) endogenous viruses, (3) the lymphoid cell populations which are the target cells for neoplastic transformation, and (4) the internal host environment, with special reference to the thymus and the immune system.
KEYWORDS: MICE;CARCINOGENESIS;RADIOINDUCTION;BIOLOGICAL RADIATION EFFECTS;ONCOGENIC VIRUSES;BIOLOGICAL EFFECTS;IMMUNE REACTIONS;HOST-CELL REACTIVATION;BIOCHEMICAL REACTION KINETICS

<034053>
TITLE: Effects of X-Rays on Normal and Malignant Cells
PROJECT NUMBER: R01-CA-04483-18
PRINCIPAL INVESTIGATOR: Tolmach, L.J.;Hawkins, R.B.;Jones, R.W.
ADDRESS: 660 S. Euclid Avenue, St. Louis, MO 63110
AFFILIATION: Washington Univ., St. Louis, Mo. (USA). School of Medicine
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$143,500
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Radiation-induced inhibition of cell growth and proliferation will be studied, with particular emphasis on the depressed rate of DNA synthesis in the cell generation during which cells are irradiated, and on the deficiency in amount of DNA that is replicated in the next generation.
APPROACH: HeLa S3 cells and 220 kV x-rays will be the main experimental materials. Treatment of irradiated cells with inhibitors of DNA synthesis and other compounds, which results in enhanced cell killing, will be studied in further analysis of x-ray-induced potentially lethal damage.
KEYWORDS: ANIMAL CELLS;BIOLOGICAL RADIATION EFFECTS;CELL PROLIFERATION;X RADIATION;CELL CULTURES;HELA CELLS;DNA;BIOSYNTHESIS;CELL KILLING

<034054>
TITLE: DNA Repair and Recovery in the Mammalian Cell Cycle
PROJECT NUMBER: R01-CA-04484-19
PRINCIPAL INVESTIGATOR: Humphrey, R.M.;Meyn, R.E.;Hewitt, R.R.
ADDRESS: P.O. Box 20036, Houston, TX 77030
AFFILIATION: Texas Univ., Houston (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$129,300
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
PROJECT DESCRIPTION: We propose an approach to studies of cell survival, mutagenesis, DNA replication, repair replication, and the assessment of DNA damage in mammalian cells as they relate to the cell cycle. Our objective is to compare these parameters and develop appropriate hypotheses concerning the relationships between the cell cycle and cellular responses to radiation and chemicals.
APPROACH: Specifically, we will compare the survival and mutagenic responses as a function of the cell cycle phase in response to UVL, UVL-like chemicals, x-rays, and x-ray-like chemicals; determine the cell cycle dependence of radiation and chemical DNA-damage recognized by damage specific enzymes; and investigate ultraviolet light-irradiated G1-phase cells for UVL-specific DNA synthesis that may be involved in the bypass of DNA damage and to compare the UVL-specific synthesis with that induced by selected chemicals.
KEYWORDS: ANIMAL CELLS;CELL CYCLE;SURVIVAL TIME;DNA REPLICATION;MUTAGENS;X RADIATION;ULTRAVIOLET RADIATION;DNA;STRAND BREAKS;BIOLOGICAL REPAIR;ENZYMES;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL RADIATION EFFECTS;CELL CULTURES;RESPONSE MODIFYING FACTORS;RADIOSENSITIVITY EFFECTS;BIOLOGICAL EFFECTS;MUTAGENS

<034055>
TITLE: Response of Pigment Cells to X- and UV-Radiations
PROJECT NUMBER: R01-CA-06097-15S1
PRINCIPAL INVESTIGATOR: Quevedo, W.C.
ADDRESS: University Hall, Box 1867, Providence, RI 02912
AFFILIATION: Brown Univ., Providence, R.I. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$12,200
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The proposed project is directed at determining the extent to which the responses of mammalian pigment cells to UV- and x-radiations arise from direct modification of the irradiated cell or

are dependent on events initiated within the particular cellular community of which it is a part.
APPROACH: The problem of pigment cell niche and radiosensitivity is examined and is subjected to experimental analysis. The significance of melanin pigment as a radioprotective agent is evaluated in the case of epidermal melanocytes. Particular emphasis is placed on determining the consequences of the proposal that the epidermal melanin unit, consisting of a melanocyte together with its constellation of associated epidermal cells (keratinocytes), is the fundamental integrated unit of pigmentary function in the epidermis of vertebrates. The functional and morphological properties of the epidermal melanin unit are examined in the skin of vertebrates representative of each of the major classes. Particular attention is given to the roles that genes and hormones play in modifying the responses of mammalian melanocytes to ionizing and ultraviolet radiations. The cellular basis for radiation-induced changes in melanocyte populations and the nature of cellular interactions during pigmentation of skin and hair are also examined.
KEYWORDS: ANIMAL CELLS;CELL CULTURES;RADIOSENSITIVITY;PIGMENTS;RESPONSE MODIFYING FACTORS;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL RADIATION EFFECTS;MELANIN;RADIOSENSITIVITY EFFECTS;ULTRAVIOLET RADIATION;X RADIATION

<034056>
TITLE: Synthesis of Carcinogenic Compounds
PROJECT NUMBER: R01-CA-07394-13
PRINCIPAL INVESTIGATOR: Newman, M.S.
ADDRESS: 164 W. 17th Avenue, 102 Administration Building, Columbus, OH 43210
AFFILIATION: Ohio State Univ., Columbus (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$52,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The purpose of this research is to prepare oxygenated derivatives of 7,12-Dimenthylbenz(a)anthracene, DMBA, to aid in the identification of metabolic products of DMBA which might be important in finding out what role DMBA plays in the initiation of cancer.
APPROACH: The 1-, 2-, 3-, 4-, 8-, 9-, 10-, and 11-hydroxy derivatives of DMBA are the primary targets. Each may exist as the corresponding keto derivatives. The relative reactivity of these keto forms will be assessed as they may be involved in reactions with DNA or proteins. We also hope to make selected derivatives of methylcholanthrene to learn how similar its metabolism might be to that of DMBA. Sufficient of all of the compounds envisioned are to be made so that interested investigators may obtain samples for their research.
KEYWORDS: ANTHRACENE;CHEMICAL EFFLUENTS;OXYGEN;CHEMICAL PREPARATION;CARCINOGENS;KETO ACIDS;CHEMICAL REACTIONS;PROTEINS;DNA;BIOCHEMICAL REACTION KINETICS;METABOLISM

<034057>
TITLE: Radiobiology Research Program
PROJECT NUMBER: R01-CA-08231-13
PRINCIPAL INVESTIGATOR: Conger, A.D.
ADDRESS: 3223 N. Broad Street, Philadelphia, PA 19122
AFFILIATION: Temple Univ., Philadelphia, Pa. (USA). School of Medicine
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$35,800
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Genome size (amount of chromosomal protein plus DNA, per cell) and radiosensitivity for mutation induction and for cell killing will be measured in different species and in different tumor cell culture lines, and correlations tested. Genome size is a good predictor of relative radiosensitivity.
APPROACH: Several human and animal tumor cell lines of different radiosensitivities will be examined for their genome size and cytological characteristics, to see if these differences account for their different sensitivities. The same tumor lines will also be grown in tissue culture as solid microsphere colonies, to test the effect of solid vs. single-cell growth on radiosensitivity. Microsphere colonies simulate in vivo solid tumors.
KEYWORDS: ANIMAL CELLS;RADIOSENSITIVITY;RESPONSE MODIFYING FACTORS;CYTOLOGY;CHROMOSOMES;CHEMICAL COMPOSITION;PROTEINS;DNA;CELL CULTURES;GENETIC VARIABILITY;RADIOBIOLOGY;TUMOR CELLS;GENOTYPE

<034058>
TITLE: Radiation Effect of Protein and Nucleic Acid Metabolism
PROJECT NUMBER: R01-CA-08318-09
PRINCIPAL INVESTIGATOR: Yatvin, M.B.;Goldin, E.M.
ADDRESS: 307 N. Charter Street, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$41,500
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: We are extending our studies in the whole animal on the action of ionizing radiation on nucleic acid metabolism in tissue.
APPROACH: To minimize the physiological perturbations which are operative in such experiments and to enable us to better interpret such data, we have enlarged our program to include tissue culture experiments.
RESULTS: It is hoped that such studies will lead to a better understanding for how radiation interferes with cell function and results in cell death.
KEYWORDS: ANIMALS;BIOLOGICAL RADIATION EFFECTS;NUCLEIC ACIDS;PROTEINS;METABOLISM;TISSUE CULTURES;TESTING;CELL KILLING;RADIOBIOLOGY

<034059>
TITLE: Effect of Chemical Carcinogens on Cells in Vitro
PROJECT NUMBER: R01-CA-08936-10A1
PRINCIPAL INVESTIGATOR: Diamond, L.;Baird, W.
ADDRESS: 36th and Spruce Streets, Philadelphia, PA 19104
AFFILIATION: Wistar Inst. of Anatomy and Biology, Philadelphia, Pa. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$143,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The objective of this proposal is to gain some understanding of the mechanisms of hydrocarbon-induced carcinogenesis by measuring in a model system, hamster embryo cell cultures, specific biological changes produced by the hydrocarbons and the various aspects of cell-carcinogen interaction that led to these changes.
APPROACH: The levels of aryl hydrocarbon hydroxylase activity, the extent of hydrocarbon metabolism, the metabolite profiles, and the amounts and types of hydrocarbon DNA-bound products, under different experimental conditions, will be compared to the frequencies of hydrocarbon-induced transformation, mutation and cytotoxicity.
RESULTS: Those aspects of cell-carcinogen interaction that are related to the induction of each of the biological effects in these cells will be defined.
KEYWORDS: CELL CULTURES;HYDROCARBONS;BIOLOGICAL EFFECTS;CARCINOGENS;ANIMAL CELLS;BIOCHEMICAL REACTION KINETICS;ENZYMES;METABOLISM;DNA;CHEMICAL BONDS;TOXICITY;MUTAGENESIS;CARCINOGENESIS

<034060>
TITLE: Effects of Radiation on Stationary Cells
PROJECT NUMBER: R01-CA-11751-08
PRINCIPAL INVESTIGATOR: Little, J.B.;Williams, J.R.;Selsky, C.A.;Nagasawa, H.
ADDRESS: 55 Shattuck St., Boston, MA 02115
AFFILIATION: Harvard Univ., Boston, Mass. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$131,600
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The long-term goal of this research is to gain knowledge about mechanisms which determine the radiosensitivity of mammalian cells, particularly those involved in the response of stationary or very slowly proliferating cells to x-irradiation.
APPROACH: We will utilize density-inhibited plateau phase cultures of several different cell strains including 10T-1/2 mouse embryo cells, human diploid cells and human tumor cells. Three endpoints will be studied in parallel: cell survival; malignant transformation in vitro; and mutation rate. We will investigate the relationships between these cellular effects and try to correlate them with molecular DNA repair processes.
RESULTS: Understand and correlate events such as repair at the molecular level with cellular effects such as survival and malignant transformation.
KEYWORDS: ANIMAL CELLS;RADIOSENSITIVITY;X RADIATION;RESPONSE MODIFYING FACTORS;CELL CYCLE;CELL CULTURES;EMBRYOS;MICE;TUMOR CELLS;DIPLOIDY;SURVIVAL TIME;RADIOBIOLOGY

<034061>
TITLE: Unsaturated Polyolefins and Hydrocarbon Carcinogenesis
PROJECT NUMBER: R01-CA-12115-07
PRINCIPAL INVESTIGATOR: Paquette, L.A.;Liotta, D.;Wallis, T.G.;Burson, R.L.;Fristad, W.E.;Park, H.
ADDRESS: 164 W. 17th Ave., 102 Administration Bldg., Columbus, OH 43210
AFFILIATION: Ohio State Univ., Columbus (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$74,300
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The project is geared to providing fundamental information as to whether such structural modifications of polycyclic aromatic hydrocarbons as perturbed delocalization, three-dimensional characteristics, and other electronic features are crucial to maintenance of carcinogenic reactivity.
APPROACH: Certain benzenoid hydrocarbons and heterocycles are known to be potent carcinogens. This proposal describes the synthesis of new types of potentially delocalized nonbenzenoid systems which have in common the size, shape, and reactivity conceivably necessary for carcinogenic reactivity. Knowledge of the reactivity and carcinogenicity of these inherently novel molecules is important because of the possible insight which may be gained into the chemical basis for carcinogenesis. Specifically, the target compounds are in certain cases expected to possess homoaromatic character, in other cases to exhibit rapid valence tautomerism, and in still other instances to possess fixed double bonds. Accordingly, a wide range of structural types are to be made available. All stable target compounds prepared in this work are to be evaluated for possible carcinogenicity.
RESULTS: Synthesis of the parent target molecules has been successfully achieved. However, it has proven to be unstable in air, decomposing readily to a tarry substance. Attention was then directed to substituted derivatives and especially to benzo fused analogs in an effort to enhance stability. The syntheses of two benzolcgs are nearing completion.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;CARCINOGENS;CHEMICAL PREPARATION

<034062>
TITLE: Induction of Leukemia in Rodents by Radiation
PROJECT NUMBER: R01-CA-12944-06
PRINCIPAL INVESTIGATOR: Warren, S.;Gates, O.;Brown, C.E.
ADDRESS: 185 Pilgrim Rd., Boston, MA 02215
AFFILIATION: New England Deaconess Hospital, Boston, Mass. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$45,900
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)

POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Observation of the rats irradiated at dose levels in the 50 to 400 R range is being continued. Data are being compiled from a series of mice irradiated in similar dose ranges.
KEYWORDS: RATS;BIOLOGICAL RADIATION EFFECTS;MICE;RADIATION DOSES;DOSE-RESPONSE RELATIONSHIPS;LEUKEMIA;RADIOINDUCTION

<034063>
TITLE: Potential Carcinogenic and Genetic Effects of Tritium
PROJECT NUMBER: R01-CA-13080-06
PRINCIPAL INVESTIGATOR: Mewissen, D.J.;Rust, J.H.;Furedi, M.;Ugarte, S.
ADDRESS: 5801 S. Ellis Ave., Chicago, IL 60637
AFFILIATION: Chicago Univ., Ill. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$120,400
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: This research is aimed at assessing comparatively the potential carcinogenic potency of tritiated water versus tritiated DNA, RNA and protein precursors, namely thymidine, uridine, or leucine, in relation to their specific patterns and sites of incorporation in C57 Black/6N mice.
APPROACH: For this purpose the basic (spontaneous) tumor spectrum in control animals will be defined as a multiple competitive tumor model, from which the variation in the tumor spectra possibly associated with exposure to various tritiated compounds will be evaluated, both quantitatively and qualitatively. In addition, it is planned to investigate the potential cumulative genetic injury resulting from exposure of male mice to tritiated water or tritiated thymidine, prior to sibling mating, during 25 successive generations. The incorporation patterns of tritiated precursors of DNA, RNA and proteins versus tritiated water in selected target organs have been investigated, in an attempt to correlate the possibly induced tumor spectra with various sites of tritium incorporation.
KEYWORDS: TRITIUM;MICE;BIOLOGICAL RADIATION EFFECTS;NEOPLASMS;RADIOINDUCTION;CHRONIC IRRADIATION;INTERNAL IRRADIATION;LABELLED COMPOUNDS;TISSUE DISTRIBUTION;DOSE-RESPONSE RELATIONSHIPS;GENETIC RADIATION EFFECTS;MUTAGENESIS;THYMIDINE;DNA;RNA;PROTEINS

<034064>
TITLE: Radiation Injury in Subpopulations of Lymphocytes
PROJECT NUMBER: R01-CA-13005-05
PRINCIPAL INVESTIGATOR: Anderson, R.E.;Scaletti, J.V.;Standefer, J.C.
ADDRESS: University Hill NE, Albuquerque, NM 87106
AFFILIATION: New Mexico Univ., Albuquerque (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$37,700
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The purpose of this project is twofold: expand observations on the radiosensitivity of defined populations of lymphocytes; and define the physical-chemical basis of these differences in radiosensitivity and thereby gain a better understanding of the pathogenesis of radiation-induced interphase death of lymphocytes.
KEYWORDS: LYMPHOCYTES;RADIOSENSITIVITY;CELL KILLING;RADIOINDUCTION;BIOCHEMICAL REACTION KINETICS;RADIOBIOLOGY

<034065>
TITLE: Radiation In Vitro and Mammary Cell Survival and Neoplasia
PROJECT NUMBER: R01-CA-13881-05
PRINCIPAL INVESTIGATOR: Clifton, K.H.;Sridharan, B.N.;Gould, M.N.
ADDRESS: 307 N. Charter St., Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$124,400
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The goal of this project is to gain quantitative information on the number, nature, and acute radiation response of the cells involved in initiation of the neoplastic process which leads to mammary tumors following exposure of mammary cells to ionizing radiation in vitro, and how this process is related to the type of radiation, the dose, and the hormonal exposure of the cells before and after irradiation.
APPROACH: The project is divided into short-term studies devoted to development and application of a radiation dose-mammary cell survival assay, and to long-term carcinogenesis experiments. The former will be based on grafting of monodispersed mammary cell suspensions into the mammary tissue-free fat pads of rats which are primed with injected hormones and/or grafted with mammotropin-secreting pituitary tumors. Long-term studies will involve irradiation of mammary cell suspensions in vitro, which will then be grafted in similar animals and observed for tumor development. By these methods we hope to: (1) determine the total number of cells of the type from which the malignancy is derived and which survive exposure; (2) minimize the abscopal effects of irradiation; and (3) develop a system in which both physical and hormonal factors can be manipulated, before and after exposure, for study of cell survival, repair and neoplasia in a quantitative fashion.
KEYWORDS: MAMMARY GLANDS;ANIMAL CELLS;NEOPLASMS;BIOLOGICAL RADIATION EFFECTS;DOSE-RESPONSE RELATIONSHIPS;CARCINOGENESIS;BIOLOGICAL MODELS

<034066>
TITLE: Inhibition of Chemical Carcinogenesis
PROJECT NUMBER: R01-CA-14146-05
PRINCIPAL INVESTIGATOR: Wattenberg, L.W.
ADDRESS: 1305 Mayo, Minneapolis, MN 55455
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (100%)

ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The ultimate goal of this program is to obtain data which can be used to evaluate the present or potential role of inhibitors of environmental chemical carcinogens.
APPROACH: The first part of this renewal is a continuation of efforts at determining the mechanism of inhibition of polycyclic hydrocarbon carcinogenesis by antioxidants. The mechanism by which butylated hydroxyanisole (BHA) causes decreased binding of benzo(a)pyrene (BP) metabolites to DNA in a microsomal system (previously observed) will be studied. BP metabolite patterns produced by incubation of BP with microsomes from normal and BHA fed mice will be determined as will be the activities of enzyme reactions potentially affecting these metabolite patterns.
RESULTS: This consists of efforts at demonstrating a direct interaction of BHA with BP metabolites. The second part of the proposal will be aimed at inhibiting carcinogenesis due to malonaldehyde and glycialdehyde.
KEYWORDS: CARCINOGENESIS;BIOLOGICAL MODELS;CHEMICAL EFFLUENTS;INHIBITION;BENZOPYRENE;METABOLISM;BIOCHEMICAL REACTION KINETICS;POLYCYCLIC AROMATIC HYDROCARBONS;TOXICITY;ALDEHYDES;CARCINOGENS;SACCHARIDES

<034067>
TITLE: Immune Surveillance in Radiation Carcinogenesis
PROJECT NUMBER: R01-CA-14270-05
PRINCIPAL INVESTIGATOR: Anderson, R.E.;Troup, G.M.;Howarth, J.L.
ADDRESS: University Hill NE, Albuquerque, NM 87106
AFFILIATION: New Mexico Univ., Albuquerque (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$22,800
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The purpose of the present proposal is threefold: (1) to investigate the effect of neonatal and adult thymectomy on the prevalence of spontaneous and radiation-related tumors in germfree and conventional mice; (2) to determine if the tumorigenic effects of radiation can be modified via reconstitution with defined populations of lymphocytes post-exposure; suppressor and helpter T cells are of particular interest in this regard; and (3) to correlate the above with the immune status of the host, particularly with respect to the number of recirculating thymic-dependent small lymphocytes mobilizable via thoracic duct cannulation.
KEYWORDS: NEOPLASMS;CARCINOGENESIS;BIOLOGICAL MODELS;RADIOIMMUNOLOGY;BIOLOGICAL RADIATION EFFECTS;IMMUNITY;IRRADIATION;THYMECTOMY;MEDICAL SURVEILLANCE;RADIOINDUCTION

<034068>
TITLE: Tritium Damaged Mammalian Cells In Vitro
PROJECT NUMBER: R01-CA-14310-05
PRINCIPAL INVESTIGATOR: Burki, H.J.
ADDRESS: School of Letters and Science, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$56,600
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: These experiments are designed to further explore regions within the mammalian cell nucleus where isotopic decay appears to be most critical in the induction of reproductive death and chromosome damage.
APPROACH: Mouse leukemic cells (L5178Y), human cells (HeLa), and several types of Chinese hamster cells from different tissue sources (V79 lung, M3-1 bone marrow, CHO ovary), will be labeled with precursors of DNA containing tritium, C14, and I125, or tritiated precursors of protein and RNA. After being synchronized by various methods, these cells will then be cooled to 4 degrees C or frozen to -196 degrees C to accumulate damage due to tritium and other isotope disintegration. After suitable time intervals the cells will be thawed out and the reproductive ability and chromosome damage will be determined. The efficiency of cellular inactivation and induction of genetic damage will be compared for damage accumulated in various subcellular regions.
RESULTS: The results of these studies may provide information of two general types: (1) information on the basic mechanisms which lead to the inactivation of proliferative ability of mammalian cells and the induction of chromosome aberrations, and (2) quantitative estimates of the relative hazards to the population from environmental tritium released to the biosphere as a by-product of nuclear power production.
KEYWORDS: ANIMAL CELLS;TRITIUM;CHROMOSOMAL ABERRATIONS;BIOCHEMICAL REACTION KINETICS;NUCLEAR ENERGY;HEALTH HAZARDS;RADIOACTIVE EFFLUENTS;BIOLOGICAL RADIATION EFFECTS;REPRODUCTION;LABELLED COMPOUNDS

<034069>
TITLE: Acidic Chromatin Proteins and Carcinogens
PROJECT NUMBER: R01-CA-14920-05
PRINCIPAL INVESTIGATOR: Spelsberg, T.C.;Moses, H.L.;Zytkovicz, T.
ADDRESS: 200 1st Street SW, Rochester, MN 55901
AFFILIATION: Minnesota Univ., Rochester (USA). Mayo Graduate School of Medicine
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$56,700
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: It is planned to more thoroughly ascertain the specificity of this binding site for carcinogenic compounds, to determine whether or not these sites are present in cells which are resistant to transformation, to determine whether or not these specific sites are found in certain organs of mice, to isolate and characterize the chromosomal component to which these carcinogens are bound, and to ascertain the exact structure of metabolites of the parent hydrocarbons which are bound to the chromosomal material.
APPROACH: These latter studies will be undertaken using high speed liquid chromatography and mass

spectrometry. Emphasis are being placed on the possible similarities or dissimilarities that methyl-cholanthrene and benzo(a)pyrene have with steroid hormones with respect to cytoplasmic receptors, igration to the nucleus, and binding to chromatin.
ORDS: PROTEINS;CARCINOGENESIS;CHROMOSOMAL ABERRATIONS;BIOLOGICAL MODELS;CARCINOGENS;POLYCYCLIC AROMATIC YDROCARBONS;METABOLISM;BENZOPYRENE;CHROMATIN;CHOLANTHRENE;MICE

<034070>
TITLE: Hydrocarbon-Induced Malignant Transformation In Vitro
PROJECT NUMBER: R01-CA-15205-04
PRINCIPAL INVESTIGATOR: Marquardt, H.W.
ADDRESS: 410 E. 68th Street, New York, NY 10021
AFFILIATION: Sloan-Kettering Inst. for Cancer Research, New York (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$23,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Mechanisms involved in hydrocarbon-induced malignant transformation will be studied in an in vitro model system for chemical carcinogenesis which employs fibroblasts from mouse prostate.
APPROACH: Our studies on the metabolic activation of polycyclic aromatic hydrocarbons will be continued, especially the biologic activity of diol-epoxides will be investigated: recent findings suggest such derivatives to be ultimate carcinogens in the case of some, if not all, hydrocarbons. Our studies on the binding of hydrocarbons and their derivatives to DNA and on the capacity of these compounds to induce DNA-repair will be continued. Our studies led us to suggest that reverse transcriptase may play a role in chemical transformation, too; we will continue to study the effect of inhibitors of this enzyme activity on chemically induced transformation and to investigate whether the activity of this enzyme changes during the course of transformation-induction. Moreover, we will further explore the suitability of our in vitro model system to predict the oncogenic potential of environmental chemicals. For instance, in such an effort we had seen that the radical-scavenger, cysteamine, inhibits tumorigenesis in vivo and malignant transformation in vitro induced by chemicals, and we had observed a good correlation between in vivo tumorigenesis and in vitro oncogenesis with the anthracycline antitumor antibiotics, adriamycin and daunomycin.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;MICE;BIOLOGICAL MODELS;BIOCHEMICAL REACTION KINETICS;CARCINOGENS;DNA;IN VITRO;CARCINOGENESIS;MEA;ANTIBIOTICS;DRUGS;ANTIMITOTIC DRUGS;MUTAGENS

<034071>
TITLE: Radiation-Induced Modifications in Protein Synthesis
PROJECT NUMBER: R01-CA-15378-04
PRINCIPAL INVESTIGATOR: Oleinick, N.L.;Biaglow, J.E.
ADDRESS: 2109 Adelbert Road, Cleveland, OH 44106
AFFILIATION: Case Western Reserve Univ., Cleveland, Ohio (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$96,900
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The objectives of the proposed research are to relate (a) the molecular damage produced by ionizing radiation in DNA to the impairment of function of the DNA, and (b) the removal of that damage and the subsequent recovery of functions to metabolic repair systems dependent upon protein synthesis.
APPROACH: We have already determined that rRNA synthesis is inhibited by gamma-radiation and subsequently recovers. The rDNA will be isolated from the irradiated cells during and after the period of inhibition, and strand-breaks, alkali-labile sites, enzyme-sensitive sites, and base damage measured. The kinetics of the repair or removal of each type of damage will be determined and compared to the kinetics of transcription, processing, and transport of rRNA.
RESULTS: A detailed understanding of these radiation-induced modifications in transcription and translation should provide a conceptual framework for evaluating the roles of protein synthesis in the induction of and/or recovery from mitotic delay, chromosome aberrations, premutational damage, and sublethal and potentially lethal damage, and for manipulating the radiation sensitivity of normal and cancerous cells in order to enhance or prevent radiation damage and improve the treatment of human tumors.
KEYWORDS: PROTEINS;BIOSYNTHESIS;BIOLOGICAL RADIATION EFFECTS;DNA;GAMMA RADIATION;BIOLOGICAL REPAIR;BIOCHEMICAL REACTION KINETICS;CHROMOSOMAL ABERRATIONS;MUTANTS;CARCINOGENESIS;BIOLOGICAL MODELS;RADIOSENSITIVITY

<034072>
TITLE: Inhibition of Initiation-Promotion Carcinogenesis
PROJECT NUMBER: R01-CA-15890-03
PRINCIPAL INVESTIGATOR: Neeman, M.;Bock, F.G.
ADDRESS: 666 Elm Street, Buffalo, NY 14203
AFFILIATION: Roswell Park Memorial Inst., Buffalo, N.Y. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The overall objective of the proposed research is to develop new inhibitors for tumor promotion to serve as tools in studies of the mechanism of the initiation-promotion sequence.
APPROACH: Anti-inflammatory compounds will be studied as potential inhibitors of carcinogenesis initiated in mouse skin by 7, 12-dimethylbenz(a)anthracene (DMBA) and promoted by 12-O-tetradecanoyl-phorbol-13-acetate (TPA). Among the anti-inflammatory agents to be bioassayed are to be included nonsteroidal compounds. Phorbol 12,13-diesters will be modified by synthesis of esters potentially capable of covalent bonding ith cellular macromolecules.
ORDS: NEOPLASMS;INHIBITION;MICE;SKIN;CARCINOGENESIS;BIOLOGICAL MODELS;ESTERS;BIOASSAY;POLYCYCLIC AROMATIC nYDROCARBONS;BIOCHEMICAL REACTION KINETICS

<034073>
TITLE: Mutants and Altered Radioresponse of Cells and Tumors
PROJECT NUMBER: R01-CA-15901-04
PRINCIPAL INVESTIGATOR: Gregg, E.C.;Nygaard, O.F.;Rustad, R.C.;Biaglow, J.E.;Rosenberg, H.M.;Yau, T.M.;Adams, R.B.;Robinson, J.K.;Voelker, W.H.;Kim, S.C.
ADDRESS: 2109 Adelbert Road, Cleveland, OH 44106
AFFILIATION: Case Western Reserve Univ., Cleveland, Ohio (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$126,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Our objectives are several fold: (1) To produce radiation resistant mutants from a stable strain of mammalian cells growing in various environments of radiation and in combination with various carcinogens and chemotherapeutic agents. Radiations of differing LET are also to be used. (2) To quantitate the overall mutation rate for radiation resistance as a function of LET and dose rate including the simulation of a fractionated radiation therapy regimen. (3) To elicit the basic mechanism of the induction of mutants by radiation and to investigate the possibility of synergism with other mutagenic agents. (4) To identify, describe and assess biochemical, biophysical and cytological differences between the mutants and the parent strain.
RESULTS: The attainment of these primary objectives will sharply extend our understanding of radiation resistance and perhaps lead to new radiation modifiers in cancer radiotherapy. Further, quantitative information on the production of radioresistant mutants as a function of dose delivery could lead to new fractionation schedules designed to minimize radioresistant tumor regrowth during and after therapy. Lastly, quantitation of mutation rates due to radiation in conjunction with other agents could have impact in both radiotherapy and regulation of environmental contaminants.
KEYWORDS: MUTANTS;RADIOSENSITIVITY;ANIMAL CELLS;SYNTHESIS;CHEMICAL PREPARATION;CHEMOTHERAPY;BIOLOGICAL RADIATION EFFECTS;SYNERGISM;CARCINOGENS;NEOPLASMS;RADIOTHERAPY;SIMULATION;MUTAGENESIS;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL MODELS;CHEMICAL EFFLUENTS

<034074>
TITLE: Cytochrome P450, Chemical Carcinogenesis Benzo(a)pyrene
PROJECT NUMBER: R01-CA-16265-03
PRINCIPAL INVESTIGATOR: Jefcoate, C.R.;Shinnick, F.;Fahl, W.E.;Wrighton, S.A.
ADDRESS: 307 N. Charter Street, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$41,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The project will focus on the biochemical mechanisms which determine the combination of benzo(a)pyrene metabolites with cellular DNA and which lead to gene mutations.
APPROACH: The metabolism of benzo(a)pyrene will be studied in liposomes reconstituted from purified P450 cytochromes, P450 reductase, oxide-hydrase and selected lipids, with rat liver microsomes or nuclear envelope after induction by various agents. The biophysical characteristics, particularly fluidity, of these membrane preparations will be investigated and related to benzo(a)pyrene metabolism. The conjugation of benzo(a)pyrene metabolites with various DNA molecules will be examined in these systems. Analytical techniques will be established to identify and quantitate nucleoside-metabolite conjugates obtained by hydrolysis of metabolite-modified DNA. The production of benzo(a)pyrene metabolites and the formation of metabolite nucleoside conjugates will be examined in isolated nuclei and whole cells from rat liver and lung. The modification of DNA in these systems will be examined in terms of parental DNA, newly synthesized DNA, euchromatin, heterochromatin and the production of DNA breaks. These parameters will be examined to explain the sensitivity of lung cells but not hepatocytes to oncogenic transformation by benzo(a)pyrene.
KEYWORDS:
BENZOPYRENE;CARCINOGENS;CARCINOGENESIS;METABOLISM;DNA;MUTAGENESIS;RATS;LIVER;LUNGS;PHYSIOLOGY;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL MODELS

<034075>
TITLE: Repair and Survival in Irradiated Cells
PROJECT NUMBER: R 01 CA 16579-03
PRINCIPAL INVESTIGATOR: Yatvin, M.B.;Gipp, J.;Hafeman, D.;Sacks, H.
ADDRESS: 307 N. Charter Street, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$29,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The aim of this proposal is to resolve, if possible, the discrepancies between biophysical and biochemical evidence of repair and ultimate survival in irradiated cells.
APPROACH: Because of its unique role in controlling cell function, many recent studies have focused on DNA and the results of alkaline sucrose gradient analysis of DNA from irradiated cells. These studies have been interpreted to indicate that there is extensive repair of single strand breaks. Recent experiments in our laboratory suggest that alternative mechanisms may play an important role. Because of the close association between DNA and the plasma membrane in E. coli, preliminary studies of bacterial cell membrane changes after irradiation will be extended. Studies on the effect of radiation on cell membranes may have relevance to the clinical treatment of malignant disease in that they may provide a better rationale for the use of combined radiation and chemotherapy.
KEYWORDS: ANIMAL CELLS;BIOLOGICAL REPAIR;IRRADIATION;BIOCHEMICAL REACTION KINETICS;DNA;ESCHERICHIA COLI;CELL MEMBRANES;RADIOTHERAPY;CHEMOTHERAPY

<034076>
TITLE: Intermolecular Cross-Links in Chemical Tumorigenesis
PROJECT NUMBER: R01 CA 16989-03
PRINCIPAL INVESTIGATOR: Kubinski, H.A.;Morin, N.M.;Kubinski, Z.U.
ADDRESS: 307 N. Charter Street, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$27,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
PROJECT DESCRIPTION: We plan to study the effects of carcinogenic chemicals on DNA and RNA in living cells and in particular to test for the formation of similar complexes in vivo and to study means of elimination of such structures from the injured tissue. In parallel, our present studies on the effects of carcinogens on biologically active (transforming) DNA will be continued. We also plan further practical applications of our observations on the increased cellular attachment of nucleic acids exposed to carcinogens and mutagens. Our survey of several agents suggests that this technique may be used as a very simple and inexpensive means of detection of carcinogenic agents in our environment.
KEYWORDS: CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL MODELS;DNA;PROTEINS;ALKYLATING AGENTS;RNA;CARCINOGENS;TOXICITY;METABOLISM;BIOLOGICAL REPAIR;MUTAGENS;CHROMIUM COMPOUNDS;BERYLLIUM COMPOUNDS;SALTS;ULTRAVIOLET RADIATION;CHEMICAL EFFLUENTS;LIVER;CROSS-LINKING

<034077>
TITLE: Mutagenic Action of Cancer Therapy on Testis Cells
PROJECT NUMBER: R01 CA 17364-03
PRINCIPAL INVESTIGATOR: Meistrich, M.L.;Brock, W.A.;Lu, C.
ADDRESS: P.O. Box 20036, Houston, TX 77030
AFFILIATION: Texas Univ., Houston (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$42,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
PROJECT DESCRIPTION: The ultimate objectives of this study are, using mice treated with radiation and mutagenic chemicals, to (1) understand the biochemical mechanisms underlying mutagenesis, and (2) quantitate survival of testicular stem cells and its relation to fertility in order to extrapolate these data to man.
APPROACH: The effects of mutagens, such as radiation or chemotherapeutic agents, on the survival of spermatogenic cells of mouse testes and the damage produced in their DNA will be studied. Biochemical alterations in testicular cell DNA produced by mutagen treatment will be assayed in cells at each stage of spermatogenesis. The different stages can be studied by separation of cells and nuclei from the testis using velocity sedimentation and equilibrium density centrifugation. In addition, effects on cells at different stages may be studied by analyzing the DNA of sperm collected from the epididymis at various times after treatment. Direct damage to the DNA and repair will be assayed by measuring strand breaks, alkaline-labile bonds and endonuclease-sensitive sites by sucrose gradient centrifugation. Alterations of the DNA content of individual cells can be measured by flow microfluorometry.
KEYWORDS: CHEMOTHERAPY;RADIOTHERAPY;MICE;TESTES;DNA;SPERMATOGENESIS;SPERMATOZOA;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL RADIATION EFFECTS

<034078>
TITLE: Carcinogenesis, Mutagenesis, and Photo-Labeling of DNA
PROJECT NUMBER: R01 CA 17394-03
PRINCIPAL INVESTIGATOR: White, W.E.;Yielding, K.L.
ADDRESS: 1919 7th Avenue S, Birmingham, AL 35233
AFFILIATION: Alabama Univ., Birmingham (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$24,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Photoaffinity labeling is used to covalently attach selected fluorene to DNA in vitro and to macromolecular targets in vivo.
APPROACH: This direct attachment circumvents the requirements for metabolic activation. This attachment leads to frameshift reversions in the Ames system; no mutations are observed in the dark or in strains possessing DNA repair. 2-azidofluorene has been applied to the backs of sheared Balb/c and C57/BL/6J mice. Sections of skin and viscera were taken from sacrificed animals. After two months no differences were observed among the treated mice in the dark, treated mice in the light and control animals. In vitro labeling on calf thymus DNA occurs on both purines and pyrimidines and probably on the sugar phosphate backbone also.
KEYWORDS: IN VITRO;IN VIVO;LABELLING;CALVES;THYMUS;SKELETON;MICE;MUTANTS;MUTATIONS;DNA;LABELLED COMPOUNDS;CARCINOGENESIS;MUTAGENESIS;BIOLOGICAL MODELS

<034079>
TITLE: Hepatic P-450 Systems Induced by Aryl Carcinogens
PROJECT NUMBER: R01 CA 17618-03
PRINCIPAL INVESTIGATOR: Cooper, D.Y.;Rosenthal, O.;Vars, H.M.;Schleyer, H.
ADDRESS: 36th and Hamilton Walk, Philadelphia, PA 19104
AFFILIATION: Pennsylvania Univ., Philadelphia (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Cytochrome P-448 in animals treated with arylhydrocarbons (AH) differs from cytochrome P-450 in control or phenobarbitol (PB) treated animals with respect to several parameters including CO difference spectra, ethyl isocyanide difference spectra, substrate specificity, molecular and immunological properties. During the tenure of this grant the additional properties of the low affinity to halothane, metopirone and CO of the reduced form of AH induced P-448 as compared with control and PB

induced P-450 have been explored. Our studies for the next year will concentrate on localizing more precisely the bases for these alterations in biophsical and biochemical properties of the multi-enzyme systems induced by AH and PB.
APPROACH: The available methods for resolving these systems and purifying their components will be evaluated and compared with the procedures we have developed for purification of the steroid hydroxylase system of adrenal mitochondria. The methods to be applied for studying the interaction of P-450 with other enzymatic components of the system and with various substrates and ligands will include optical spectrophotometry and electron paramagnetic resonance spectroscopy.
KEYWORDS: CARCINOGENS;HYDROCARBONS;PHENOBARBITAL;ORGANIC NITROGEN COMPOUNDS;AROMATICS;CYTOCHROMES;BIOSYNTHESIS;METABOLISM;LIVER;ENZYMES;BIOCHEMICAL REACTION KINETICS;PHYSIOLOGY

<034080>
TITLE: Derivation of Carcinogenic Epoxides
PROJECT NUMBER: R01 CA 17872-03
PRINCIPAL INVESTIGATOR: Smith, L.L.;Gibson, T.L.;Smart, V.B.
ADDRESS: 300 University Boulevard, Galveston, TX 77550
AFFILIATION: Texas Univ., Galveston (USA). Medical Branch
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$26,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
PROJECT DESCRIPTION: We propose to continue to attempt to separate, purify, and identify the several oxidation products formed from benz(a)pyrene and from pyrene and other related polycyclic aromatic hydrocarbons in radiation-induced air oxidations.
APPROACH: We shall be applying high-pressure liquid column chromatography, thin-layer chromatography, etc., and a variety of spectral methods for these studies, including mass spectra. Radiation-induced oxidations will be made using either cobalt-60 gamma radiation of 254 nm ultraviolet light, with pure crystalline substrates or substrates adsorbed onto silica gel. All oxidation product mixtures and all resolved pure oxidation products will be evaluated for their putative mutagenicity using test strains of Salmonella typhimurium bacteria.
KEYWORDS: CARCINOGENESIS;BIOLOGICAL MODELS;POLYCYCLIC AROMATIC HYDROCARBONS;RADIOINDUCTION;PYRENE;BENZOPYRENE;OXIDATION;BIOCHEMICAL REACTION KINETICS;SALMONELLA TYPHIMURIUM;GAMMA RADIATION;COBALT 60;ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;EPOXIDES

<034081>
TITLE: Carcinogen-DNA Complexes--Structure and Interactions
PROJECT NUMBER: R01 CA 17922-02
PRINCIPAL INVESTIGATOR: Clarke, R.H.
ADDRESS: 755 Commonwealth Avenue, Boston, MA 02215
AFFILIATION: Boston Univ., Mass. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The proposed research program seeks to detail the geometry of complexes of carcinogenic polycyclic hydrocarbons with DNA and chromatin and to elucidate the intermolecular interactions which stabilize them.
APPROACH: Our approach will be through the utilization of magnetic properties in the excited triplet states of the carcinogen to probe the orientations and interactions within the complex, using newly developed methods of optical detection of magnetic resonance.
RESULTS: Our experiments will focus on complexes of nucleic acids with polycyclic hydrocarbons which have been postulated to be actively involved in carcinogenesis and which may be of importance in elaborating mechanisms of chemical carcinogenic activity at the molecular level.
KEYWORDS: CARCINOGENS;DNA;POLYCYCLIC AROMATIC HYDROCARBONS;CARCINOGENESIS;BIOLOGICAL MODELS;BIOCHEMICAL REACTION KINETICS

<034082>
TITLE: Mechanisms of Carcinogenesis in Cell Culture
PROJECT NUMBER: R01 CA 18197-01A1
PRINCIPAL INVESTIGATOR: Bertram, J.S.;Merriman, B.L.
ADDRESS: 666 Elm Street, Buffalo, NY 14203
AFFILIATION: Roswell Park Memorial Inst., Buffalo, N.Y. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$54,800
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The proposed research is concerned with the mechanism by which chemical and physical carcinogens induce malignancy in vitro.
APPROACH: All work will be performed in cell culture using a transformable line of mouse embryo fibroblasts in which malignant transformation can be readily quantitated, and which can be synchronized for the cell cycle studies. The effects of repair inhibitors will be studied over a range of concentrations and carcinogen exposure and measured as changes in lethality and transformation frequency.
KEYWORDS: NEOPLASMS;BIOCHEMICAL REACTION KINETICS;CARCINOGENESIS;BIOLOGICAL MODELS;IN VITRO;X RADIATION;ULTRAVIOLET RADIATION;RESPONSE MODIFYING FACTORS;CAFFEINE;ANTIBIOTICS;DRUGS;MICE;BIOLOGICAL REPAIR;INHIBITION;RADIOINDUCTION;BIOLOGICAL RADIATION EFFECTS

<034083>
TITLE: Synthesis, Photo and Thermochemistry of Arene Oxides
PROJECT NUMBER: R01 CA 18346-02
PRINCIPAL INVESTIGATOR: Griffin, G.W.;Nishiyama, K.;Nakamura, K.
ADDRESS: Lakeshore Drive, New Orleans, LA 70122
AFFILIATION: Louisiana State Univ., New Orleans (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$51,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Our research goals include: (1) continuation of our efforts to develop new and more direct routes for the synthesis of K-region arene oxides, particularly those in which the oxirane ring is flanked by substituents; (2) expansion of our program in the area of oxygen transfer reactions to nitrogen bases and sulfur containing compounds in order to define the scope and mechanism of this process and the possible significance in the area of chemical carcinogenesis; and (3) further investigation of the photochemical properties of arene oxides, in particular their rearrangement to oxepins, and the potential role of this process in solar induction of skin cancer.
KEYWORDS: BIOSYNTHESIS;PHOTOSYNTHESIS;TEMPERATURE EFFECTS;AROMATICS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS;CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL MODELS;OXYGEN COMPOUNDS;OXIDES;SOLAR FLUX;ULTRAVIOLET RADIATION

<034084>
TITLE: Approaches to Chemical Carcinogenesis Mechanisms
PROJECT NUMBER: R01-CA-19279-01
PRINCIPAL INVESTIGATOR: Fitcher, T.L.
ADDRESS: 1102 Columbia St., Seattle, WA 98104
AFFILIATION: Fred Hutchinson Cancer Research Center, Seattle, Wash. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$49,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: This project includes the synthesis, reactivity study, and collaborative biological testing of certain derivatives of polycyclic aromatic amine carcinogens and some potential new types of carcinogens which have been selectively designed to provide information concerning: (1) structural requirements necessary or sufficient for carcinogenic activity at a given organ site, (2) positive identification of some metabolic products arising from the action of the carcinogens on cellular proteins, (3) the structures and perhaps significance of some of the carcinogen-nucleic acid adducts, and (4) a unified hypothesis of carcinogenesis which has been proposed.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;BIOLOGICAL EFFECTS;CARCINOGENS;CHEMICAL COMPOSITION;CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;METABOLISM;PROTEINS;NUCLEIC ACIDS

<034085>
TITLE: Injury and Tumor Formation in the Rat Lung
PROJECT NUMBER: R01 CA 19354-01A1
PRINCIPAL INVESTIGATOR: Evans, M.J.;Freeman, G.
ADDRESS: 333 Ravenswood Avenue, Menlo Park, CA 94025
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$39,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The purpose of this proposed research is to study epithelial tumor formation in the terminal bronchioles and alveoli of the rat lung.
APPROACH: The studies will entail exposing animals to nitrogen dioxide (NO2) and to a chemical carcinogen benzo(a)pyrene (BP). NO2 exposure results in tissue injury followed by proliferation of two epithelial cell types in the lung (nonciliated cells in the terminal bronchioles and Type 2 cells in the alveoli). We will introduce the carcinogen at specific times during the proliferative phase of repair to determine if it will alter this response and cause an increased incidence of tumor formation. Specifically, we will study the effects of BP on (1) the duration of cell proliferation and (2) the transition of nonciliated cells to ciliated cells and of Type 2 cells to Type 1 cells.
RESULTS: These studies results then will be related to the incidence and types of tumors formed.
KEYWORDS: RATS;LUNGS;NEOPLASMS;BRONCHI;NITROGEN DIOXIDE;BENZOPYRENE;BIOLOGICAL EFFECTS;METABOLISM;CARCINOGENS;CARCINOGENESIS

<034086>
TITLE: Aryl Hydrocarbon Hydroxylase Levels-Head-Neck Cancer
PROJECT NUMBER: R01 CA 19659-01
PRINCIPAL INVESTIGATOR: Alfred, L.J.;Bowers, M.P.;Kouri, R.E.;Talcott, R.E.
ADDRESS: 1620 E. 119th Street, Los Angeles, CA 90059
AFFILIATION: C.R. Drew Postgraduate Medical School, Los Angeles, Calif. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$86,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The immediate objectives of the proposed study are: (1) to measure the induced AHH activity in cultured lymphocytes from the peripheral blood of adult patients with head and neck cancer, and from healthy control subjects; (2) to determine the rates of proliferation of the above lymphocyte cultures systems; and (3) to isolate and identify the T and B lymphocytes from healthy and cancer subjects, and compare the AHH activity in both cell populations. The long range goal of this study is to develop a reproducible cell culture system to determine man's potential susceptibility to toxic and carcinogenic environmental chemicals.
APPROACH: To test this hypothesis, we will determine whether culture lymphocytes derived from adult patients with demonstrated carcinoma of the head and neck region have statistically higher levels of AHH than

lymphocytes from healthy controls. This type of malignancy was chosen for the proposed study because of its cellular origin, which in some cases is respiratory epithelium; it is one of the first tissues exposed to inhaled or ingested environmental carcinogenic chemicals; and because this tumor is usually detected as primary.
RESULTS: Establish a relationship between lymphocyte AHH activity and other types which might arise from respiratory epithelium.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;CARCINOGENESIS;MICE;MAN;BIOLOGICAL ACCUMULATION;NEOPLASMS;HEAD;NECK;HYDROXYLASE;ENZYMES;CHEMICAL EFFLUENTS;CARCINOGENS;INHALATION;INGESTION

<034087>
TITLE: 3-D Fluorometric Analysis of Hydrocarbon Metabolites
PROJECT NUMBER: R01-CA-19974-01A1
PRINCIPAL INVESTIGATOR: Rho, J.H.
ADDRESS: 2025 Zonal Avenue, Los Angeles, CA 90033
AFFILIATION: University of Southern California, Los Angeles (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$29,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The major objectives of this project are: (1) determine qualitatively and quantitatively the nature of the products formed through the activity of aryl hydrocarbon hydroxylase with polycyclic hydrocarbons; (2) correlate the relative abundance of each metabolite with the functional state of the microsomal enzymes by use of various enzyme inhibitors and different cell lines, some highly sensitive to, and the other less susceptible to chemical carcinogens; (3) evaluate the relevance of basal and induced levels of functioning of the enzymes to the induction of cancer in experimental animals; and (4) evaluate the functional state of the enzymes in the polycyclic hydrocarbon binding in vitro to biological macromolecules.
APPROACH: The three-dimensional fluorometry recently developed in our laboratory delineates not only the excitation and emission wavelengths but also emission intensity for each peak. This permits us, therefore, to characterize even very closely related structures of the polycyclic hydrocarbon metabolites. Computer enhancement technique for fluorescence spectra will make posssible the detection of polycyclic hydrocarbons in extremely minute amounts.
KEYWORDS: METABOLISM;BIOCHEMICAL REACTION KINETICS;POLYCYCLIC AROMATIC HYDROCARBONS;FLUORESCENCE SPECTROSCOPY;FLUORESCENCE;IN VITRO;CARCINOGENESIS;ANIMALS;QUALITATIVE CHEMICAL ANALYSIS;QUANTITATIVE CHEMICAL ANALYSIS;ENZYMES

<034088>
TITLE: Reactive Heterocycles - Cancer and Biomechanism
PROJECT NUMBER: R01-CA-20574-01
PRINCIPAL INVESTIGATOR: Rastetter, W.H.
ADDRESS: 77 Massachusetts Avenue, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$64,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The synthesis and chemistry of a variety of reactive heterocycles will be studied. Part I--Nucleophilic additions to reactive epoxides will be studied in relation to the carcinogenic activation of polycyclic aromatic hydrocarbons, and in relation to the total synthesis of antiviral agents potentially useful in the treatment of viral caused cancer. Part II--Model systems will be studied to mimic the mechanism of carcinogenic activation of polycyclic aromatic hydrocarbons by the flavin cofactored monooxygenases. Part III--Reactive crown ethers, macrocyclic reagents capable of both complexing and reacting selectively with substrates in nonpolar media, will be used in mechanistic and synthetic studies. These will include further studies of the mechanism of action of flavins in enzyme oxidation systems (see Part II) and the development of an efficient and general macrolide synthesis.
KEYWORDS: CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;POLYCYCLIC AROMATIC HYDROCARBONS;VIRUSES;BIOLOGICAL MODELS;BIOSYNTHESIS;ENZYMES;HETEROCYCLIC COMPOUNDS;NEOPLASMS;POLYETHYLENE GLYCOLS

<034089>
TITLE: Toxicity of Alpha-Emitting Heavy Elements
PROJECT NUMBER: R13 CA 20671-01
PRINCIPAL INVESTIGATOR: Dasilvahorta, J.;Cayolladamotta, L.;Tavares, M.H.
ADDRESS: Cidade Universitaria, Lisbon, Portugal, XX
AFFILIATION: Lisbon Univ. (Portugal)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$24,200
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The Portuguese Study Group proposes to organize in Portugal, in June 1977, an International Conference on the Toxicity of Thorotrast and Other Alpha-Emitting Heavy Elements.
APPROACH: We have in mind a conference with a 5 days duration and about 50 to 60 participants, with the purpose of addressing the questions of how current studies being conducted on thorium and radium toxicity can serve as a useful benchmark for studying and evaluating the toxicity of other alpha-emitters, namely uranium and plutonium. It will represent a truly international effort in order to bring together scientists from a number of specialities and countries, some of whom will be discussing these problems directly with each other for the first time.
KEYWORDS: THORIUM;RADIUM;TOXICITY;URANIUM;PLUTONIUM;MEETINGS;PLANNING;TECHNOLOGY TRANSFER;TRANSURANIUM ELEMENTS;THOROTRAST;ORGANIZING;ALPHA PARTICLES;HEALTH HAZARDS

<034090>
TITLE: Environmental Stress and Tumorigenesis
PROJECT NUMBER: R01-CA-20964-01S1
PRINCIPAL INVESTIGATOR: Blatteis, C.M.
ADDRESS: 800 Madison Avenue, Memphis, TN 38163
AFFILIATION: Tennessee Univ., Memphis (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$7,200
TECHNOLOGY: GEOTHERMAL/General (100%)
POLLUTANTS: HEAT, THERMAL (100%)
PROJECT DESCRIPTION: The aim of the present proposal is to study in a single species (rats) the growth of a family of related tumors (4 lines of Morris hepatomas) and of their common, normal parent tissue (regenerating liver) during extended sojourn in a stressful environment.
APPROACH: Thus, tumor-bearing rats will be exposed for 3 weeks to (a) high or (b) low ambient temperature, or (c) reduced barometric pressure. Additionally, other rats will receive (d) periodic injections of isoprcterenol, a drug which induces some of the responses observed in stressed animals. The observed results will be correlated with the known biochemical characteristics of the hepatomas used, as well as with the hosts' food intake, to gain a clearer understanding of the mechanisms operating under these stress conditions.
KEYWORDS: RATS;NEOPLASMS;IN VIVO;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL MODELS;TEMPERATURE EFFECTS;BIOLOGICAL STRESS;DRUGS;DIET;CARCINOGENESIS;THERMAL POLLUTION;PATHOLOGICAL CHANGES;LOW PRESSURE;LIVER

<034091>
TITLE: Role of Mutagenesis in Chemical Carcinogenesis
PROJECT NUMBER: R01-CA-21247-02
PRINCIPAL INVESTIGATOR: Maher, V.M.;McCormick, J.J.;Heflich, R.H.;Levinson, W.
ADDRESS: Soil Science Building, East Lansing, MI 48823
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Since this points to the involvement of different kinds of DNA repair defects in enhancing the cytotoxic and mutagenic action of carcinogens, we will investigate the question using, in addition to our XP cells, cells derived from persons with two other forms of genetic pre-disposition to cancer, viz., ataxia telangiectasia (AT) (sensitive to x-rays) and Fanconi's anemia (FA) (sensitive to mitomycin C). With such cells we will: (1) investigate the effect of DNA excision repair replication on the mutagenicity of carcinogens; and (2) investigate the effect of post-replication repair on such action.
APPROACH: For these studies we will utilize, where applicable, radioactively-labeled carcinogens to determine the number and kinds of DNA-carcinogen adducts which corollate with the induction of mutations in these human cells.
KEYWORDS: CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL MODELS;MUTAGENESIS;DNA;SOLAR FLUX;ULTRAVIOLET RADIATION;GENETIC VARIABILITY;BIOLOGICAL REPAIR;REPRODUCTION;CARCINOGENS;ANIMAL CELLS;MAN;LABELLED COMPOUNDS;HYDROCARBONS

<034092>
TITLE: Intracellular Enzyme Kinetics and Carcinogens
PROJECT NUMBER: R01 CA 21153-01
PRINCIPAL INVESTIGATOR: Kohen, E.;Viallet, P.;Salmon, J.
ADDRESS: 1155 14th Street, NW, Box 6188, Miami, FL 33136
AFFILIATION: Papanicolaou Cancer Research Inst., Miami, Fla. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Changes in intracellular enzyme kinetics and metabolic compartmentation associated with carcinogen treatment and spontaneously or chemically induced neoplastic transformation will be investigated by microspectrofluorometry. The intracellular binding, accumulation and metabolites of recently synthesized carcinogens (of the chrysene or benzanthracene series) will be investigated. Studies will be carried out in E12, L, NCTC 8739 cells, paired lines of normal vs. spontaneously transformed cells, hepatomas of graded malignancy, neuroblastoma).
APPROACH: The living cell represents an organizational complex with a delicate control of simultaneously operative pathways, and compartments. On this basis, topographic analysis of fluorescence transients (e.g., NAD(P) yields (reversibly) NAD(P)H) will be carried out on 50 to 100 cell sites simultaneously (following intracellular electrophoretic injection of metabolites), in reference to microchondrial-extramitochondrial dehydrogenase and shuttle pathways; regional asynchronicities. The cell fluorescence spectrum will be resolved in free vs. bound NAD(P)H, flavoproteins, and correlated to distribution or induction of dehydrogenases. The living cell will be submitted to challenges which may alter the regulation of intracellular pathways or organelles, e.g., carcinogens, growth with various substrates, agents affecting mitochondrial-cytoplasmic-nuclear exchanges or organelle biogenesis. Fluorescence spectra of carcinogen (or metabolite) treated cells using a high temporal and spectral resolution microspectrofluorometer may lead to in situ detection of carcinogen interactions and metabolites in localized cell regions. Via the intracellular assay of carcinogens, carcinogen-metabolizing activity and definition of metabolic aberrations (promoting the action of carcinogens or carcinogen-induced) ultimately methods may be developed for predicting the susceptibility of cell lines to malignant growth or recognizing early metabolic criteria of malignant transformation.
KEYWORDS: ENZYMES;BIOCHEMICAL REACTION KINETICS;METABOLISM;NEOPLASMS;CARCINOGENS;CHRYSENE;HYDROCARBONS

<034093>
TITLE: Modification of X-Ray Induced Damages in Phages T4
PROJECT NUMBER: R01-CA-21342-02
PRINCIPAL INVESTIGATOR: Wallace, S.S.
ADDRESS: NY, NY 10029
AFFILIATION: New York Medical Coll., N.Y. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$59,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The general goal of this research project is to elucidate the molecular mechanisms involved in the repair of ionizing radiation damage using T4 bacteriophage and its Escherichia coli host as model systems.
APPROACH: To this end, this laboratory is proceeding to purify the products of the T4 x and y genes as well as the Escherichia coli x-ray endonuclease. In addition, in vitro repair studies will be carried out on damaged DNA substrates using purified enzymes of known specificity.
KEYWORDS: BIOLOGICAL RADIATION EFFECTS;X RADIATION;BIOLOGICAL REPAIR;ESCHERICHIA COLI;MICROORGANISMS;BIOCHEMICAL REACTION KINETICS;GENES;DNA;ENZYMES

<034094>
TITLE: Carcinogenic, Mutagenic and Cytotoxic Mechanism--(DMBA)
PROJECT NUMBER: R01-CA-21371-01
PRINCIPAL INVESTIGATOR: Witiak, D.T.;Hart, R.W.;Cazer, F.D.;Daniel, F.B.
ADDRESS: 190 N. Oval Drive, 102 Administration Building, Columbus, OH 43210
AFFILIATION: Ohio State Univ., Columbus (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$64,500
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
PROJECT DESCRIPTION: It is our primary goal to combine the cellular, molecular, and radiochemical capabilities of our laboratories in order to elucidate the specific deoxynucleoside-hydrocarbons responsible for the biological (cytotoxic, mutagenic, carcinogenic) effects of 7,12-dimethylbenz(a)anthracene (DMBA) and selected DMBA derivatives.
APPROACH: Utilizing 14C labeled DMBA and related derivatives of high specific activity (synthesized in our laboratories) we will compare the DN-HC profile of each of these compounds with one another. The differential rate of removal of the various DN-HC compounds will be determined and compared with their respective biological effects. Non-label derivatives will be utilized to access the ability of these compounds to induced DNA damage (as measured by unscheduled DNA synthesis, BUdR photolysis and alkaline sucrose sedimentation). We will further utilize selected repair deficient mutants human fibroblast cell cultures in order to characterize these mutants and the forms of repair involved in removal of DMBA induced DNA damage. Based upon the assumption that rapidly removed DN-HC(s) compound(s) have no biological effect, we will characterize the chemical nature of not only removed DN-HC(s) but also those not removed by DNA repair processes prior to DNA replication. In order to perform these studies it is necessary that we be able to detect one molecule in 20,000 and for these reasons it is of major importance that radiolabeled DMBA (14C) of high specific activity (described in this proposal) be employed.
KEYWORDS: HYDROCARBONS;BIOCHEMICAL REACTION KINETICS;CARCINOGENESIS;BIOLOGICAL MODELS;MUTAGENESIS;ANIMAL CELLS;CYTOCHEMISTRY;XYLENES;ORGANIC COMPOUNDS;POLYCYCLIC AROMATIC HYDROCARBONS;TRACER TECHNIQUES

<034095>
TITLE: Metabolism of 3-Methylcholanthrene in Liver and Lung
PROJECT NUMBER: R01-CA-21481-01
PRINCIPAL INVESTIGATOR: Stoming, T.A.
ADDRESS: 1459 Gwinnett Street, Augusta, GA 30902
AFFILIATION: Medical Coll. of Georgia, Augusta (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$30,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: To gain additional insight into the mechanism of activation of PAH's through study of the metabolism of 3-methylcholanthrene (3-MC).
APPROACH: The aims of the proposed research are to: (1) identify all primary metabolites of 3-MC; (2) compare the primary metabolites of 3-MC to the known metabolities of other carcinogenic hydrocarbons and determine if a common pathway for activation exists; (3) compare the levels of the primary metabolites of 3-MC from the livers and lungs of susceptible and resistant strains of mice to establish if the formation of a certain metabolite is related to susceptibility; and (4) determine if there is a relationship between lung epoxide hydrase levels and susceptibility to lung tumor formation.
RESULTS: Preliminary studies show that high pressure liquid chromatography provides an effective means of separating the metabolites of 3-MC. These investigations are designed to increase our understanding of the mechanism of metabolic activation in relation to chemical carcinogenesis.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;BIOLOGICAL MODELS;CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;LUNGS;LIVER;NEOPLASMS;SEPARATION PROCESSES;CHROMATOGRAPHY;ENVIRONMENTAL EXPOSURE PATHWAY

<034096>
TITLE: Screening for Neoplasms in Irradiated Populations
PROJECT NUMBER: R01-CA-21452-01
PRINCIPAL INVESTIGATOR: Hempelmann, L.H.;O'Mara, R.;Weber, D.;Rogoff, S.;Borg, S.;Mansur, P.;Pincus, R.;Depapp, Z.;Woodard, E.
ADDRESS: 601 Elmwood Avenue, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$31,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The purpose of this program is to determine the risks of development of tumors in

irradiated populations and to evaluate alternatives in diagnosis and treatment of the tumors.
APPROACH: The study populations have been followed for 15 to more than 20 years and are at high risk of developing tumors of the thyroid gland (Populations A and C) and breast (Population B). Thyroid palpation and technetium scan will be performed on Population A and Subgroup I or Population C. Follow-up scans using I131 will be performed on those with abnormal screening scans. Population B will undergo mammographic-thermographic studies.
RESULTS: The prevalence of cold nodules will be described and the response to treatment with thyroid suppressive drugs will be monitored. The efficacy of repetitive thermographic-mammographic examination of women at high risk of development of breast cancer will be determined.
KEYWORDS: IRRADIATION;BIOLOGICAL EFFECTS;HUMAN POPULATIONS;NEOPLASMS;NUCLEAR MEDICINE;DIAGNOSIS;RADIOTHERAPY;HEALTH HAZARDS;THYROID;TECHNETIUM ISOTOPES;SCINTISCANNING;DIAGNOSTIC TECHNIQUES;RADIOISOTOPE SCANNING;PATHOLOGICAL CHANGES;MEDICAL SURVEILLANCE;PREVENTIVE MEDICINE;DELAYED RADIATION EFFECTS;IODINE 131;MAMMARY GLANDS;CARCINOGENESIS;BIOLOGICAL MODELS

<034097>
TITLE: Radiation-Induced Thyroid Cancer
PROJECT NUMBER: R01-CA-21518-01
PRINCIPAL INVESTIGATOR: Schneider, A.B.;Frohman, L.;Pinsky, S.
ADDRESS: 2929 S. Ellis Avenue, Chicago, IL 60616
AFFILIATION: Chicago Univ., Ill. (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$46,900
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The major objective of this research proposal is to study radiation-induced thyroid cancer by a coordinated program of clinical and basic endocrinological investigations. The clinical studies are designed to determine the current risk and continuing incidence of radiation-induced thyroid cancer and to evaluate methods of diagnosis and medical and surgical approaches to treatment.
APPROACH: This will be accomplished by a longitudinal study of patients who have been evaluated at Michael Reese Hospital because of a history of childhood head or neck irradiation. Of 5,200 patients who were so treated, 1,500 already have been examined and another 1,000 have been contacted by mail. Follow-up examinations of these patients will provide the information necessary to develop clinical guidelines for the care of persons with a history of head or neck irradiation. Laboratory studies will focus on the role of plasma thyroglobulin in the diagnosis of thyroid tumors. In addition, an in vitro system will be used to determine at what point thyroglobulin is released from the thyroid into the circulation.
KEYWORDS: THYRCID;NEOPLASMS;DELAYED RADIATION EFFECTS;CARCINOGENESIS;NUCLEAR MEDICINE;RADIOTHERAPY;DIAGNOSIS;COST BENEFIT ANALYSIS;BIOLOGICAL RADIATION EFFECTS

<034098>
TITLE: Carcinogens on Pro- and Eucaryotic DNA Replication
PROJECT NUMBER: R01-CA-21622-01
PRINCIPAL INVESTIGATOR: Hurwitz, J.;Schlagman, S.;Marians, K.;Spencer, E.;Ferraiuolo, F.D.;Riva, S.
ADDRESS: 1300 Morris Park Avenue, Bronx, NY 10461
AFFILIATION: Yeshiva Univ., New York (USA)
MONITORING AGENCY: National Cancer Inst., Bethesda, Md. (USA)
77 FUNDING: National Cancer Inst. FY77:$35,100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: The influence of two known carcinogens, beta-propiolactone and benzo(a)pyrene diol epoxide on DNA replication will initially be studied using the partially purified system responsible for catalyzing the three stages of phi X174 DNA replication. These include reactions in which phi X174 DNA is converted to the RFII form; the second step involves the replication of superhelical phi X RFI leading to the formation of phi X RFI and the third step is the process in which phi X RFI is used to prime the synthesis of phi X174 DNA (the plus progeny viral strand).
APPROACH: We shall examine the influence of these compounds on (a) the structure of the DNA; (b) the ability of complexed DNA carcinogen to be utilized in DNA replication; and (c) whether biologically active DNA products are formed or if specific errors can accumulate which alters the biologically active circular DNA.
KEYWORDS: CARCINOGENESIS;DNA;DNA REPLICATION;BENZOPYRENE;BIOLOGICAL MODELS;CARCINOGENS;HYDROCARBONS;METABOLISM

Department of Health, Education and Welfare/National Institute of Dental Research

<035001>
TITLE: Chemical Radioprotection by WR-2721 of Parotid Glands
PROJECT NUMBER: R01-DE-03666-04
PRINCIPAL INVESTIGATOR: Sodicoff, M.;Pratt, N.E.
ADDRESS: 3223 N. Broad Street, Philadelphia, PA 19122
AFFILIATION: Temple Univ., Philadelphia, Pa. (USA). School of Medicine
MONITORING AGENCY: National Inst. of Dental Research, Bethesda, Md. (USA)
77 FUNDING: National Inst. of Dental Research FY77:$34,900
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The purpose of this study is to determine whether WR-2721 can be effective in lessening the damage to the rat parotid gland caused by high doses of x-radiation.
APPROACH: The protective effects of the drug will be evaluated by studies of salivary flow, amylase content, synthetic ability and morphologic appearance during periods ranging from the first week to 3 months following irradiation with 1600, 3200 and 6400 R.
KEYWORDS: RATS;BIOLOGICAL RADIATION EFFECTS;X RADIATION;DOSE-RESPONSE RELATIONSHIPS;SALIVARY GLANDS;RADIOSENSITIVITY;RADIOPROTECTIVE SUBSTANCES;TESTING;DRUGS;RADIOSENSITIVITY EFFECTS

<035002>
TITLE: Low-Level Irradiation-Modification of Carcinogenesis
PROJECT NUMBER: R23-DE-03996-03
PRINCIPAL INVESTIGATOR: Lurie, A.G.
ADDRESS: Farmington Avenue, Farmington, CT 06032
AFFILIATION: Connecticut Univ., Farmington (USA)
MONITORING AGENCY: National Inst. of Dental Research, Bethesda, Md. (USA)
77 FUNDING: National Inst. of Dental Research FY77:$10,200
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The proposed study would examine the effects of concurrent, repeated exposures to low doses of x-radiation on tumor induction by repeated, low dose applications of a chemical carcinogen (DMBA), in established carcinogenic amounts, on an in vivo mammalian oral epithelial cell renewal system.
APPROACH: Young adult male Syrian golden hamsters receive multiple applications of 0.1% DMBA in mineral oil to the right cheek pouch, 20R x-radiation to the head and neck, or both agents simultaneously. Tumor incidence, onset latency, histopathology, cytokinetics, and hemodynamics are evaluated.
RESULTS: Results thus far have suggested synergy between the two agents. It is anticipated that the results of these experiments will provide information leading to some clarification of mechanisms involved in the interaction between concurrent exposures to low levels of x-radiation and chemical carcinogens, as well as provide a useful model system and preliminary data for more detailed quantitative studies of low level exposures to multiple carcinogens and factors which modify host responses to these exposures.
KEYWORDS: ANIMAL CELLS;BIOLOGICAL RADIATION EFFECTS;LOW DOSE IRRADIATION;X RADIATION;CHRONIC IRRADIATION;CARCINOGENS;SYNERGISM;HAMSTERS;ORAL CAVITY;CARCINOGENESIS;TIME DEPENDENCE;NEOPLASMS;MORPHOLOGICAL CHANGES;BIOLOGICAL EFFECTS;BIOCHEMICAL REACTION KINETICS;EPITHELIUM

Department of Health, Education and Welfare/National Institute of General Medical Sciences

<035101>
TITLE: Liver Function, Carbon Monoxide Toxicity and Oxygen Toxicity (Rodents)
PROJECT NUMBER: P50-GM-12675-130014
PRINCIPAL INVESTIGATOR: Roberts, R.J.
ADDRESS: Jessup Hall, Iowa City, IA 52240
AFFILIATION: Iowa Univ., Iowa City (USA)
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS (100%)
PROJECT DESCRIPTION: Research in Biochemical Toxicology, Pharmacology, and Clinical Pediatric Pharmacology.
KEYWORDS: RODENTS;PHYSIOLOGY;LIVER;CARBON MONOXIDE;OXYGEN;TOXICITY;PHARMACOLOGY;INFANTS;PEDIATRICS

<035102>
TITLE: Chemical Carcinogens and Polysome Association with Endoplasmic Reticulum (Rats)
PROJECT NUMBER: P50-GM-12675-130057
PRINCIPAL INVESTIGATOR: Shires, T.K.
ADDRESS: Jessup Hall, Iowa City, IA 52240
AFFILIATION: Iowa Univ., Iowa City (USA)
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Research in Biochemical Toxicology, Pharmacology, and Clinical Pediatric Pharmacology.
KEYWORDS: RATS;CARCINOGENS;BIOCHEMICAL REACTION KINETICS;ENDOPLASMIC RETICULUM;INFANTS;RIBOSOMES;PEDIATRICS

<035103>
TITLE: Lead Effect on Uroporphyrinogen I Synthetase Activity (Rats)
PROJECT NUMBER: P50-GM-12675-130059
PRINCIPAL INVESTIGATOR: Tephly, T.R.
ADDRESS: Jessup Hall, Iowa City, IA 52240
AFFILIATION: Iowa Univ., Iowa City (USA)
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Research in Biochemical Toxicology, Pharmacology, and Clinical Pediatric Pharmacology.
KEYWORDS: RATS;LEAD;TOXICITY;BIOCHEMICAL REACTION KINETICS;LIGASES;PHARMACOLOGY;PEDIATRICS

<035104>
TITLE: Induction and Electrophoretic Mutation Detection--Mammalian Cell Lines (Hamster)
PROJECT NUMBER: R01-GM-15597-100009
PRINCIPAL INVESTIGATOR: Siciliano, M.J.
ADDRESS: P.O. Box 20036, Houston, TX 77030
AFFILIATION: Texas Univ., Houston (USA)
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Metabolic conversion of chemical carcinogens into the active or proximate form with emphasis on the enzymes converting polycyclic hydrocarbons, with particular reference to genetic variation in man.

APPROACH: Use of electrophoretically variant enzymes as genetic markers continues to play a role in some of the projects supported by this grant. The methodlogy has been modified to study newly synthesized proteins in developing embryos by autoradiographic techniques. The enzyme (isozyme) markers are used in ongoing studies of genetic divergence among species, in analysis of altered forms of enzymes in suppressor strains of bacteria, and in detection of experimentally induced mutations in cultured mammalian cells.
KEYWORDS: CARCINOGENS;POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;HAMSTERS;ANIMAL CELLS;CELL CULTURES;ISOENZYMES;BIOCHEMICAL REACTION KINETICS;GENETIC EFFECTS;PROTEINS;BIOSYNTHESIS;EMBRYOS;TRACER TECHNIQUES;AUTORADIOGRAPHY;GENETIC VARIABILITY;BACTERIA;MAN;MUTATIONS;ELECTROPHORESIS;MEASURING METHODS

<035105>
TITLE: Enzymes Which Metabolize Chemical Carcinogens (Bacillus Subtilis)
PROJECT NUMBER: R01-GM-15597-100001
PRINCIPAL INVESTIGATOR: Shaw, C.R.
ADDRESS: P.O. Box 20036, Houston, TX 77030
AFFILIATION: Texas Univ., Houston (USA)
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Metabolic conversion of chemical carcinogens into the active, or proximate form with emphasis on the enzymes converting polycyclic hydrocarbons, with particular reference to genetic variation in man.
APPROACH: Use of electrolytically variant enzymes as genetic markers continues to play a role in some of the projects supported by this grant. The methodology has been modified to study newly synthesized proteins in developing embryos by autoradiographic techniques. The enzyme (isozyme) markers are used in ongoing studies of genetic divergence among species, in analysis of altered forms of enzymes in suppressor strains of bacteria, and in detection of experimentally induced mutations in cultured mammalian cells.
KEYWORDS: BACILLUS SUBTILIS;BIOCHEMICAL REACTION KINETICS;GENETIC EFFECTS;MUTATIONS;ELECTROPHORESIS;MAN;GENETIC VARIABILITY;POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;PROTEINS;BIOSYNTHESIS;ENZYMES;TRACER TECHNIQUES;AUTORADIOGRAPHY;CELL CULTURES;ANIMAL CELLS;MAMMALS

<035106>
TITLE: Study of the Mode of Action of Chemical Mutagens
PROJECT NUMBER: R01-GM-07816-18
PRINCIPAL INVESTIGATOR: Strauss, B.S.;Karran, P.;Bose, K.
ADDRESS: 5801 S. Ellis Avenue, Chicago, IL 60637
AFFILIATION: Chicago Univ., Ill. (USA)
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences FY77:$95,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: (1) Determine whether replication repair in excision deficient cells occurs by branch migration by experiments designed to trap the repair intermediate in xeroderma cells deficient in the excision repair mechanism. (2) Utilize the properties of BND-cellulose to isolate DNA fragments with single stranded regions after treatment of cells with mutagenic agents since such DNA fragments are likely to be intermediates in both post replication repair and degradation processes. (3) Determine the relationship between cell differentiation and excision repair ability in order to understand the sensitivity of some tissues to chemical carcinogens. (4) Relate the observation that repair induced by methyl nitronitrosoguanidine occurs to a greater extent at DNA growing point regions to the observation that this compound is more mutagenic at DNA growing points.
KEYWORDS: MUTAGENS;BIOCHEMICAL REACTION KINETICS;ANIMAL CELLS;CELL CULTURES;SKIN DISEASES;CHROMOSOMAL ABERRATIONS;GENETIC EFFECTS;MUTATIONS;DNA;STRAND BREAKS;DNA REPLICATION;BIOLOGICAL REPAIR;CARCINOGENS;BIOLOGICAL EFFECTS

<035107>
TITLE: Physico-Chemical Studies of Radiation Effects in Cells
PROJECT NUMBER: R01-GM-13557-11
PRINCIPAL INVESTIGATOR: Powers, E.L.;Cross, M.H.
ADDRESS: 200 W. 21st Street, Austin, TX 78712
AFFILIATION: Texas Univ., Austin (USA)
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences FY77:$52,400
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: To characterize the physical and chemical events leading to the expression of radiation-induced damage at the cellular level.
APPROACH: The above objective has been approached mainly through the use of the spores of Bacillus megaterium as the test organism. Other systems have and will be used such as Phage 77 (used in the past) and transforming DNA (currently in use). Both x-rays and UV have been used. Pulse radiolysis studies at the Center for Fast Kinetics Research are now beginning to obtain chemical data relative to biological data.
RESULTS: The relationship to water (H2O or D2O) and water structure to radiation sensitivity has been clarified through experiments in dry systems and damage in dry systems compartmentalized into several types whose characteristics have been defined. A proposed model of radiation sensitization in solution has been presented involving the OH radical and H2O2. The sensitizing action of many metal ions including Fe, Co, Pt and Ag has been studied biologically and chemistry studies relative to these biological results are now underway so as to understand the mechanisms involved in radiation sensitization. Mechanisms involving organic sensitizers such as PNAP and diacetyl have been studied. The effect of nitrate in radiation sensitization of the bacterial spore has been reported and the effects of nitrate concentration on radical

yields chemically has been reported. Initial results have been obtained on the effects of radiation on transforming DNA.
KEYWORDS: BACILLUS MEGATERIUM;BIOLOGICAL RADIATION EFFECTS;SPORES;X RADIATION;ULTRAVIOLET RADIATION;BIOCHEMICAL REACTION KINETICS;WATER;RADIOSENSITIVITY EFFECTS;MOLECULAR BIOLOGY;BIOLOGICAL MODELS;NITRATES;DNA REPLICATION;IRON;COBALT;PLATINUM;SILVER;METALS

<035108>
TITLE: Genetic and Comparative Studies of Enzymes
PROJECT NUMBER: R01-GM-15597-10
PRINCIPAL INVESTIGATOR: Shaw, C.R.;Baptist, J.N.;Rasco, M.A.;Siciliano, M.J.;Wright, D.A.
ADDRESS: P.O. Box 20036, Houston, TX 77030
AFFILIATION: Texas Univ., Houston (USA)
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences FY77:$77,000
PROJECT DESCRIPTION: Metabolic conversion of chemical carcinogens into the active, or proximate form with emphasis on the enzymes converting polycyclic hydrocarbons, with particular reference to genetic variation in man.
APPROACH: Use of electrophoretically variant enzymes as genetic markers continues to play a role in some of the projects supported by this grant. The methodology has been modified to study newly synthesized proteins in developing embryos by autoradiographic techniques. The enzyme (isozyme) markers are used in ongoing studies of genetic divergence among species, in analysis of altered forms of enzymes in suppressor strains of bacteria, and in detection of experimentally induced mutations in cultured mammalian cells.
KEYWORDS: CARCINOGENS;POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;MAN;ANIMAL CELLS;BIOCHEMICAL REACTION KINETICS;ISOENZYMES;GENETIC EFFECTS;PROTEINS;BIOSYNTHESIS;EMBRYOS;TRACER TECHNIQUES;AUTORADIOGRAPHY;GENETIC VARIABILITY;CELL CULTURES;BACTERIA;MUTATIONS;ELECTROPHORESIS;MEASURING METHODS

<035109>
TITLE: Radiation Induced Cellular Mutagenesis and DNA Repair
PROJECT NUMBER: R01-GM-21788-03
PRINCIPAL INVESTIGATOR: Bockrath, R.C.;Palmer, J.;Haak, R.
ADDRESS: 1219 W. Michigan Street, Indianapolis, IN 46202
AFFILIATION: Indiana Univ., Indianapolis (USA). School of Medicine
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences FY77:$18,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Mutagenesis by ultraviolet radiation in bacterial cells will be investigated.
APPROACH: Particular modes of reversion will be identified and studied extensively, to determine specific mutagenic processes. Specific mutagenic processes will be related to aspects of DNA repair by concomitant biochemical studies of DNA metabolism.
RESULTS: These studies should identify fundamental processes by which cells cope with unusual molecular residues in their genetic material and survive with occasional genetic alteration.
KEYWORDS: BACTERIA;BIOLOGICAL RADIATION EFFECTS;MUTATIONS;RADIOINDUCTION;DNA;STRAND BREAKS;BIOLOGICAL REPAIR;BIOCHEMICAL REACTION KINETICS;MOLECULAR BIOLOGY;GENETIC RADIATION EFFECTS

<035110>
TITLE: Radiation Mutagenesis and Repair in Saccharomyces
PROJECT NUMBER: R01-GM-21858-03
PRINCIPAL INVESTIGATOR: Lawrence, C.W.;Christensen, R.;McKee, R.
ADDRESS: 601 Elmwood Avenue, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: National Inst. of General Medical Sciences, Bethesda, Md. (USA)
77 FUNDING: National Inst. of General Medical Sciences FY77:$88,800
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The proposed research aims to examine in detail the genetic consequences of repair of radiation-damaged DNA in the eukaryote Saccharomyces cerevisiae, and the physiology of mutagenesis.
APPROACH: The involvement of the products of a number of radiation-sensitive genes in different mutational processes will be examined using the reversion of well-defined cycl alleles to monitor such events, with particular reference to base pair substitution versus frameshift events and the significance of specific nucleotide sequences. Mutations which suppress one or more of the phenotypes of the radiation sensitive mutants will be examined, in order to discover alternate metabolism pathways, and the physiology of mutagenic repair examined by a variety of techniques, including the use of temperature-sensitive mutations.
KEYWORDS: SACCHAROMYCES CEREVISIAE;BIOLOGICAL RADIATION EFFECTS;DNA;STRAND BREAKS;BIOLOGICAL REPAIR;MOLECULAR BIOLOGY;NUCLEOTIDES;BIOSYNTHESIS;MUTATIONS;RADIOINDUCTION

Department of Health, Education and Welfare/National Institute of Health (Division of Research Resou

<035201>
TITLE: Puerto Rico--Biomedical Effects of Mercury Pollution (Human)
PROJECT NUMBER: M01-RR-00063-150121
PRINCIPAL INVESTIGATOR: Garciacastro, J.M.
ADDRESS: P.O. Box 5067, San Juan, PR 00936
AFFILIATION: Puerto Rico Univ., San Juan
MONITORING AGENCY: National Institutes of Health, Bethesda, Md. (USA)
77 FUNDING: National Institutes of Health
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (100%)

PROJECT DESCRIPTION: Investigations include genetic studies involving chromosomal derangements, population and biochemical genetics, endocrine studies concerning Sheehan's syndrome and other such disorders, hemotherapy of neoplastic diseases and last, but not least, diagnostic and therapeutic studies on arasitic disorders.
ORDS: MAN;MERCURY;TOXICITY;TROPICAL MEDICINE;DISEASES;DIAGNOSIS;THERAPY;BIOLOGICAL EFFECTS

<035202>
TITLE: Lead Toxicity (Human)
PROJECT NUMBER: M01-RR-00068-150082
PRINCIPAL INVESTIGATOR: Brooks, S.M.
ADDRESS: Eden and Bethesda Avenues, Cincinnati, OH 45221
AFFILIATION: Cincinnati Univ., Ohio (USA)
MONITORING AGENCY: National Institutes of Health, Bethesda, Md. (USA)
77 FUNDING: National Institutes of Health
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (100%)
PROJECT DESCRIPTION: Clinical research of areas as follows: (1) Kinetics, genetics, drug therapy, relationship to atherosclerosis; (2) Research in mechanisms of diabetes with particular emphasis on diabetes in pregnancy and the interaction of diabetes with other endocrine systems; (3) Studies in biochemistry and physiology of asthma and other pulmonary conditions with specific focus on the effects of treatment of cortico-steroid metabolism; (4) Studies of the connective tissue diseases with special focus on lupus erythematosis and hydralazine induced systemic lupus; (5) Systemic studies of the treatment and biochemical parameters of alcoholic cirrhosis; (6) Systemic evaluation of the function of the kidney in lipid and apolipoprotein catabolism with studies of apr CII-urea in subjects with nephrotic syndrome; (7) Study of the effects of the non-absorbable new cholesterol lowering compound (sucrose poly-ester) effects on fecal bile acids, neutral sterols and cholesterol.
KEYWORDS: MAN;LEAD;TOXICITY;DIABETES MELLITUS;PREGNANCY;ENDOCRINE GLANDS;PHYSIOLOGY;RESPIRATORY SYSTEM DISEASES;ASTHMA;THERAPY;LUPUS;LIVER CIRRHOSIS;METABOLIC DISEASES;UROGENITAL SYSTEM DISEASES;DISEASES;DIAGNOSIS;THERAPY

<035203>
TITLE: Diagnosis and Therapy in Internal Radionuclide Contamination (Human)
PROJECT NUMBER: M01-RR-00056-160126
PRINCIPAL INVESTIGATOR: Wald, N.
ADDRESS: 3550 Terrace Street, Pittsburgh, PA 15261
AFFILIATION: Pittsburgh Univ., Pa. (USA). School of Medicine
MONITORING AGENCY: National Institutes of Health, Bethesda, Md. (USA)
77 FUNDING: National Institutes of Health
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (100%)
PROJECT DESCRIPTION: Plasma insulin binding capacity of brittle diabetes; neutrophil kinetics; intestinal absorption in progressive systemic sclerosis (scleroderma); factors affecting urinary cyclic amp excretion; metabolic disposition of bethanidine; hypertensive screening protocol; AHR-3050 protocol 15; Parts I, II and III pharmacokinetic studies on bethanidine; neutrophil kinetics utilizing tritiated thymidine; isolation identification and quantitation of isoflavones in human urine and bile; effect of alcohol ingestion on gonodotropin releasing factor responses; plasma gastrin and lower esophageal sphincter tone during the menstrual cycle; physiology of human neutrophysin secretion-plasma neurophysin study during vasopressin related events; investigation of 1-desamino-8-D-arginine-vasopressin in the treatment of central diabetes insipidus; investigation of water loading in adrenal insufficiency; effect of posture on cycles of renal and adrenal function; circadial cycle of cortisol metabolism in normal subjects and in patients with Cushing's syndrome; selective hypoaldosteronism; acute infusion of angiotensin II in patients with essential hypertension; gonadotropin releasing factor responses in alcoholic man.
KEYWORDS: RADIOISOTOPES;INTERNAL IRRADIATION;RADIATION INJURIES;DIAGNOSIS;THERAPY;MAN;MEDICINE;DISEASES

<035204>
TITLE: Thyroid Cancer Screening--Recipients of Radiation Therapy in Childhood
PROJECT NUMBER: M01-RR-00058-160072
PRINCIPAL INVESTIGATOR: Cerletty, J.M.
ADDRESS: 561 N. 15th Street, Milwaukee, WI 53233
AFFILIATION: Medical Coll. of Wisconsin, Milwaukee (USA)
MONITORING AGENCY: National Institutes of Health, Bethesda, Md. (USA)
77 FUNDING: National Institutes of Health
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Research protocols include studies of: (1) normal intestinal absorption and malabsorption in diarrheal diseases; (2) normal and abnormal esophageal function especially regulation of lower esophageal sphincter in patients with achalasia or gastric reflux; (3) abnormal growth and delayed sexual development in children; (4) immunologic reaction in hypersensitivity pneumonitis; (5) effects of neck irradiation in children on development of thyroid diseases, especially thyroid cancer; (6) effects of hormones, calcium and phosphate on carbohydrate tolerance and on insulin and glucagon secretion; (7) therapeutic trials of treatment of Hodgkin's disease, non-Hodgkin's lymphoma, polycythemia vera, and carcinoman of the lung; (8) antigens of human leukemic cells; (9) mechanisms of regulating plasma levels of the lipid-carrying protein (apo-LDL); (10) mechanisms of hypercalciuria and hypophosphatemia in patients with recurrent urinary tract stones; (11) metabolism of 125 (OH2) Vitamin D in health and in patients with hyperparathyroidism, with renal failure, and with kidney stones; (12) therapy of the idiopathic nephrotic syndrome in adults and rapidly progressive glomerular nephritis; (13) a device for continuous measurement on intracranial pressure; and (14) effects of dentatotomy in patients with spasticity.
WORDS: CHILDREN;BIOLOGICAL RADIATION EFFECTS;NECK;IRRADIATION;THYROID;NEOPLASMS;RADIOINDUCTION;DELAYED RADIATION EFFECTS

<035205>
TITLE: Clinical Studies of Low Dose-Rate Teletherapy
PROJECT NUMBER: M01-RR-00058-160079
PRINCIPAL INVESTIGATOR: Wilson, J.F.
ADDRESS: 561 N. 15th Street, Milwaukee, WI 53233
AFFILIATION: Medical Coll. of Wisconsin, Milwaukee (USA)
MONITORING AGENCY: National Institutes of Health, Bethesda, Md. (USA)
77 FUNDING: National Institutes of Health
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: Research protocols include studies of: (1) normal intestinal absorption and malabsorption in diarrheal diseases; (2) normal and abnormal esophageal function especially regulation of lower esophageal sphincter in patients with achalasia or gastric reflux; (3) abnormal growth and delayed sexual development in children; (4) immunologic reaction in hypersensitivity pneumonitis; (5) effects of neck irradiation in children on development of thyroid diseases, especially thyroid cancer; (6) effects of hormones, calcium and phosphate on carbohydrate tolerance and on insulin and glucagon secretion; (7) therapeutic trials of treatment of Hodgkin's disease, non-Hodgkin's lymphoma, polycythemia vera, and carcinoma of the lung; (8) antigens of human leukemic cells; (9) mechanisms of regulating plasma levels of the lipid-carrying protein (apo-LDL); (10) mechanisms of hypercalciuria and hypophosphatemia in patients with recurrent urinary tract stones; (11) metabolism of 125 (OH2) Vitamin D in health and patients with hyperparathyroidism, with renal failure, and with kidney stones; (12) therapy of the idiopathic nephrotic syndrome in adults and rapidly progressive glomerular nephritis; (13) a device for continuous measurement on intracranial pressure and treatment of raised intracranial pressure; and (14) effects of dentatotomy in patients with spasticity.
KEYWORDS: RADIOTHERAPY;PATIENTS;SIDE EFFECTS;NEOPLASMS;PHYSIOLOGY;RADIATION DOSES;DOSE RATES

<035206>
TITLE: Bone Seeking Internal Alpha-Ray Emitters (Human)
PROJECT NUMBER: M01-RR-00088-140053
PRINCIPAL INVESTIGATOR: Evans, R.D.
ADDRESS: 77 Massachusetts Avenue, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: National Institutes of Health, Bethesda, Md. (USA)
77 FUNDING: National Institutes of Health
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The purpose of these studies is to survey the nutritional status of patients in a variety of hospital environments, and to develop more sensitive and functional measures or protein depletion, such as adaptation of the creatinine height index to adults and assessment of the host defense system in adult malnutrition (B and T lymphocyte number and function, leukocyte function, and complement levels and activity). A second series of studies will attempt to manipulate the semistarved state by dietary means so as to minimize the contribution of endogenous protein to energy needs. In contrast to routine protein-sparing therapy with small amounts of carbohydrate, modification of a total fast with small amounts of protein allows better nitrogen economy. Protein-sparing, modified fast will be applied to treatment of other adolescent obese and adult onset obese diabetics, and to minimize the catabolic response to clinically controlled infection (yellow fever vaccine).
KEYWORDS: RADIOISOTOPES;TISSUE DISTRIBUTION;BONE TISSUES;RADIONUCLIDE KINETICS;ALPHA SOURCES;PATIENTS;HOSPITALS;ENVIRONMENTAL EFFECTS;PROTEINS;METABOLISM;METABOLIC DISEASES;DIET;DIABETES MELLITUS;CARBOHYDRATES;ADOLESCENTS;INFECTIOUS DISEASES;DIAGNOSIS

Department of Health, Education and Welfare/National Institute of Neurological and Communicative Dis

<035301>
TITLE: Radiation Induced Changes in Neonatal Nervous System
PROJECT NUMBER: R01-NS-04761-14
PRINCIPAL INVESTIGATOR: Gilmore, S.A.
ADDRESS: 4301 W. Markham Street, Litte Rock, AR 72201
AFFILIATION: Arkansas Univ., Little Rock (USA)
MONITORING AGENCY: National Inst. of Neurological Diseases and Stroke, Bethesda, Md. (USA)
77 FUNDING: National Inst. of Neurological Diseases and Stroke FY77:$32,300
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The objectives of this research are to investigate (1) effects of ionizing radiation on the immature spinal cord, (2) the reparative and regenerative capacities of the immature nervous system, and (3) the manner in which ionizing radiation alters these capacities.
APPROACH: All experiments are carried out in rats because the developmental state of these animals at birth makes it possible to study the immature nervous system ex utero. Neurologic, histopathologic and autoradiographic methods are used in this research. The responses of the immature nervous system to injury are compared and contrasted with those reported by others in the adult nervous system/ this, perhaps, will provide some insight into the reactions and limitations occurring in the mature state. In addition to the experimental data, the information derived from intact, control animals will contribute to the understanding of normal maturation of the nervous system.
KEYWORDS: RATS;BIOLOGICAL RADIATION EFFECTS;NERVOUS SYSTEM;NEONATES;DELAYED RADIATION EFFECTS

Department of Health, Education and Welfare/National Institute of Child Health and Human Development

<035401>
TITLE: Developmental Effects of Low Level Lead Exposure
PROJECT NUMBER: P01-HD-08945-03
PRINCIPAL INVESTIGATOR: Needleman, H.L.;Gunnoe, C.E.;Lorenzo, A.;Averill, D.;Maher, C.
ADDRESS: 300 Longwood Avenue, Boston, MA 02115
AFFILIATION: Children's Hospital Medical Center, Boston, Mass. (USA)

MONITORING AGENCY: National Inst. of Child Health and Human Development, Bethesda, Md. (USA)
77 FUNDING: National Inst. of Child Health and Human Development FY77:$210,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (100%)
PROJECT DESCRIPTION: This program project is studying the effects of lead at doses less than those associated with clinical symptoms on the development of school age children and experimental organisms.
APPROACH: Lead burden is measured in children in the first two grades, and neuropsychologic function is measured in high and low exposure groups. The relationship of confounding covariates to outcome is controlled in the analysis. Transport of aminoacids into the brain, synaptogenesis and dentritic complexity is being studied in the rabbit and rodent at controlled doses of lead lower than those which produce frank encephalopathy.
KEYWORDS: CHILDREN;LABORATORY ANIMALS;LEAD;TOXICITY;NERVOUS SYSTEM;BIOLOGICAL EFFECTS;PATHOLOGICAL CHANGES

<035402>
TITLE: In Vitro Teratologic Assay System with P-450 Metabolism
PROJECT NUMBER: R01-HD-10868-01
PRINCIPAL INVESTIGATOR: Manson, J.M.;Smith, C.C.;Bus, J.S.;Cristian, R.C.;Niemeier, R.
ADDRESS: Eden and Bethesda Avenues, Cincinnati, OH 45221
AFFILIATION: Cincinnati Univ., Ohio (USA)
MONITORING AGENCY: National Inst. of Child Health and Human Development, Bethesda, Md. (USA)
77 FUNDING: National Inst. of Child Health and Human Development FY77:$146,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
PROJECT DESCRIPTION: Our first objective is to utilize cyclophosphamide as a model compound to evolve procedures necessary to achieve cytochrome P-450 metabolism in vitro and delivery of metabolites to the developing limb. These procedures will be used to elucidate the mechanism of cyclophosphamide-induced teratogenesis, as well as the conditions related to maternal and fetal metabolism of cyclophosphamide. Our second objective is to apply the model system to environmentally-related compounds such as benzo(a)pyrene, diethylstylbesterol, and tap water concentrates to investigate the influence of P-450 metabolism on their teratogenic activity.
KEYWORDS: ENDOXAN;BIOLOGICAL EFFECTS;TERATOGENESIS;ETIOLOGY;METABOLISM;FEMALES;FETUSES;CARCINOGENS;BENZOPYRENE;STILBESTROL;BIOLOGICAL MODELS

Department of Health, Education and Welfare/National Heart, Lung and Blood Institute

<035451>
TITLE: Respiratory Diseases Due to Occupational Exposure
PROJECT NUMBER: P60-HL-17292-030002
PRINCIPAL INVESTIGATOR: Bobbins, A.
ADDRESS: 85 S. Prospect Street, Burlington, VT 05401
AFFILIATION: Vermont Univ., Burlington (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (33%);METALS (33%);ORGANICS (34%)
PROJECT DESCRIPTION: The Vermont Lung Center has as its major objectives: (1) the integration into a cohesive operational system of existing lung programs in research, education, clinical demonstration, and regional disease management, including dissemination of information and technical assistance, health statistics and prevention and control; (2) interdisciplinary study, prevention and control of pneumoconiosis; (3) research in the pathology and management of acute pulmonary trauma, in basic methodology of computer-assisted instruction in pulmonary physiology in the pathology, pathogenesis, biochemistry, immunology, and cell physiology of diffuse interstitial lung disease (Vermont SCOR); (4) clinical demonstration and rapid application of new research findings in lung disease using the Problem Oriented Medical Information System (PROMIS); (5) regional management of specified lung disease problems utilizing an inter-hospital computer network; (6) graduate and post-graduate education using audio-visual aids and regional interactive television; (7) public education and information geared to lung disease problems specified by the regional Lung Disease Management Committee; and (8) provision of a broadly based, multi-disciplinary Training Environment for undergraduate, graduate and post-graduate scientists, physicians, nurses, and allied health professionals in the various facets of research, clinical practice,
KEYWORDS: VERMONT;HUMAN POPULATIONS;RESPIRATORY SYSTEM DISEASES;EPIDEMIOLOGY;DATA COMPILATION;PNEUMOCONIOSES;HEALTH HAZARDS;COMPUTERS;INFORMATION SYSTEMS;ETIOLOGY

<035452>
TITLE: Mineral Pneumoconioses--Pathogenesis and Pathology (Human)
PROJECT NUMBER: P60-HL-17292-030005
PRINCIPAL INVESTIGATOR: Craighead, J.E.
ADDRESS: 85 S. Prospect Street, Burlington, VT 05401
AFFILIATION: Vermont Univ., Burlington (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (33%);METALS (33%);ORGANICS (34%)
PROJECT DESCRIPTION: This project is part of a broader program (HL 17292-03) whose summary states: The Vermont Lung Center has as its major objectives: (1) the integration into a cohesive operational system of existing lung programs in research, education, clinical demonstration, and regional disease management, including dissemination of information and technical assistance, health statistics and prevention and control; (2) intedisciplinary study, prevention and control of pneumoconiosis; (3) research in the pathology and management of acute pulmonary trauma, in basic methodology of computer-assisted instruction in pulmonary physiology in the pathology, pathogenesis, biochemistry, immunology, and cell physiology of diffuse interstitial lung disease (Vermont SCOR); (4) clinical demonstration and rapid application of new

research findings in lung disease using the Problem Oriented Medical Information System (PROMIS); (5) regional management of specified lung disease problems utilizing an inter-hospital computer network; (6) graduate and post-graduate education using audio-visual aids and regional interactive television; (7) public education and information geared to lung disease problems specified by the regional Lung Disease Management Committee; and (8) provision of a broadly based, multi-disciplinary Training Environment for undergraduate, graduate and post-graduate scientists, physicians, nurses, and allied health professionals in the various facets of research, clinical practice, teaching and continuing education in the biology of the lung, disease of the lung, and health care management of categorical problems related to lung.
KEYWORDS: VERMONT;HUMAN POPULATIONS;RESPIRATORY SYSTEM DISEASES;EPIDEMIOLOGY;ETIOLOGY;DATA COMPILATION;COMPUTERS;INFORMATION SYSTEMS;PNEUMOCONIOSES;HEALTH HAZARDS

<035453>
TITLE: Clinical Study of Industry Related Lung Disease in Vermont
PROJECT NUMBER: P60-HL-17292-030012
PRINCIPAL INVESTIGATOR: Graham, W.G.
ADDRESS: 85 S. Prospect Street, Burlington, VT 05401
AFFILIATION: Vermont Univ., Burlington (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (33%);METALS (33%);ORGANICS (34%)
PROJECT DESCRIPTION: This project is part of a broader program (HL 17292-03) whose summary states: The Vermont Lung Center has as its major objectives: (1) The integration into a cohesive operational system of existing lung programs in research, education, clinical demonstration, and regional disease management, including dissemination of information and technical assistance, health statistics and prevention and control; (2) interdisciplinary study, prevention and control of pneumoconiosis; (3) research in the pathology and management of acute pulmonary trauma, in basic methodology of computer-assisted instruction in pulmonary physiology in the pathology, pathogenesis, biochemistry, immunology, and cell physiology of diffuse interstitial lung disease (Vermont SCOR); (4) clinical demonstration and rapid application of new research findings in lung disease using the Problem Oriented Medical Information System (PROMIS); (5) regional management of specified lung disease problems utilizing an inter-hospital computer network; (6) graduate and post-graduate education using audio-visual aids and regional interactive television; (7) public education and information geared to lung disease problems specified by the regional Lung Disease Management Committee; (8) provision of a broadly based, multi-disciplinary Training Environment for undergraduate, graduate and post-graduate scientists, physicians, nurses, and allied health professionals in the various facets of research, clinical practice, teaching and continuing education in the biology of the lung, disease of the lung, and health care management of categorical problems related to the lung.
KEYWORDS: VERMONT;HUMAN POPULATIONS;RESPIRATORY SYSTEM DISEASES;EPIDEMIOLOGY;ETIOLOGY;DATA COMPILATION;COMPUTERS;INFORMATION SYSTEMS;AIR POLLUTION;HEALTH HAZARDS

<035454>
TITLE: Occupational Health Education Project
PROJECT NUMBER: P60-HL-17292-030017
PRINCIPAL INVESTIGATOR: Slack, H.
ADDRESS: 85 S. Prospect Street, Burlington, VT 05401
AFFILIATION: Vermont Univ., Burlington (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (33%);METALS (33%);ORGANICS (34%)
PROJECT DESCRIPTION: This project is part of a broader program (HL 17292-03) whose summary states: The Vermont Lung Center has as its major objectives: (1) the integration into a cohesive operational system of existing lung programs in research, education, clinical demonstration, and regional disease management, including dissemination of information and technical assistance, health statistics and prevention and control; (2) interdisciplinary study, prevention and control of pneumoconiosis; (3) research in the pathology and management of acute pulmonary trauma, in basic methodology of computer-assisted instruction in pulmonary physiology in the pathology, pathogenesis, biochemistry, immunology, and cell physiology of diffuse interstitial lung disease (Vermont SCOR); (4) clinical demonstration and rapid application of new research findings in lung disease using the Problem Oriented Medical Information System (PROMIS); (5) regional management of specified lung disease problems utilizing an inter-hospital computer network; (6) graduate and post-graduate education using audio-visual aids and regional interactive television; (7) public education and information geared to lung disease problems specified by the regional Lung Disease Management Committee; (8) provision of a broadly based, multi-disciplinary Training Environment for undergraduate, graduate and post-graduate scientists, physicians, nurses, and allied health professionals in the various facets of research, clinical practice, teaching and continuing education in the biology of the lung, disease of the lung, and health care management of categorical problems related to the lung.
KEYWORDS: VERMONT;HUMAN POPULATIONS;RESPIRATORY SYSTEM DISEASES;EPIDEMIOLOGY;ETIOLOGY;DATA COMPILATION;COMPUTERS;INFORMATION SYSTEMS

<035455>
TITLE: Hyperbaric Oxygen, Carbon Monoxide, and Ozone or Peroxide Toxicity (Rats)
PROJECT NUMBER: P50-HL-15061-060012
PRINCIPAL INVESTIGATOR: Chance, B.
ADDRESS: 36th and Hamilton Walk, Philadelphia, PA 19104
AFFILIATION: Pennsylvania Univ., Philadelphia (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (100%)
PROJECT DESCRIPTION: This project is part of a broader program (HL 15061-06) whose summary states: A proposal is made for a supplement to the Specialized Center of Research (SCOR) at the University of Pennsylvania. As in the original proposal, the topic is The Response of the Lung to Injury. Six additional programs are outlined and described either as extensions of work currently in progress or as direct off-shoots of current research. The particular components are as follows: Metabolism of Lipoproteins by Lung--Julian

Marsh, et al. Studies of Lipids and Basement Membrane of Endothelial Cells--Barbara Howard, et al. Immune Response of Pulmonary Lymphocytes to Influenza Virus--Normal Klinman, et al. Immunocompetent Cells of the Lung--Ronald Daniele, and David Rowlands. Molecular mechanisms of hyperbaric oxygen, carbon monoxide, and ozone or peroxide toxicity evaluated at the subcellular and organ levels--Britton Chance. Mitochondrial respiratory activity in fetus and newborn--Robert Forster and Maria Delivoria. The proposal not only describes these projects separately but also demonstrates their relationship to existing projects.
KEYWORDS: RATS;RESPIRATION;OXYGEN;HIGH PRESSURE;CARBON MONOXIDE;TOXICITY;PEROXIDES;RESPIRATORY SYSTEM;PHYSIOLOGY;OZONE;LUNGS;CELL MEMBRANES;CHEMICAL COMPOSITION;LIPIDS;IMMUNE REACTIONS;LYMPHOCYTES;INFLUENZA VIRUSES;MOLECULAR BIOLOGY;FETUSES;INFANTS;CELL CONSTITUENTS;MITOCHONDRIA;TOLERANCE

<035456>
TITLE: Pulmonary Function Industrial Population Unexposed to Injurious Inhalants
PROJECT NUMBER: P50-HL-15092-060004
PRINCIPAL INVESTIGATOR: Weill, H.
ADDRESS: 1430 Tulane Avenue, New Orleans, LA 70118
AFFILIATION: Tulane Univ., New Orleans, La. (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: This project is part of a broader program (HL 15092-06) whose summary states: The goal of this SCOR program is to provide the scientific basis for the prevention of fibrotic and immunologic lung diseases which are related to the occupational environment. A multidisciplinary approach is utilized in order to establish causal relationships, dose-response curves, and threshold levels of exposure in lung disorders which are related to the inhalation of mineral and organic dusts, and chemical vapors and gases. Disciplines incorporated in this Center include pulmonary physiology, epidemiology, biostatistics, immunology, chest roentgenography, bioengineering, environmental chemistry and industrial hygiene. Significant emphasis is placed on newer methods of characterizing the inhaled environment which should lead to establishment of those methods which relate best to the indexes of an altered biologic response, and therefore most closely estimate the true exposure dose. The overall significance of this program lies in the fact that these occupational lung disorders are potentially completely preventable, and data from these studies should lead to the establishment of rational occupational environmental standards for hazardous inhalants.
KEYWORDS: RESPIRATORY SYSTEM DISEASES;PERSONNEL;EPIDEMIOLOGY;ETIOLOGY;DATA COMPILATION;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;TOXIC MATERIALS;INHALATION;BIOLOGICAL EFFECTS;INDUSTRIAL MEDICINE

<035457>
TITLE: Tolerance to Respiratory Gases in Health and Disease
PROJECT NUMBER: P01-HL-08899-13
PRINCIPAL INVESTIGATOR: Lambertsen, C.J.;Abraham, A.;Clark, J.M.;Cowley, J.R.;Fink, L.
ADDRESS: 36th and Hamilton Walk, Philadelphia, PA 19104
AFFILIATION: Pennsylvania Univ., Philadelphia (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$798,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
APPROACH: Investigations of the biological effects of metabolically active and inert respiratory gases were performed by dose-response methods to elaborate limits of tolerance to increasing partial pressures or density. Adaptations and deteriorations of sensory, cognitive, neuromuscular, pulmonary, respiratory, cardiovascular and exercise functions were determined to provide bases both for elucidating mechanisms of gas effects and predicting the consequences of complex exposures. Investigation of inert gas exchange in organs and tissues provided the basis for systems of decompression and aids understanding of biophysical factors in bubble formation and resolution. A major area of investigation concerns oxygenation and oxygen tolerance. Within the narrow range of oxygen pressures tolerated by living cells, the processes of cellular oxidation and energy metabolism depend upon effective delivery of oxygen to the metabolic site and the balance of oxidant-antioxidant processes. Inadequate tissue oxygenation limits the ultimate oxidation process. Excessive oxygenation, as in therapeutic or other use of high oxygen pressures, disrupts the enzyme activity upon which oxidation itself depends. Both oxygenation and oxidation processes, and even the poisoning by hypoxia, are affected by exposures to extreme alterations of carbon dioxide, inert gases, and certain respired toxic gases.
KEYWORDS: RESPIRATION;GASES;DENSITY;CRITICAL PRESSURE;ANOXIA;OXYGEN;HIGH PRESSURE;PHYSIOLOGY;BIOLOGICAL EFFECTS;MAN;TOLERANCE;RESPIRATORY SYSTEM;METABOLISM

<035458>
TITLE: Center for the Study of Chronic Airway Diseases
PROJECT NUMBER: P50-HL-14179-06
PRINCIPAL INVESTIGATOR: Bouhuys, A.;Glenn, W.W.;Gottschalk, A.
ADDRESS: 333 Cedar Street, New Haven, CT 06510
AFFILIATION: Yale Univ., New Haven, Conn. (USA). School of Medicine
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$1,035,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: Our SCOR program concerns the highly prevalent groups of diseases--termed ''chronic airway diseases'' in this proposal--which have as common features: (1) the presence of wheezing, sputum production, or cough, or a combination of these, often combined with shortness of breath, as principal symptoms; (2) the presence of airway obstruction as defined by lung function tests, varying in degree, duration, age of onset and amenability to drug treatment; (3) airway smooth muscle contraction, secretion of mucus in the bronchial tree, inflammation of the airway mucosa, or loss of structural support of the

airways or any combination of these, are the main underlying pathological processes; and (4) an increased susceptibility--specific or nonspecific--to inhaled irritants, air pollutants and infectious agents affecting the respiratory tract.
KEYWORDS: RESPIRATORY SYSTEM DISEASES;ETIOLOGY;LUNGS;PATHOLOGICAL CHANGES;PHYSIOLOGY;THERAPY;DRUGS;RESPIRATORY SYSTEM

<035459>
TITLE: Immune and Fibrotic Responses to Occupational Environment
PROJECT NUMBER: P50-HL-15092-06
PRINCIPAL INVESTIGATOR: Weill, H.
ADDRESS: 1430 Tulane Avenue, New Orleans, LA 70118
AFFILIATION: Tulane Univ., New Orleans, La. (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$669,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: The goal of this SCOR program is to provide the scientific basis for the prevention of fibrotic and immunologic lung diseases which are related to the occupational environment.
APPROACH: A multidisciplinary approach is utilized in order to establish causal relationships, dose-response curves, and threshold levels of exposure in lung disorders which are related to the inhalation of mineral and organic dusts, and chemical vapors and gases. Disciplines incorporated in this center include pulmonary physiology, epidemiology, biostatistics, immunology, chest roentgenography, bioengineering, environmental chemistry and industrial hygiene. Significant emphasis is placed on newer methods of characterizing the inhaled environment which should lead to establishment of those methods which relate best to the indexes of an altered biologic response, and therefore most closely estimate the true exposure dose.
RESULTS: The overall significance of this program lies in the fact that these occupational lung disorders are potentially completely preventable, and data from these studies should lead to the establishment of rational occupational environmental standards for hazardous inhalants.
KEYWORDS: RESPIRATORY SYSTEM DISEASES;ETIOLOGY;LUNGS;PATHOLOGICAL CHANGES;RESPIRATORY SYSTEM;PHYSIOLOGY;PERSONNEL;ENVIRONMENTAL EFFECTS;HAZARDOUS MATERIALS;INHALATION;IMMUNE REACTIONS

<035460>
TITLE: Bio-Organic Cemistry of Ozone, NO2 and Tobacco Smoke
PROJECT NUMBER: R01-HL-16029-04
PRINCIPAL INVESTIGATOR: Pryor, W.A.;Grady, G.L.;Graham, W.D.;Terauchi, K.
ADDRESS: University Station, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$71,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (10%);PARTICULATES (10%);ORGANICS (30%)
PROJECT DESCRIPTION: We propose to continue our study of the reactions of the airborne pollutants ozone, nitrogen dioxide, and cigarette smoke. All of these toxic pollutants either are free radicals or cause the formation of free radicals when they react with organic materials.
APPROACH: We have chosen initially to concentrate our study on the reactions of these toxic agents with polyunsaturated fatty acids (PUFA) in a series of model systems of increasing complexity, starting with simple chemical model systems such as PUFA esters and lipids, then to aqueous systems such as liposome, and finally to biological membranes, in pulmonary alveolar macrophages.
RESULTS: We have established that both ozone and nitrogen dioxide initiate the destructive autoxidation of PUFA both in lipophilic and hydrophilic systems. The lierature clearly establishes that this destructive autoxidation causes damage to membranes, occurs in vivo, and can cause cell death. It is the aim of our research to provide a continuum in understanding between the chemical events that occur when PUFA are exposed to ozone or nitrogen dioxide and the biological damage that these agents cause. We have shown that autoxidation of PUFA produces prostaglandins. This suggests that the bioorganic chemistry of endoperoxides and cyclic peroxides related to those in prostaglandin biosynthesis is of considerable importance in free radical biology. In our study of cigarette smoke, we have identified and quantified the radicals present in filtered smoke by the technique of spin traps and electron spin resonance (ESR). We are investigating the reactions of radicals in smoke with biologically important molecules. For example, we have shown that smoke radicals react with the tar produced by cigarettes; we believe that these reactions are involved in the carcinogenicity of smoke.
KEYWORDS: AIR POLLUTION;OZONE;NITROGEN DIOXIDE;TOBACCO SMOKES;TOXICITY;IN VITRO;CELL CULTURES;BIOCHEMICAL REACTION KINETICS;MOLECULAR BIOLOGY

<035461>
TITLE: Pulmonary Tissue Injury and Repair
PROJECT NUMBER: R01-HL-16330-05
PRINCIPAL INVESTIGATOR: Evans, M.J.;Cabralanderson, L.J.;Freeman, G.
ADDRESS: 333 Ravenswood Avenue, Menlo Park, CA 94025
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
PROJECT DESCRIPTION: The proposed research is a continuation of ongoing studies concerning pulmonary cell renewal as related to tissue injury and repair.
APPROACH: Three areas of study are proposed. In the first, we will determine if the proliferative response following injury is a quantitative measure of the amount of injury. This will be accomplished by correlating the proliferative response with morphometric measurements of the amount of tissue damage following exposure to NO2. In the second area, we will test the ability of dietary vitamin E and selenium to alter the amount of lung damage. This will be accomplished by quantitating the amount of injury following exposure to NO2 of rats with diets supplemented and deficient in these antioxidants. In the third area, we will determine if tolerance in the epithelium of rats exposed to NO2 is associated with

increased turnover or accumulation of cells. This will be accomplished by measuring the proliferative response and differentiation of Type 2 cells to Type 1 cells and nonciliated bronchiolar cells to ciliated cells in the epithelium tolerant to NO2.
YWORDS: RATS;DIET;TOLERANCE;NITROGEN DIOXIDE;TOXICITY;RESPIRATORY SYSTEM;INJURIES;BIOLOGICAL REPAIR;PHYSIOLOGY;CYTOLOGY;EPITHELIUM

<035462>
TITLE: Airborne Metals and Lung Permeability
PROJECT NUMBER: R01-HL-16674-04
PRINCIPAL INVESTIGATOR: Gatzy, J.T.
ADDRESS: Manning Drive, Chapel Hill, NC 27514
AFFILIATION: North Carolina Univ., Chapel Hill (USA). School of Medicine
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$42,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: NOXIOUS GAS (30%);METALS (40%);PARTICULATES (15%);ORGANICS (15%)
PROJECT DESCRIPTION: The objectives of this project are twofold: (1) to determine the factors that control the movement of solute and water across the lung epithelium; and (2) to elucidate the effects of airborne metals such as mercury and cadmium and of air pollutants such as ozone, sulfates, nitrates, and cigarette smcke on these control mechanisms.
APPROACH: Two biolcgical preparations, the amphibian lung and the perfused, microlavaged, mammalian alveolar sac, will be utilized to pursue the objectives. Fluxes of ions, water and heavy metals across the entire lung wall and luminal membrane of the alveolar epithelial cells will be measured in the excised bullfrog lung mounted as a planar sheet or as a sac. The effect of sulfhydryl compounds, EDTA, imidazoles and antioxidants on metal binding and on metal and ozone induced permeability changes will be measured in the intact, excised lung and in epithelial cells separated by enzymatic procedures. Similar measurements will be made by micropuncture techniques on the mammalian alveolar sac. Differences in the patterns of heavy metal protection afforded by luminal and blood-borne complexing agents may make it possible to differentiate between vascular and epithelial sites of metal action. In addition, changes in the pattern of response to heavy metals in lungs from animals with a surfeit of deficit of essential substances such as zinc, selenium and vitamin E may help identify cellular constituents that protect against lung damage.
KEYWORDS: LUNGS;PHYSIOLOGY;EPITHELIUM;MEMBRANE TRANSPORT;WATER;MERCURY;CADMIUM;SOLUBILITY;OZONE;SULFATES;NITRATES;TOBACCO SMOKES;IN VITRO;TISSUES;MOLECULAR BIOLOGY

<035463>
TITLE: Mucociliary Transport Mechanisms
PROJECT NUMBER: R01-HL-17816-03
PRINCIPAL INVESTIGATOR: Sackner, M.A.;Landa, J.F.;Michaelson, E.D.
ADDRESS: 4300 Alton Road, Miami Beach, FL 33140
AFFILIATION: Mount Sinai Medical Center, Miami Beach, Fla. (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: This study will extend observations made with a roentgenographic technique for measuring tracheal mucous velocity in unanesthetized sheep, normal humans and patients with chronic obstructive lung disease. Investigations will be made of the effects of environmental pollutants, drugs, and cigarette smoking on tracheal mucous velocity. The recovery of tracheal mucous velocity from oxygen suppression will also be determined.
APPROACH: An in vivo technique for measuring rheology of mucus will be applied to the study of pathologic conditions. Modifications by pharmacologic agents and air pollutants of tracheal mucous velocity will be investigated.
KEYWORDS: SHEEP;MAN;PATIENTS;TRACHEA;MUCOUS MEMBRANES;PHYSIOLOGY;RESPIRATORY SYSTEM DISEASES;MEMBRANE TRANSPORT;PATHOLOGICAL CHANGES;AIR POLLUTION;DRUGS;TOBACCO SMOKES;BIOLOGICAL EFFECTS;BIOMEDICAL RADIOGRAPHY;ETIOLOGY

<035464>
TITLE: Evaluation of Anti-Fibrotic Agents in Pulmonary Fibrosis
PROJECT NUMBER: R01-HL-19720-02
PRINCIPAL INVESTIGATOR: Giri, S.N.
ADDRESS: School of Veterinary Medicine, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA). School of Veterinary Medicine
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: The aim of the proposed investigation is to develop a scientific basis for screening a potentially desirable antifibrotic agent which could be of therapeutic value against the pulmonary fibrotic lesions.
APPROACH: In this regard, first, attempts will be made to develop an acceptable model of pulmonary fibrosis in rats similar to humans by administering the herbicide paraquat. Thereafter, the effectiveness of anticollagenous agents such as zinc, beta-amino propionitrile and D-penicillamine against the pulmonary fibrosis will be tested. The ability of each antifibrotic agents to prevent and/or reverse the lung fibrosis will be evaluated by histopathological, biochemical and pulmonary function test studies.
RESULTS: We believe that this type of multidisciplinary approach will not only provide a better understanding for the pathophysiological mechanism responsible for the genesis of lung fibrosis, but will also help us to search for a better therapeutically efficacious anti-fibrotic compound.
KEYWORDS: RATS;LUNGS;FIBROSIS;THERAPY;DRUGS;PHARMACOLOGY

<035465>
TITLE: Effect of Pollutants on Organotypic Lung Cultures
PROJECT NUMBER: R01-HL-21008-01
PRINCIPAL INVESTIGATOR: Douglas, W.H.;Delvecchio, P.;Laduke, M.
ADDRESS: Box 631, Lake Placid, NY 12946
AFFILIATION: Jones (W.Alton) Cell Science Center, Lake Placid, N.Y. (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$28,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: Utilizing an organotypic in vitro system, which shares many characteristics with lungs in whole animals, we plan to examine the toxicity of various gaseous and particulate air pollutants on the histotypic organization of the cultures and on the synthesis, storage and secretion of the pulmonary surfactant by the type II alveolar pneumonocytes.
APPROACH: After demonstrating that certain ultrastructural, cytochemical and biochemical characteristics found in whole lung are also present in our organotypic systems, we will subject the system to pollutants and observe the changes. More specifically, we will monitor the effects of pollutants on surfactant production by determining the rates of incorporation of 14C-choline into saturated lecithin and the cytochemical distribution of esterases. Fine structure analysis will be by transmission and scanning electron microscopy.
KEYWORDS: LUNGS;TISSUE CULTURES;HAZARDOUS MATERIALS;TOXICITY;IN VITRO;CYTOLOGY;BIOCHEMISTRY;TRACER TECHNIQUES;MUCOUS MEMBRANES;PHYSIOLOGY;BIOLOGICAL EFFECTS

<035466>
TITLE: Effects of Air Pollutants on Lung Cells in Culture
PROJECT NUMBER: R01-HL-21009-01
PRINCIPAL INVESTIGATOR: Smith, J.R.;Douglas, W.H.;Hospelhorn, V.D.;Farrell, P.M.
ADDRESS: Box 631, Lake Placid, NY 12946
AFFILIATION: Jones (W.Alton) Cell Science Center, Lake Placid, N.Y. (USA)
MONITORING AGENCY: National Heart, Lung, and Blood Inst., Bethesda, Md. (USA)
77 FUNDING: National Heart FY77:$95,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
PROJECT DESCRIPTION: We plan to develop an in vitro system (which is relevant to an in vivo situation) for assessing the toxicity of oxidant air pollutants and to utilize this system to learn more about the effects of air pollutants at the cellular and subcellular level.
APPROACH: The L-2 rat lung cell strain will be used in the study. It retains differentiated characteristics possessed by the type II alveolar epithelial cells present in whole lung. Like their in vivo counterparts, L-2 cells synthesize a highly saturated lecithin which is the major component of environmental pollutants on surfactant production by type II alveolar epithelial cell in whole lung. To this end we will employ a range of assays to detect degrees of damage ranging from very subtle changes in cell function to outright cell death and determine the degree of toxicity of various doses of different pollutants and various oxygen concentrations. We will also investigate the feasibility of utilizing antioxidants as protection against the deleterious effects of those agents. A wide range of antioxidants will be tested including d1-a-tocopherol.
KEYWORDS: RATS;LUNGS;CELL CULTURES;PHOTOCHEMICAL OXIDANTS;TOXICITY;TESTING;BIOLOGICAL EFFECTS;DOSE-RESPONSE RELATIONSHIPS;PATHOLOGICAL CHANGES;AIR POLLUTION;HEALTH HAZARDS

Department of Health, Education and Welfare/National Institute on Aging

<035551>
TITLE: Relationships of Diet and Air Pollutants to Aging
PROJECT NUMBER: R01-AG-00174-03
PRINCIPAL INVESTIGATOR: Privett, O.S.
ADDRESS: 801 16th Avenue NE, Austin, MN 55912
AFFILIATION: Minnesota Univ., Austin (USA)
77 FUNDING: FY77:$57,600
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
PROJECT DESCRIPTION: The overall objective of this research is to gain an insight into metabolic-structural effects and interrelationships of dietary and environmental factors that influence lipid composition and underlying enzyme reactions associated with aging and related metabolic disorders. It is proposed to study the accumulation of the aging pigment in rats of different ages fed diets containing fats of low, high and medium degrees of unsaturation. Another objective will be to define more clearly the influence of aging on the isoenzyme pattern of lactate dehydrogenase of serum and tissues, relative to dietary and environmental factors. It is also proposed to study the effect of ozone in the atmosphere in lipids and lipid-protein interactions in lung surfactant, and the reactions that underlie the accelerating effects of x-irradiation on aging using rats as the animal model. Biochemical changes will be correlated with histologic studies of the same tissues.
KEYWORDS: RATS;DIET;AIR POLLUTION;BIOLOGICAL EFFECTS;BIOLOGICAL RADIATION EFFECTS;SYNERGISM;AGE DEPENDENCE;PATHOLOGICAL CHANGES;BIOCHEMICAL REACTION KINETICS;HAIR;PIGMENTS;BLOOD SERUM;TISSUES;LACTATE DEHYDROGENASE;X RADIATION;METABOLISM

Department of Health, Education and Welfare/National Institute of Arthritis, Metabolism and Digestiv

<035601>
TITLE: X-Irradiation, Bile Salts and Intestinal Transport
PROJECT NUMBER: R01-AM-18406-03
PRINCIPAL INVESTIGATOR: Feldman, E.B.;Feldman, D.S.

ADDRESS: 1459 Gwinnett Street, Augusta, GA 80902
AFFILIATION: Medical Coll. of Georgia, Augusta (USA)
MONITORING AGENCY: National Inst. of Arthritis, Metabolism, and Digestive Diseases, Bethesda, Md. (USA)
FUNDING: National Inst. of Arthritis FY77:$31,200
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
PROJECT DESCRIPTION: The role of bile salts in the intestinal radiation syndrome will be delineated so that practical measures to prevent or ameliorate the syndrome can be recommended.
APPROACH: Bile acid composition, concentration and turnover will be measured in irradiated rats. Effects of bile salts, bile diversion and irradiation on intestinal transport of nutrients and electrolytes via transmucosal and shunt pathways will be measured. Electrophysiological studies of voltage clamping, input resistance and cable properties will characterize intestinal mucosal function in irradiated rats and delineated effects of bile salts and bile diversion. These data should support or refute the hypothesis that the intestinal radiation syndrome is a form of choleraic enteropathy, responsive to treatment. Basic physiologic information will be obtained concerning intestinal cellular function and the role of bile salts.
KEYWORDS: RATS;BIOLOGICAL RADIATION EFFECTS;BILE ACIDS;INTESTINAL ABSORPTION;MEMBRANE TRANSPORT;X RADIATION

<035602>
TITLE: Obesity and Physiological Response to Environment
PROJECT NUMBER: R01-AM-08311-13
PRINCIPAL INVESTIGATOR: Buskirk, E.R.;Mendez, J.;Nicholas, W.C.;Kollias, J.;Gahagan, H.E.;Hodgson, J.L.
ADDRESS: 201 Shields Building, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: National Inst. of Arthritis, Metabolism, and Digestive Diseases, Bethesda, Md. (USA)
77 FUNDING: National Inst. of Arthritis FY77:$62,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
PROJECT DESCRIPTION: The study of the physiological consequences of obesity is important.
APPROACH: The physiological responses of the obese to environmental variables such as: heat, cold, physical work, hypoxia, hyperoxia, hypo and hypercapnia, air pollutants, etc.
KEYWORDS: MAN;ENVIRONMENT;BIOLOGICAL EFFECTS;PHYSIOLOGY;METABOLIC DISEASES;TEMPERATURE DEPENDENCE;BIOLOGICAL STRESS;ANOXIA;AIR POLLUTION

Department of Interior/Fish and Wildlife Services

<051001>
TITLE: RFF Forum on the Impact on Western Waters, Fish, and Wildlife of Energy Development
PROJECT NUMBER: 77BBO
PRINCIPAL INVESTIGATOR: Spofford, W.O.
ADDRESS: Resources for the Future, Inc., 1755 Massachusetts Avenue, N.W., Washington, DC 20036
AFFILIATION: Resources for the Future, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA)
DIVISION: U.S. Office of Biological Services
MONITOR: Hayden, Robert
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (80%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (10%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Site specific Upper Colorado River;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: An issue of particular importance regarding the development of western energy resources is its impact on the water resources of the region, water quality as well as water supply, and the subsequent impact on fish, wildlife, and vegetation. The Forum will concentrate on these impacts in the Upper Colorado Basin which is located in parts of Wyoming, Utah, Colorado, New Mexico, and Arizona. The intent of the Forum is to bring together the results of the most recent research on the energy-related impacts, and to identify specific potential fish and wildlife related problems and delineate research needs.
APPROACH: Relevant questions to be addressed by the Forum include: What impact will the inevitable changes in the hydrologic regime of this region, both surface waters and groundwaters, have on fish, wildlife, and vegetation. How is the existing riparian habitat of this basin likely to change with energy development, and what impact will these changes have on the fish and wildlife of the region. How can the region best be managed to provide a suitable environment for fish and wildlife, with particular consideration given to the need for, and establishment of, maintenance flows. More broadly, what are the future ecological implications of developing the energy resources of the Upper Colorado River Basin.
RESULTS: Final report expected by September 1978.
KEYWORDS: ENERGY SOURCES;FISHES;WILD ANIMALS;ENVIRONMENTAL EFFECTS;PLANTS;WATER RESOURCES;WATER QUALITY;MEETINGS;SURFACE WATERS;PROCEEDINGS;POLLUTION

<051002>
TITLE: Ecological Methods for Assessing Impacts to Wildlife Habitat in Areas Affected by Coal Development
PROJECT NUMBER: 77BBN
PRINCIPAL INVESTIGATOR: Stewart, R.E.
ADDRESS: Office of Biological Services, U.S. Fish and Wildlife Services, Washington, DC 20240
AFFILIATION: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA)
DIVISION: U.S. Office of Biological Services
MONITOR: Stewart, Robert E.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)

ENERGY CYCLE: EXTRACTION (60%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: These investigations will identify and demonstrate a rapid cost effective reliable method of inventorying characterizing wildlife habitat. Emphasis will be given to habitat requirements of wildlife species for food, cover, breeding, and other critical factors and the relationship for these factors, the surface resources and events. Emphasis is given to a determination of how various coal related activities, particularly processing and population growth, will impact wildlife and the magnitude of that impact. Results will consist of interim and final reports of field laboratory work and an interagency workshop. Studies will be conducted on designated areas where coal development is or will be taking place.
KEYWORDS: COAL;ENVIRONMENTAL EFFECTS;WILD ANIMALS;ECOLOGY;NOISE;HABITAT;INVENTORIES;ANIMAL BREEDING

<051003>
TITLE: Establish the Value for Fish and Wildlife of Existing Waters in Energy Development Areas
PROJECT NUMBER: 77BBU
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Hayden, Robert
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$237,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (80%);PROCESSING, CONVERSION (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Establish the current status of fish and wildlife in relationship to existing water, the potential fish and wildlife value of these waters, and a ranking of waters according to value in fish and wildlife terms.
APPROACH: Conduct workshops in all potential energy development areas involving the Fish and Wildlife Service, State Fish and Game agencies, university professors, sportsmen, and conservation and environmental groups. A series of handbooks will be produced which outline the relative value of streams and rivers as fish and wildlife habitat.
KEYWORDS: ENERGY SOURCES;FISHES;WILD ANIMALS;WATER;ENVIRONMENTAL EFFECTS;POLLUTION;MANUALS;MEETINGS;WATER RESOURCES;FISHES;HABITAT;EDUCATION

<051004>
TITLE: Critical Appraisal of Research Needs with Respect to Fish and Wildlife Implications of Western Water Allocation for Energy Development
PROJECT NUMBER: 77BBP
PRINCIPAL INVESTIGATOR: Lord, W.B.
ADDRESS: Institute of Behavioral Sciences, University of Colorado, Boulder, CO 80302
AFFILIATION: Colorado Univ., Boulder (USA). Inst. of Behavioral Sciences
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Hayden, Robert
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Site specific Missouri River Basin;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To identify critical research needs for improving decision making in the subject matter area for the Upper Missouri River Basin.
APPROACH: Definition of policy issues, establishment of information requirements, determination of information availability, evaluation of research needs, preparation of discussion documents, review of documents through conference of government and academic specialists, and preparation of final report. Project is conducted by a multi-disciplinary team from the disciplines of anthropology, biology, civil engineering, economics, geography, geology, law, and political science.
KEYWORDS: POLICY ISSUES;INFORMATION;ENERGY SOURCES;BIOLOGICAL EFFECTS;FISHES;WILD ANIMALS;RESEARCH PROGRAMS;MISSOURI RIVER;DATA ACQUISITION;ECONOMICS;GEOLOGY;GEOGRAPHY;BIOLOGY;ENGINEERING;LAWS

<051005>
TITLE: Ecological and Physiological Effects of Oil on Birds
PROJECT NUMBER: 77BAV
PRINCIPAL INVESTIGATOR: Stickel, L.F.
ADDRESS: Patuxent Wildlife Research Center, Laurel, MD 20810
AFFILIATION: Patuxent Wildlife Research Center, Laurel, Md. (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Stickel, Lucille F.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$480,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: METALS/Nickel;METALS/Vanadium (20%);ORGANICS/DDE;ORGANICS/PCB (20%);SPECIFIED OTHER POLLUTANTS/Oil (60%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To test and adapt analytical methods for identification of oil in tissues and eggs. Evaluate the effects of oil on viability of eggs and on survival. To assess the prevalence of oil ingestion by wild birds and relate tissue levels of oil to damage and to assess the joint effects of oil

and chemicals on survival.
APPROACH: Realistic dietary dosage with measurements of egg production, fertility, hatchability, and survival of chicks using ducks. Adult male and female ducks will be fed sublethal and lethal dosages of oil, with measurements of mortality, pathology, and blood enzymes. Oil will be introduced artificially and also by light oiling of the incubating hen. Kinetics of oil will be followed when oil is ingested directly and when it is obtained secondarily through food items. Top priorities for assessment of joint oil and chemical action would be: polychlorinated biphenyls, DDE, nickel, and vanadium. A three year study program is anticipated with funding beginning in Fiscal Year 75 and major implementation in Fiscal Years 76, 77, and 78.
KEYWORDS: PETROLEUM;INGESTION;BIOLOGICAL EFFECTS;BIRDS;EGGS;SURVIVAL TIME;OIL SPILLS;TERATOGENESIS;TOXICITY;CHICKENS

<051006>
TITLE: Ecological Characterization of the Chenier Plain of SW Louisiana and SE Texas
PROJECT NUMBER: 77BAW
PRINCIPAL INVESTIGATOR: Tait, H.D.
ADDRESS: National Coastal Ecosystems Team, National Space Technology Laboratories, Bay St. Louis, MS 39520
AFFILIATION: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$387,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Site specific Louisiana, Southeast Texas;COASTS/Gulf;HYDROGRAPHIC AREAS/Other hydrographic areas Coast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Development of an ecological characterization of Chenier Plain in the coastal regions of southwestern Louisiana and Southeastern Texas with a predictive potential, evaluate methodology used for characterization, and synthesize and disseminate information obtained. The preliminary work will involve a determination of information needs, preparation of tentative methodology, and segmentation of the characterization into workable study units. Study units will focus on geomorphology, economics and sociolcgy, biology, and ecology of the coastal ecosystem. Once study units have been formulated and defined, a plan will be devised for accomplishing the objectives as detailed under each study unit. A deterministic simulation model will be developed as a part of the characterization to provide predictive potential. Data assembled by the various study units will provide input for the model. The simulation model will provide to decision-makers an instrument with which impacts can be quickly tested and evaluated. The model will also provide a system for identifying areas with data deficiences. A manual will be published in popular form from the characterization studies and serve as an atlas for users or decision-makers with interests in the particular coastal ecosystem studied. The model will be continuously updated as additional information is supplied by special studies or from other sources.
KEYWORDS: COASTAL REGIONS;LOUISIANA;TEXAS;ECOLOGY;ECONOMICS;SOCIOLOGY;BIOLOGY;INFORMATION;SIMULATION;MANUALS;MATHEMATICAL MODELS;ECOSYSTEMS

<051007>
TITLE: The Fish and Wildlife Impacts of Energy Development in the Four Corners Region
PROJECT NUMBER: 77BBS
PRINCIPAL INVESTIGATOR: Kneese, A.V.
ADDRESS: The Department of Economics, University of New Mexico, Albuquerque, NM 87131
AFFILIATION: New Mexico Univ., Albuquerque (USA). Dept. of Economics
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: King, Bill
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$197,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (70%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Four Corners
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) To assess the impact of continued energy development in the Four Corners Region on fish and wildlife resources by investigating the implications of increased population resulting from southwestern energy resource development. (2) To examine the institutional and substantive problems associated with managing these impacts and provide management alternatives under various southwestern energy development scenarios.
APPROACH: The basic methodological problem in this research is the development of a plan integrating biology and economics. Economic analysis of energy development in the southwest will be translated into biological impacts on fish and wildlife. Research output will identify potential problem areas in overall management of energy development resulting from encroachment of human population in presently remote areas of the southwest.
RESULTS: A report including: (a) methodology for the measurement of the environmental impact of energy development on fish and wildlife; (b) an evaluation of innovative policy and management options; and (c) specific management and policy recommendations.
PROJECT MILESTONES: Details of proposal under discussion, contract by October 1, 1975.
KEYWORDS: ENERGY SOURCES;FISHES;WILD ANIMALS;BIOLOGICAL EFFECTS;HUMAN POPULATIONS;ECONOMICS;MANAGEMENT;POLLUTION;ENERGY POLICY;ECONOMIC POLICY;PLANNING

<051008>
TITLE: Determine Water Quantity Needs of Fish and Wildlife in the Upper Colorado and Upper Missouri River Basins
PROJECT NUMBER: 77BBQ
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Briedbaust, James
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$280,000

TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH (60%);ANALYTICAL (40%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Site specific Upper Colorad River, Upper Missouri River;HYDROGRAPHIC AREAS/Other hydrographic areas Streams
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Establish the in-stream flow requirements at specific locations necessary to maintain the viability of all fish and wildlife species present in each basin.
APPROACH: Information on in-stream flow requirements from previous studies will be assembled and evaluated. The best currently available methodology will be selected for conducting field studies within the time and monetary limits of the project. The requirements established at specific locations by the field studies will remain the best estimate of the in-stream flow requirements necessary to maintain fish and wildlife viability until improved methodologies are developed and applied.
KEYWORDS: FISHES;WILD ANIMALS;VIABILITY;ECONOMICS;MISSOURI RIVER;COLORADO RIVER;WATER QUALITY

<051009>
TITLE: Survey to Determine the Extent and Location of Unallocated Water in the 11 Western States
PROJECT NUMBER: 77EBT
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Doerkson, Harvey
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Other hydrographic areas Streams, rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Identify areas with unallocated water and methods of obtaining allocation for habitat preservation.
APPROACH: A preliminary survey of the 11 Western States will be conducted including review of reports and legal documents, and consultation with appropriate officials and other knowledgeable persons. Unallocated, unobligated, or otherwise available water will be listed by specific location within each drainage. Also to be outlined for each drainage will be all laws, records, and agreements applicable to water allocation and obligation, and the procedures and limitations on obtaining water for fish and wildlife or other purposes.
KEYWORDS: WATER;LEGAL ASPECTS;ECOLOGY;FISHES;WILD ANIMALS;HABITAT;LAWS;ALLOCATIONS

<051010>
TITLE: Institutional Analysis and Historic Summary of the Trans-Alaska Pipeline
PROJECT NUMBER: 77BBR
ADDRESS: Office of Biological Services, Washington, DC 20240
AFFILIATION: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Dole, Al
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$88,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Summarize the ''history'' of the Trans-Alaska Pipeline project. (2) Analyze the institutions established throughout the project. (3) Compare these institutions with either the Geothermal Environmental Advisory Panel or the Oil Shale Environmental Advisory Panel.
APPROACH: Basically the data upon which analyzation and summarization will be gathered by literature review and interviews with appropriate participants in each project.
RESULTS: A report detailing the findings and outlining future actions that might be initiated to strengthen institutions that involve environmental aspects of major development projects.
KEYWORDS: ALASKA OIL PIPELINE;ENVIRONMENTAL EFFECTS;DATA;WILD ANIMALS;TERRESTRIAL ECOSYSTEMS;SOILS;PLANTS

<051011>
TITLE: Crucial Decision Processes that Affect the Development of Western Energy Resources
PROJECT NUMBER: 14-16-0008-2103
PRINCIPAL INVESTIGATOR: Graves, F.
ADDRESS: 1619 Massachusetts Avenue N.W., Washington, DC 20036
AFFILIATION: Institute of Public Administration, Washington, D.C. (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Doerksen, Harvey R.
TELEPHONE: C(303)221-2040
TYPE OF FUNDING: Contract No.-2103
77 FUNDING: Fish and Wildlife Service FY77:$65,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Identify processes and points at which decisions concerning energy development are made. (2) Determine the information most important to the proper evaluation of fish and wildlife resources as a part of those decision-making processes.
APPROACH: A primary way of reducing the cost of information gathering, while at the same time increasing the effectiveness of that information, is to orient the gathering of data toward requirements articulated by the decision-making process.

RESULTS: (1) Identify the relevant government decision-making processes. (2) Describe the decision points. (3) Determine information requirements. Publication OBS 77/04: Energy--Public Choices and Environmental Needs.
KWORDS: ENERGY SOURCES;GOVERNMENT POLICIES;DATA ACQUISITION;INFORMATION SYSTEMS;DECISION MAKING;PLANNING;ENERGY POLICY;MINING

<051012>
TITLE: State-of-the-Art Review of Rehabilitation and Reclamation of Wildlife Habitats
PROJECT NUMBER: 14-16-0008-2110
PRINCIPAL INVESTIGATOR: Busby, F.;McKell, C.
ADDRESS: Campus of Utah State University, Old Main, UMC 14, Logan, UT 84322
AFFILIATION: Utah State Univ., Logan (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Dittberner, Phillip L.
TELEPHONE: C(303)221-2040
TYPE OF FUNDING: Contract No.-2110
77 FUNDING: Fish and Wildlife Service FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Overburden (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To provide ''state-of-the-art'' literature on rehabilitation and reclamation of wildlife habitats. (2) Be aware of current and planned research. (3) Identify research needs and establish priorities. (4) Provide guidelines and recommendations to agencies.
APPROACH: Western energy development will continue at a rapid rate for the foreseeable future due to the nation's need for oil, coal, and natural gas, and other energy resources. This study will collate information on ''state-of-the-art,'' review it in a workshop, and prepare useful documents as guides for people in field and management positions.
RESULTS: (1) Workshop to bring together knowledgeable people of ''state-of-the-art.'' (2) Final report on the literature. (3) Handbook to guide field personnel and operational managers.
KEYWORDS: ECOSYSTEMS;LAND RECLAMATION;ENERGY SOURCES;RESEARCH PROGRAMS;EDUCATION;RECOMMENDATIONS;WILD ANIMALS;CLIMATES;PLANTS;SOILS;FISHES;MANUALS

<051013>
TITLE: Distribution and Concentration of Trace Substances in Wildlife and in Wildlife Foodchains, in the Piceance Creek Basin of Colorado
PROJECT NUMBER: 14-16-0008-2111
PRINCIPAL INVESTIGATOR: Nagy, J.G.;Price, M.J.
ADDRESS: Office of Sponsored Research, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Fish and Wildlife Service, Fort Collins, Colo. (USA). Western Energy and Land Use Team
DIVISION: WELUT--Western Energy and Land Use Team
MONITOR: Ash, Henry
TYPE OF FUNDING: Contract No.-2111
77 FUNDING: Fish and Wildlife Service FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Produce a computer-accessible information bank on the known or suspected adverse effect on wildlife of toxic elements. (2) To collect information on the occurrence, distribution and food habits and major food chains of the fauna occupying the various ecological units of the oil shale region. (3) To produce baseline information on the natural levels of potentially toxic elements in plant parts. (4) To produce similar information for fauna.
APPROACH: The development of an oil shale inustry to its full potential may result in large quantities of contaminant into the environment. This study focuses on the trace substances that occupy the food chains related to the Wildlife in the Piceance Basin.
RESULTS: Interim and final reports.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;BIOLOGICAL MODELS;CHEMICAL EFFLUENTS;FOSSIL FUELS;COMBUSTION PRODUCTS;FOOD CHAINS;BIOLOGICAL EFFECTS;OIL SHALE INDUSTRY;ENVIRONMENTAL EFFECTS;TRANSLOCATION;COLORADO;WATER POLLUTION;WASTE MANAGEMENT;WILD ANIMALS;PLANTS;MINING

<051014>
TITLE: Techniques for Predicting Entrainment and Impingement at Power Plants
PROJECT NUMBER: 14-16-0008-2094
PRINCIPAL INVESTIGATOR: Eraslan, A.H.;Kim, K.H.
ADDRESS: Office of the Vice Chancellor for Graduate Studies and Research, Knoxville, TN 37916
AFFILIATION: Tennessee Univ., Knoxville (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Maher, Mark W.
TELEPHONE: C(313)994-3331
TYPE OF FUNDING: Contract No.-2094
77 FUNDING: Department of the Interior FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Develop a model to predict the numbers of organisms and the proportion of the populations of these organisms that will be withdrawn by power plants.
APPROACH: Entrainment, impingement, and entrapment losses cannot be adequately predicted prior to operation of power plants utilizing existing analytical techniques. Such losses are considered to be the most

serious impact by power plants on fishery resources.
RESULTS: (1) A report presenting a synthesis of the literature on existing methodologies and models relating to the development of this model. (2) A report presenting the models with documentation. (3) A document presenting techniques for obtaining model input.
KEYWORDS: MODELING;POWER PLANTS;COOLING SYSTEMS;IMPINGEMENT;FISHES;FORECASTING;ENTRAINMENT;ENVIRONMENTAL EFFECTS;COMPUTER CODES;AQUATIC ORGANISMS;WATER;DATA ACQUISITION;BIOLOGICAL MODELS

<051015>
TITLE: An Evaluation of Density Dependent Mortality on Fish Populations as it Relates to the Impact of Entrainment and Impingement Losses at Power Plants
PROJECT NUMBER: 14-16-0008-2068
PRINCIPAL INVESTIGATOR: Lackey, R.;Tiptin, A.
ADDRESS: Virginia Polytechnic Institute and State University, Blacksburg, VA 24061
AFFILIATION: Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Goodyear, C. Phillip
TELEPHONE: C(313)994-3331
TYPE OF FUNDING: Contract No.-2068
77 FUNDING: Department of the Interior
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Summarize, analyze, and evaluate existing evidence of compensation in fish populations. (2) Provide a list of all known forms of density-dependent mechanisms in fish populations and determine how these mechanisms could interact singly or in combination to offset power plant induced stresses on fish populations. (3) Present scientifically and statistically reliable guidelines for measurement of compensation in fish populations.
APPROACH: Utility companies currently assume that the operation of density-dependent processes will offset or compensate for the increases in mortality rates in aquatic populations that result from entrainment and impingement at power plants. For the most part, regulatory agencies cannot evaluate the degree to which such processes may offset power plant induced mortalities because the operation of such mechanisms is not supported by documentation in the field or literature.
RESULTS: (1) Evaluation of literature report. (2) Computer simulation of compensatory mechanisms. (3) Preparation of compensation workbook. (4) Development of Sampling Strategies manual.
KEYWORDS: FISHES;POPULATION DYNAMICS;MORTALITY;ENTRAINMENT;POWER PLANTS;ENVIRONMENTAL EFFECTS;COOLING SYSTEMS;THERMAL EFFLUENTS;AQUATIC ECOSYSTEMS

<051016>
TITLE: Effects of Chlorine on Egg and Larval Finfish
PROJECT NUMBER: 14-16-0008-2050
PRINCIPAL INVESTIGATOR: Block, R.M.;Morgan, R.P. II
ADDRESS: Center for Environmental and Estuarine Studies, College Park, MD 20742
AFFILIATION: Maryland Univ., College Park (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Goodyear, Phillip C.
TELEPHONE: C(313)994-3331
TYPE OF FUNDING: Contract No.-2050
77 FUNDING: Department of the Interior
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Chlorine (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Site specific Chesapeake Bay;COASTS/Other coasts Chesapeake Bay
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To study the toxicity of chlorine to estuarine fishes in early life stages.
APPROACH: Chlorination is currently used on a regular basis by most steam electric power plants as an effective means of controlling biofouling of cooling water systems. Subsequent appearance of chlorine and its derivatives in discharge plumes has caused great concern by ecologists over its possible toxic effects on aquatic organisms.
RESULTS: A report will be prepared presenting chlorine dose-response functions of other models which will allow computations of percent mortality as a function of time of exposure and concentration for the early developmental stages of striped bass, white perch and blueback herring in the Chesapeake estuarine system.
KEYWORDS: EFFLUENTS;FISHES;LARVAE;CHLORINE;BIOLOGICAL EFFECTS;ENVIRONMENTAL EFFECTS;WATER POLLUTION;ESTUARIES;TOXICITY;POWER PLANTS;BIOLOGICAL FOULING;EGGS;MORTALITY;PHYSIOLOGY;IN VIVO;TOXINS;WASTES

<051017>
TITLE: Management of Transmission Line Rights-of-Way for Fish and Wildlife
PROJECT NUMBER: 2150
PRINCIPAL INVESTIGATOR: Galvin, M.
ADDRESS: Blair Mill Road, Willow Grove, PA 19090
AFFILIATION: Asplundh Environmental Services, Willow Grove, Pa. (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Hoover, Kenneth
TELEPHONE: C(313)994-3331
TYPE OF FUNDING: Contract No.-2150
77 FUNDING: Department of the Interior FY77:$119,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Prepare a technical assistance manual which integrates fish and wildlife management techniques and special problems in transmission line ROW management into comprehensive management strategies for land used as ROW by electric utilities throughout the United States.
APPROACH: Utilities presently own or control vast acreages of land as a result of the production, transformation, and transmission of energy resources. Electric utilities operate over 300,000 miles of overhead electric transmission lines which require an estimated 4 million acres of land for rights-of-way (ROW). For the most part these lands represent potential fish and wildlife habitats that are not being fully utilized because of a lack of comprehensive fish and wildlife resources management plans.
RESULTS: (1) A report presenting a classification of transmission line ROW lands based upon biological provinces and communities, and ownership, and associated lists of species and essential habitat components. (2) A report presenting state-of-the-art management, techniques and approaches to mitigation or special consideration for some species. (3) A technical assistance manual for management of transmission line ROW. (4) Other study reports and bibliography.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;WILD ANIMALS;FISHES;ELECTRIC POWER;POWER TRANSMISSION LINES;ENVIRONMENTAL EFFECTS;SOILS;ELECTROMAGNETIC RADIATION;BIOLOGICAL EFFECTS

<051018>
TITLE: Bibliography: Environmental Impacts of Electric Power Generation and Transmission on Fish and Wildlife
PROJECT NUMBER: 14-16-0008-1250
PRINCIPAL INVESTIGATOR: Pfuderer, H.A.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Fodor, Beth L.
TELEPHONE: F378-1238
TYPE OF FUNDING: Contract No.-1250
77 FUNDING: Department of the Interior FY77:$30,000
TECHNOLOGY: POSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%);ELECTRICAL TRANSMISSION (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To compile several bibliographies of technical information pertaining to environmental impacts of electric power generation and transmission.
APPROACH: The environmental impacts of power plants are of concern to the Fish and Wildlife Service and the biological effects of an electric power generation and transmission are not fully known. In an attempt to gain more knowledge on the subject, information will be gathered on selected aspects, such as energy parks and floating power plants. This information will lead to what additional studies may be needed to fully evaluate the potential impacts of power plants.
RESULTS: (1) Camera-ready manuscripts of bibliographies. (2) Copies of each document cited in the bibliographies for National Power Plant Team. (3) Magnetic tapes of the bibliographies suitable for a computer retrievable system.
KEYWORDS: POWER GENERATION;POWER TRANSMISSION;ENVIRONMENTAL EFFECTS;ELECTRIC POWER;BIBLIOGRAPHIES;DATA COMPILATION;FISHES;POWER PLANTS;INFORMATION RETRIEVAL;COMPUTER CODES;ELECTROMAGNETIC RADIATION;BIOLOGICAL EFFECTS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;WILD ANIMALS

<051019>
TITLE: Assessment of Low Altitude Remote Sensing Applications to Fish and Wildlife Resources on Disturbed Lands
PROJECT NUMBER: 2061
PRINCIPAL INVESTIGATOR: Meyer, M.P.
ADDRESS: College of Forestry, St. Paul, MN 55108
AFFILIATION: Minnesota Univ., St. Paul (USA)
MONITORING AGENCY: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
DIVISION: Office of Biological Services
MONITOR: Mellgren, Don C.
TELEPHONE: C(617)223-2984
TYPE OF FUNDING: Contract No.-2061
77 FUNDING: Department of the Interior
TECHNOLOGY: POSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To obtain a qualitative and quantitative analysis of remote sensing capabilities relative to its use in the collection of baseline data. (2) To develop effective methods for aerial detection of degrading influences such as soil movement and acid mine drainage. (3) To establish a system for evaluating ecosystem responses to rehabilitation prescriptions.
APPROACH: Select from 19 abandoned mine land site areas for phototransects.
RESULTS: (1) An operating manual of procedures for 35 mm low altitude remote sensing applications. (2) A detailed report on the photographic interpretation of each site. (3) A report on the comparative analysis of baseline data and photo interpretation.
KEYWORDS: EFFLUENTS;INSTRUMENTATION;FISHES;WILD ANIMALS;TERRESTRIAL ECOSYSTEMS;LAND POLLUTION;MONITORING;BIOLOGICAL MODELS;BIOLOGICAL RECOVERY;ACID MINE DRAINAGE;EQUIPMENT;SOILS;LAND RECLAMATION;MINING;ENVIRONMENTAL EFFECTS;REMOTE SENSING;BIOLOGICAL EFFECTS

<051020>
TITLE: Factors Associated with Accuracy in Sampling Fish Eggs and Larvae
PROJECT NUMBER: 14-16-0008-2118
PRINCIPAL INVESTIGATOR: Merriner, J.
ADDRESS: Virginia Institute of Marine Science, Gloucester Point, VA 23062
AFFILIATION: Virginia Inst. of Marine Science, Gloucester Point (USA)
MONITORING AGENCY: Department of the Interior, Washington, D.C. (USA)
DIVISION: Fish and Wildlife Service, Office of Biological Services
MONITOR: Boreman, John G.
TELEPHONE: C(313)994-3331

TYPE OF FUNDING: Contract No.-2118
77 FUNDING: Department of the Interior FY77:$8,900
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Determine what biological and physical features of aquatic ecosystems affect obtaining accurate samples of fish eggs and larvae. (2) List the types of gear currently employed in fish egg and larvae sampling and provide an assessment as to their accuracy in obtaining representative samples of fish eggs and larvae. (3) Compile a list of those factors which need to be maximized in gear for adequately sampling various ecological categories of fish eggs and larvae under various physical conditions.
APPROACH: Withdrawal of large volumes of water by power plants for cooling purposes usually means withdrawal of those life stages of aquatic organisms unable to actively escape from the intakes, such as fish eggs and larvae. These life stages suffer high mortality rates and they pass through condenser cooling systems. Predicting the impact requires accurate sampling of fish eggs and larvae in the affected water.
RESULTS: A document discussing what biological and physical features of aquatic ecosystems affect attainment of representative samples of fish egg and larvae populations. It will also include an assessment of how gear currently used overcomes or succumbs to sampling problems.
KEYWORDS: INSTRUMENTATION;AQUATIC ECOSYSTEMS;FISHES;EGGS;LARVAE;SAMPLING;POPULATION DYNAMICS;BIOLOGICAL MODELS;POWER PLANTS;COOLING SYSTEMS;MORTALITY

<051021>
TITLE: Assessment of Oil and Gas Development on Federal Refuges Along the Gulf Coast
PROJECT NUMBER: 14-16-0008-2152
PRINCIPAL INVESTIGATOR: Brown, W.
ADDRESS: P.O. Box 13517, Austin, TX 78711
AFFILIATION: Research Planning Consultants, Austin, Tex. (USA)
MONITORING AGENCY: Department of the Interior, Washington, D.C. (USA)
DIVISION: Fish and Wildlife Service, Office of Biological Services
MONITOR: Tait, Howard
TELEPHONE: C(601)688-2091
TYPE OF FUNDING: Contract No.-2152
77 FUNDING: Department of the Interior FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (10%);ORGANICS (10%);NOISE, VIBRATION (20%);HEAT, THERMAL (10%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/South;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To develop a report which describes and documents the management of oil and gas development on wildlife refuges along the Louisiana and Texas coasts through an analysis of guidelines, standards and stipulations imposed on development activities in these areas.
APPROACH: The work will consist of a series of case study surveys comparing the effects of oil and gas operations on fish and wildlife on Gulf coastal refuges where regulations and stipulations are in effect, with selected comparable Gulf coastal areas where oil and gas activities are conducted under less regulated conditions.
RESULTS: (1) An illustrated handbook of methods and standards for the protection of fish and wildlife and habitat on wildlife refuges and other wildlife areas during oil and gas operations. (2) A comprehensive technical report containing descriptions and evaluations of former and present practices on wildlife refuges to prevent, alleviate or mitigate adverse impact of oil and gas operations.
KEYWORDS: LOUISIANA;TEXAS;COASTAL REGIONS;LAND USE;WILD ANIMALS;FISHES;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;OIL FIELDS;NATURAL GAS FIELDS;ENVIRONMENTAL EFFECTS;ECOLOGY;STANDARDS;POLLUTION REGULATIONS;WASTE MANAGEMENT

<051022>
TITLE: Coal Project Augmented Implementation Needs
PROJECT NUMBER: 14-16-0008-944-2
PRINCIPAL INVESTIGATOR: Anderson, R.D.
ADDRESS: P.O. Box 92957, Los Angeles, CA 90009
AFFILIATION: Aerospace Corp., Los Angeles, Calif. (USA)
MONITORING AGENCY: Department of the Interior, Washington, D.C. (USA)
DIVISION: Fish and Wildlife Service, Office of Biological Services
MONITOR: Stewart, Robert E., Jr.
TELEPHONE: C(202)343-3032
TYPE OF FUNDING: Contract No.-944-2
77 FUNDING: Department of the Interior FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: VISUAL AESTHETICS (50%);SPECIFIED OTHER POLLUTANTS/Water (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To use the expertise of the Aerospace Corporation to implement portions of the research and operational aspects of the Coal Project in the East where a new coal team is planned.
APPROACH: The Coal Project is national in scope, and in addition to its expanding research and new operational roles in the West, is scheduled to begin addressing eastern coal problems and opportunities, primarily on private lands.
RESULTS: (1) Preparation of a report on each final test area containing a preliminary assessment of data and appropriate map based information. (2) Project support to the Eastern Coal Team for coal issues, status of plans, review of work statements, fiscal and milestone tracking.
KEYWORDS: USA;COAL DEPOSITS;REGIONAL ANALYSIS;CHEMICAL EFFLUENTS;WILD ANIMALS;PLANTS;TERRESTRIAL ECOSYSTEMS;FORESTS;WATER POLLUTION;WASTE WATER

Department of Interior/Bureau of Reclamation

<052001>
TITLE: Ecological and Limnological Impact of the Construction and Operation of Pumped-Storage Plants
PROJECT NUMBER: DR-331
PRINCIPAL INVESTIGATOR: LaBounty, J.F.
ADDRESS: Division of General Research, P.O. Box 25007, Denver Federal Center, Denver, CO 80225
AFFILIATION: Bureau of Reclamation, Denver, Colo. (USA)
MONITORING AGENCY: Bureau of Reclamation, Denver, Colo. (USA)
DIVISION: Division of General Research
MONITOR: Cohan, Howard J.
TELEPHONE: F234-3303
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Bureau of Reclamation FY77:$66,000
TECHNOLOGY: HYDROELECTRIC (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Inland waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Research is directed toward determining the effects of fluctuating water levels from pumped-storage powerplant operations on the ecology and limnology of Twin Lakes Reservoir. Baseline data are being established on the heat budget, bottom sediments, chemical and physical limnology, and aquatic microbiological populations during the preconstruction phase of the project. These data will be used for comparative analysis of conditions in the lake when the project becomes operational.
APPROACH: Present (preoperational) environmental conditions within the reservoir are being determined to provide base data against which future comparisons can be made, and from which sensitive and possibly critical situations can be identified so mitigating steps can be taken. The physical, chemical, and biological parameters will be monitored throughout construction and through several years of operation.
RESULTS: The ability to describe the impacts of operation of a pumped-storage project on a mountain lake.
PROJECT MILESTONES: (1) July 1, 1971 Project began. (2) September 1978 Preoperational phase completed-baseline established. (3) October 1978 Project monitoring phase begins. (4) September 1981 Estimated project completion date.
KEYWORDS: INSTRUMENTATION;HYDROELECTRIC POWER PLANTS;PUMPED STORAGE;PUMPING;WATER RESERVOIRS;LAKES;ENVIRONMENTAL EFFECTS;VARIATIONS;ECOLOGY;SITE SELECTION;WATER;ECOSYSTEMS;BASELINE ECOLOGY;LIMNOLOGY

<052002>
TITLE: Ecological Assessment of the Effects of Grand Coulee Dam Pumped-Storage Power Generation on the Ecology of Banks Lake, Washington
PROJECT NUMBER: RI-20
PRINCIPAL INVESTIGATOR: Stober, Q.J.
ADDRESS: Fisheries Research Institute, College of Fisheries, University of Washington, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Coll. of Fisheries
MONITORING AGENCY: Bureau of Reclamation, Boise, Idaho (USA)
DIVISION: Pacific Northwest Regional Office
MONITOR: Woodworth, John R.
TELEPHONE: F588-2109
TYPE OF FUNDING: Contract No.-14-06-100-7794
77 FUNDING: Bureau of Reclamation FY77:$105,000
TECHNOLOGY: HYDROELECTRIC (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Inland waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Assess the effects on Banks Lake sport fish population due to entrainment and pass through during pumped-storage operations. Will provide information necessary to identify and minimize potential adverse effects on the Banks Lake fish populations.
APPROACH: Comprehensive approach designed to establish baseline data about the limnology, fish populations, and entrainment in Banks Lake prior to startup of pump-generation units 7 and 8 at Grand Coulee.
RESULTS: Results will be reflected in the baseline data for Banks Lake as an operational reservoir and delineate more closely the effects of an operational pump-storage system on the ecology of Banks Lake. Will also relate the operating of the pumped storage and irrigation systems and their interaction to the ecology of Banks Lake.
PROJECT MILESTONES: (1) 7/1/73 Project began. (2) 7/1/75 Acquisition of baseline data to include 1 year of normal irrigation drawdown. (3) 7/1/76 Kokanee salmon sampling, nutrient and plankton interchange and additional entrainment studies. (4) 9/30/77 Completion of project. (5) 4/21/77 Letter Contract No. 7-07-10-S0023, University of Washington Fisheries Research Institute for fish-net barrier study involving Kokanee migration from Banks Lake, period of performance 11 months, FY 77 funds $70,000, FY 78 funds $40,000.
KEYWORDS: PUMPED STORAGE;ENVIRONMENTAL EFFECTS;HYDROELECTRIC POWER PLANTS;PUMPING;FISHES;POPULATION DYNAMICS;AQUATIC ECOSYSTEMS;LIMNOLOGY;IRRIGATION;ENTRAINMENT;WASHINGTON;WATER

<052003>
TITLE: Appraisal Study of the Geothermal Resources of Arizona and Their Value for Desalination of Water and Other Uses
PROJECT NUMBER: 14-06-300-2582
PRINCIPAL INVESTIGATOR: Swanberg, C.A.
ADDRESS: University Park, Las Cruces, NM 88001
AFFILIATION: New Mexico State Univ., Las Cruces (USA)
MONITORING AGENCY: Bureau of Reclamation, Washington, D.C. (USA)
77 FUNDING: Bureau of Reclamation FY77:$61,500
TECHNOLOGY: GEOTHERMAL/Hydrothermal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The present investigation consists of two parts: a geothermal appraisal investigation of the thermal spring systems of Arizona and a compilation of existing gravity magnetic, and heat flow data for the state. The objectives of the thermal springs study are to: (1) inventory the thermal spring systems of Arizona with respect to temperature, discharge, and water chemistry to determine their origin, history, and potential for pollution; (2) apply known chemical geothermometers to the thermal waters to determine whether or not these areas have a sufficiently high base temperature for economic geothermal development; (3) make a preliminary assessment of the hydrology of the thermal spring systems and make predictions regarding the size and production potential of the resource; and (4) conduct a site evaluation to determine the nature of problems that may result during more detailed geophysical studies and/or eventual production. The objectives of the compilation study are to use existing geophysical data to outline broad regions (i.e., the boundary between the Basin and Range and the Colorado plateau physiographic provinces) which have high geothermal activity and correlate geophysical data and thermal spring locations with areas of known tertiary and quaternary volcanic and plutonic igneous activity.
KEYWORDS: GEOTHERMAL ENERGY;ARIZONA;WATER;DESALINATION;USES;WATER QUALITY

Department of Interior/Bureau of Land Management

<053002>
TITLE: Taylor Creek Reclamation Study Site
PROJECT NUMBER: PH-5-203
PRINCIPAL INVESTIGATOR: McCoy, J.;Biesecker, J.;Hadley, R.
ADDRESS: Bureau of Reclamation, Washington, DC 20240
AFFILIATION: Department of the Interior, Washington, D.C. (USA)
MONITORING AGENCY: Bureau of Land Management, Washington, D.C. (USA)
77 FUNDING: Bureau of Land Management FY77:$154,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (25%);PARTICULATES (25%);ORGANICS (25%);VISUAL AESTHETICS (25%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Purpose is to establish baseline conditions on soil, overburden, coal resource, surface and ground water quantity and quality, vegetation and sedimentation on a 5,000-acre site being considered for mining. From these data guidance for preparation of stipulations in future leases will be prepared. Alternative reclamation techniques and vegetation types will be described. Water monitors will remain on site until baseline conditions are established or until no further changes are anticipated if the area is mined and reclaimed. Chemical and physical data obtained on all geologic strata to a depth of approximately 200'. The project is located at T4N, R93W, Sections 33 and 34 and T3N, R93W, Sections 2, 3, 4, 5, 8, 9 and 10.
KEYWORDS: BASELINE ECOLOGY;COAL MINING;SURFACE WATERS;WATER QUALITY;PLANTS;SEDIMENTS;LEASING;LAND RECLAMATION;COAL INDUSTRY;ENVIRONMENTAL IMPACTS;SURFACE MINING;GEOLOGICAL SURVEYS;WASTE MANAGEMENT;PLANNING;SITE SELECTION

<053003>
TITLE: Otter Creek Reclamation Study Site
PROJECT NUMBER: PH-=5-201
PRINCIPAL INVESTIGATOR: Dupree, H.K.;Pike, G.;Landis, E.
ADDRESS: Bureau of Reclamation, Washington, DC 20240
AFFILIATION: Department of the Interior, Washington, D.C. (USA)
MONITORING AGENCY: Bureau of Land Management, Washington, D.C. (USA)
77 FUNDING: Bureau of Land Management FY77:$154,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (25%);PARTICULATES (25%);ORGANICS (25%);VISUAL AESTHETICS (25%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Purpose is to establish baseline conditions on soil, overburden, coal resource, surface and ground water quantity and quality, vegetation and sedimentation of a 1920-acre site being considered for mining. From these data guidance for preparation of stipulations in future leases will be prepared. Alternate reclamation techniques and vegetation types will be described. Water monitors will remain on site until baseline conditions are established or until no further changes are anticipated if the area is mined and reclaimed. Chemical and physical data obtained on all geologic strata to a depth of approximately 200'. The project is located at T3S, R45E, Sections 23, 27 and 35.
KEYWORDS: COAL INDUSTRY;ENVIRONMENTAL IMPACTS;BASELINE ECOLOGY;LAND USE;LAND RECLAMATION;LEASING;SURFACE MINING;WATER QUALITY;PLANTS;SEDIMENTS;PLANNING

<053004>
TITLE: Hanna Reclamation Study Site
PROJECT NUMBER: PH-5-202
PRINCIPAL INVESTIGATOR: Schacterle, D.;West, S.;Landis, E.
ADDRESS: Bureau of Reclamation, Washington, DC 20240
AFFILIATION: Department of the Interior, Washington, D.C. (USA)
MONITORING AGENCY: Bureau of Land Management, Washington, D.C. (USA)
77 FUNDING: Bureau of Land Management FY77:$164,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (25%);PARTICULATES (25%);ORGANICS (25%);VISUAL AESTHETICS (25%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Purpose is to establish baseline conditions on soil, overburden, coal resource, surface and ground water quantity and quality, vegetation and sedimentation of a 2400-acre site being considered for mining. From these data guidance for preparation of stipulations in future leases will be prepared. Alternate reclamation techniques and vegetation types will be described. Water monitors will remain on site until baseline conditions are established or until no further changes are anticipated if the area is mined and reclaimed. Chemical and physical data obtained on all geologic strata to a depth of approximately 200'. The project is located at T23N, R83, Section 6; T23N, T84W, Sections 2 and 12; T24N, R83W, Section 32; and T24N, R84W, Section 36.
KEYWORDS: COAL INDUSTRY;ENVIRONMENTAL IMPACTS;SURFACE MINING;LAND RECLAMATION;PLANNING;SITE SELECTION;BASELINE ECOLOGY;LEASING;WATER QUALITY;SEDIMENTS;PLANTS;WASTE MANAGEMENT

<053005>
TITLE: Phytoplankton - CS
PROJECT NUMBER: R7120844
PRINCIPAL INVESTIGATOR: Lar-rance, J.D.
ADDRESS: Environmental Research Labs., Boulder, CO 80302
AFFILIATION: Department of Commerce, Washington, D.C. (USA)
MONITORING AGENCY: Bureau of Land Management, Washington, D.C. (USA)
77 FUNDING: Bureau of Land Management FY77:$75,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (25%);TRANSPORTATION (25%);STORAGE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Other hydrographic areas Gulf of Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine temporal and spatial distributions of phytoplankton population and primary productivity in the northern Gulf of Alaska in support of an environmental impact assessment of oil and gas development sponsored by Bureau of Land Management.
APPROACH: To sample phytoplankton populations and measure primary production during several oceanographic cruises to the Gulf of Alaska. Data will be submitted and reports written on species composition, standing stock, productivity, and related variables.
KEYWORDS: PHYTOPLANKTON;POPULATION DYNAMICS;ALASKA;PETROLEUM INDUSTRY;NATURAL GAS INDUSTRY;BASELINE ECOLOGY;WATER QUALITY;ENVIRONMENTAL IMPACTS

Department of Interior/U.S. Geological Survey

<054001>
TITLE: U. S. Lineaments
PROJECT NUMBER: E-6
PRINCIPAL INVESTIGATOR: Carter, W.D.
ADDRESS: U.S. Geological Survey, EROS Program Stop 730, Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Department of the Interior, Washington, D.C. (USA)
DIVISION: U.S. Geological Survey
MONITOR: De Noyer, John M.
TELEPHONE: C(703)860-7881
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (10%);NUCLEAR/General (10%);GEOTHERMAL/General (10%);GENERAL SCIENCE (70%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;OS
PROJECT DESCRIPTION: U.S. Lineaments visible in Landsat images and mosaics are being analyzed for the following reasons and objectives: (1) Some have been found to be related to the location of energy resources (oil, gas and geothermal) and a better understanding of such features and determination of their geologic significance can lead to definition of new areas where such resources can be found. (2) Others may be determined to be faults along which seismic activity is recent enough to preclude an area as a site for reactor or hydroelectric installation.
APPROACH: Use of Landsat images and mosaics at various scales. Statistical analysis of frequency and trends of lineaments detected. Determine relationship to known geologic structures and define areas where additional field work is needed. Study relationship of lineaments to known energy sources and project trends into less well explored regions. Determine by comparison with seismic activity maps which lineaments may be related to active faulting and which, therefore, may constitute a potential hazard for sites being considered for energy installations.
RESULTS: Map at scale of 1:2,500,000 showing lineaments of the Conterminous United States. Report describing methods used, meaning of map, analytical results showing frequency and orientation of lineaments by 1 degree cells, relationships with known structures, resource and hazard implications.

PROJECT MILESTONES: (1) Detailed study of Landsat Mosaic of the Conterminous United States has been completed by 3 separate geologists and combined into a composite display at 1:1,000,000 scale. This has been reduced to 1:2,500,000 scale compatible with the Tectonic Map of the United States. It is now possible to compare what was previously known with what has been defined from satellite data. (2) Map and report are now in final review prior to publication. (3) Project completion date of 6/78 expected to be reached.
KEYWORDS: LINEAMENTS;FAULT;HAZARDS;EARTH CRUST;GEOLOGICAL SURVEYS;AERIAL SURVEYING;PHOTOGRAPHY;COLOR;ENERGY SOURCES;PETROLEUM DEPOSITS;NATURAL GAS DEPOSITS;GEOTHERMAL FIELDS;MAPS;USA;DATA COMPILATION;DISPLAY DEVICES;GEOCHEMISTRY;SEISMIC SURVEYS;SITE SELECTION;GEOPHYSICAL SURVEYS

<054002>
TITLE: Targeting of Mineral Explorations
PROJECT NUMBER: E-18
PRINCIPAL INVESTIGATOR: Taranik, J.V.
ADDRESS: EROS Data Center, Sioux Falls, SD 57198
AFFILIATION: Geological Survey, Sioux Falls, S.Dak. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
DIVISION: Land Information and Analysis Office
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: To demonstrate the usefulness of remote sensing data and effectiveness of remote sensing data analysis techniques for: (1) targeting of areas for mineral exploration effort; (2) development of exploration strategies; and (3) rating and evaluating the development of successfully targeted mineral deposits in the light of environmental factors.
APPROACH: Sites are to be selected in different geographic settings where petroleum and ore deposits have already been defined by ground exploration effort. Existing multispectral remotely sensed data (including airborne geophysical data) will be evaluated at different scales, accuracies, and format using different data analysis techniques. Conceptual geologic exploration models will be developed that will enable the known deposits to be targeted from remote sensor information. Areas where mineral deposits are suspected will then be targeted using developed techniques. Success of the targeting procedure will be demonstrated through the ground investigations conducted in the public domain.
RESULTS: (1) Publication of briefing aids, workshop exercises, and applications examples by FY 77. (2) Development of a complete documented application package by June 1977. This will be a complete stepwise procedure for targeting of mineral exploration effort and development of exploration strategy based on remotely sensed data. (3) Several technical publications in professional journals planned.
KEYWORDS: EARTH CRUST;GEOLOGICAL SURVEYS;AERIAL SURVEYING;REMOTE SENSING;GEOPHYSICAL SURVEYS;MINERALS;EXPLORATION;URANIUM;HYDROCARBONS

<054004>
TITLE: Fraunhofer Luminescence
PROJECT NUMBER: EROS PLD 1
PRINCIPAL INVESTIGATOR: Hemphill, W.R.
ADDRESS: U.S. Geological Survey, Reston, VA 22090
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: National Aeronautics and Space Administration, Washington, D.C. (USA)
DIVISION: Langley Space Center
MONITOR: Parker, Robert
TELEPHONE: C(804)827-3661
TYPE OF FUNDING: Interagency agreement-NASA/Langley Order I-58-514
77 FUNDING: Geological Survey FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (40%);GENERAL SCIENCE (60%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (30%)
REGIONS OF INTEREST: HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: Identify and discriminate selected natural resources and environmental pollutants through the use of an airborne Fraunhofer line discriminator (FLD) which measures solar stimulated luminescence. A supporting laboratory program uses a fluorescence spectrometer to quantify the luminescence of materials of interest and to predict the detectivity of such materials with the FLD.
RESULTS: The luminescence of oils (crude and refined), oil shales, industrial and residential wastes (including phosphate plant and paper mill effluent), phosphate and gypsum outcrops, and geochemically stressed vegetation was quantified in terms of a known standard rhodamine WT. Results were used to predict the detectivity of these materials with an airborne FLD. Measurements of luminescence with the FLD proved the validity of the predictive technique. Application of the FLD measurements to the environmental impact of phosphate plant effluent at Lakeland, Florida, and paper mill effluent at Perry, Florida, were made in cooperation with the Environmental Protection Agency. In addition, geochemically stressed vegetation was detected at Malachite Mine, Colorado, and Pine Mt., Nevada; also the FLD was used in cooperation with the Army Corps of Engineers to measure longshore currents in Lake Michigan by using fluorescent dyes as tracers. The instrument is now operating in an imaging mode from a fixed wing aircraft. Marked success has been shown in imaging oil seeps in the Santa Barbara Channel, California, and fluorescent rocks associated with uranium mineralization in New Mexico.
KEYWORDS: LAND POLLUTION;WATER POLLUTION;MEASURING INSTRUMENTS;PERFORMANCE TESTING;AERIAL MONITORING;LUMINESCENCE;SPECTROMETERS;OIL SPILLS;CHEMICAL EFFLUENTS;LIQUID WASTES;URANIUM MINERALS;PHOSPHATE ROCKS;PAPER INDUSTRY;HYDROCARBONS;FORESTS;PHOTOSYNTHESIS;PLANTS;WATER CURRENTS;LAKES;TRACER TECHNIQUES;MEASURING METHODS;ULTRAVIOLET SPECTRA;SEWAGE;GEOLOGICAL SURVEYS

<054005>
TITLE: Earth Sciences Applications
PROJECT NUMBER: S1-11
PRINCIPAL INVESTIGATOR: Nichols, D.R.
ADDRESS: 720 National Center, U.S. Geological Survey, Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
DIVISION: Land Information and Analysis Office
MONITOR: Balsley, James R.
TELEPHONE: F928-6961
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$1,600,000
TECHNOLOGY: FOSSIL FUEL/Coal (10%);FOSSIL FUEL/Oil and Gas (90%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (80%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);FULL SCALE DEMONSTRATION (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT;OS
PROJECT DESCRIPTION: To demonstrate for areas of diverse geologic and hydrologic conditions the application of earth-sciences data to the material benefit of urban land-use planning and decisionmaking; provide land-resource and hazard data and relate to decisions on facility siting and other on-shore effects of oil and gas importation in a form directly usable by land-use planners and decisionmakers. Study areas (Fairfax County, Colorado Front Range, and Puget Sound) cover a broad range of geologic and hydrologic conditions in critical urban areas.
APPROACH: Compilation and analysis of file data; field measurement of hydrologic properties and conditions of aquifers; analysis of streamflow and infiltration characteristics; geophysical and geologic mapping; direct and indirect field measurements of floods; engineering soils tests; horizontal level control surveys; various remote sensing techniques where appropriate; publication mainly as single purpose, individual maps or folio with text, designed for the land-use planner/decisionmaker.
RESULTS: Regional topographic maps at 1:100,000 and 1:125,000 scales, orthophoto quadrangles at a variety of scales. Basic data maps, such as those describing geology slopes and land forms and interpretive maps delineating potential hazards such as floods, active faults, landslides, and mine subsidence. Also included: mineral and construction resource maps including mapping of coal beds, and land capability studies.
PROJECT MILESTONES: (1) Completion of Colorado Front Range and Fairfax County urban area studies in FY 1978. (2) Completion of Puget Sound Earth Sciences Applications Study in FY 1982.
KEYWORDS: OIL SPILLS;SUBSIDENCE;LAND-USE PLANNING;NATURAL HAZARDS;URBAN AREAS;LAND USE;PLANNING;DECISION MAKING;GEOLOGICAL SURVEYS;HYDROLOGY;TOPOGRAPHY;REGIONAL ANALYSIS;HAZARDS;DATA COMPILATION;WATER RESOURCES

<054006>
TITLE: Land Use Impact on Solar-Terrestrial Energy Systems
PROJECT NUMBER: G-13
PRINCIPAL INVESTIGATOR: Lins, H.F.
ADDRESS: LIA, Geography Program, MS710, Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: LIA, Geography Program
MONITOR: Alexander, Robert H.
TELEPHONE: F928-6345
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$9,000
TECHNOLOGY: SOLAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this project are to improve knowledge of what happens to the sun's energy at the land-air interface, how land use and land cover influence the dissipation of that energy and thus affect local climates, and how this increased knowledge might lead to more effective conservation and use of this vast energy resource.
APPROACH: Development of energy budget simulation model. Define model sensitivity with respect to land use inputs. Surface roughness and surface materials will be correlated with land use types.
RESULTS: Ten reports to be completed as part of NASA contract requirements as well as several USGS Professional Papers.
KEYWORDS: INSTRUMENTATION;LAND USE;ENVIRONMENTAL IMPACTS;SOLAR ENERGY;TERRESTRIAL ECOSYSTEMS;MAPS;METEOROLOGY;POLLUTION;SOCIO-ECONOMIC FACTORS;PLANNING;CLIMATES;AIR POLLUTION;WEATHER;WATER RESOURCES;SIMULATION

<054007>
TITLE: Land Use Mapping and Data Compilation, Input Processing of Land Use Maps and Data, National Program
PROJECT NUMBER: G-1 and G-15
PRINCIPAL INVESTIGATOR: Loelkes, G.L.;Mitchell, W.B.
ADDRESS: LIA, Geography Program, MS-710, Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$1,670,000
TECHNOLOGY: FOSSIL FUEL/General (25%);GEOTHERMAL/General (10%);SOLAR/General (15%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;COASTS/Other coasts Unspecified;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes;HYDROGRAPHIC AREAS/Other hydrographic areas All inland waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To complete initial compilation and dissemination of land use/land cover data for the

entire U.S.
APPROACH: Land use/land cover data compiled from high altitude photography and other sources. All data entered into geographic information system for manipulation, research and applications.
RESULTS: Maps and overlays at 1:250,000 or 1:100,000 scale for entire U.S. Magnetic tapes and statistical reports also available.
KEYWORDS: LAND USE;MAPS;DATA COMPILATION;USA;STATISTICS;DATA ACQUISITION;TERRESTRIAL ECOSYSTEMS;BASELINE ECOLOGY;GEOLOGICAL SURVEYS

<054008>
TITLE: Impact of the Oil and Gas Industry on the Louisiana Coast
PROJECT NUMBER: G-14
PRINCIPAL INVESTIGATOR: Davis, D.W.
ADDRESS: Dept. of Geography, Nichols State University, Thibodaux, LA 70301
AFFILIATION: Nichols State Univ., Thibodaux, La. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: LIA, Geography Program
MONITOR: Place, John L.
TELEPHONE: F928-6345
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$9,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To study the historical development of that segment of the oil and gas industry on the Louisiana coast that is served by boat, either off-shore or in the poorly drained coastal plain, including the growth of the canal system to serve it, the change in socio-economic patterns, and particularly changes in land use.
APPROACH: The research will employ field surveys, literature search, and interpretation of maps and air photos covering the past 30 years.
RESULTS: Principal product will be USGS Professional Paper.
KEYWORDS: LOUISIANA;LAND USE;NATURAL GAS INDUSTRY;PETROLEUM INDUSTRY;ENVIRONMENTAL EFFECTS;COASTAL WATERS;COASTAL REGIONS;CONSTRUCTION;OFFSHORE OPERATIONS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;SOCIO-ECONOMIC FACTORS;WATER POLLUTION;LAND POLLUTION

<054012>
TITLE: Mined Area Reclamation and Related Land Use Planning
PROJECT NUMBER: R2
PRINCIPAL INVESTIGATOR: Imhoff, E.A.;LaFevers, J.R.
ADDRESS: National Center (750), Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: Resource and Land Investigations Program (RALI)
MONITOR: Imhoff, Edgar A.
TELEPHONE: C(703)860-6717
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Geological Survey FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Based on literature review and study of representative field conditions, to prepare a report which summarizes, for the land and resource planner, the processes, methodologies, and alternate choices that arise as land is converted to surface mining and is later reconverted into an asset or is left as a liability. To develop and compile a methodology to integrate land use plans with mining and reclamation plans.
APPROACH: Bibliographic review, case study analyses, field surveys, state-of-the-art surveys, and an interpretation for land use planners, on how to accomplish integrated mine, reclamation, and end-state land planning.
RESULTS: (1) Publication: Chap. A--A Guide to the Reclamation of Mined Areas for Land Resource Planners; Chap. B--Annotated Bibliography of Research, Programs, and Systems Relating to the Reclamation of Mined Areas; Chap. C--A Guide to the Technology of Reclamation of Mined Areas; Chap. D--A Guide to Integrated Land Use, Mining, and Reclamation Planning; and Chap. E--Case Studies in Mined Area Reclamation and Related Land Use Planning. (2) User oriented workshops for state and local officials will be conducted at 6 to 8 locations from September 1977 to June 1978.
KEYWORDS: LAND USE;SURFACE MINING;EXCAVATION;LAND RECLAMATION;PLANNING

<054013>
TITLE: Development and Application of a Methodology for Siting Onshore Facilities Associated with OCS Development
PROJECT NUMBER: R-1 (R-10)
PRINCIPAL INVESTIGATOR: Ciampa, V.
ADDRESS: New England River Basins Commission, 55 Court St., Boston, MA 02108
AFFILIATION: New England River Basins Commission, Boston, Mass. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: Resource and Land Investigations Program (RALI)
MONITOR: Doyel, William W.
TELEPHONE: F928-6717
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Geological Survey FY77:$75,000; Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)

ENERGY CYCLE: EXTRACTION (60%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (10%);WASTE MANAGEMENT (10%)
LLUTANTS: NOXIOUS GAS (60%);PARTICULATES (10%);ORGANICS (10%);HEAT, THERMAL (10%);VISUAL AESTHETICS (10%)
ARACTER OF STUDY: ANALYTICAL (100%)
nEGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To prepare a methodological guidebook to assist planners in preparing for the impacts of OCS oil and gas development, optimizing the benefits and minimizing the negative aspects, through formulation of guidelines for the siting of onshore facilities associated with OCS development.
APPROACH: (1) Development of scenarios based on different levels of OCS production. (2) Determination of facility requirements for each scenario, with associated infrastructure. (3) Development of a methodological approach to facility siting. (4) Testing of methodology through case studies with individual States. (5) Publication of ''guidebook''. (6) Two series of regional workshops transmitting results to state and local planners. To be held between 03/77 and 09/78, conducted under contract by the American Society of Planning Officials and funded by the Environmental Protection Agency.
RESULTS: Duplicated reports: (1) Estimates for New England; (2) Factbook; (3) The Methodology; (4) Case Studies; (5) Data and Information Needs and Availability; (6) Source Book; and (7) Workshop Manual.
PROJECT MILESTONES: (1) Scenarios completed 8/76. (2) Facility requirements 8/76. (3) Methodology 6/77. (4) Case Studies in N.E. States 7/77. (5) Revision of methodology 8/77. (6) Publication of Guidebook 10/77.
KEYWORDS: ENERGY FACILITIES;SITE SELECTION;CONTINENTAL SHELF;NATURAL GAS DEPOSITS;PETROLEUM DEPOSITS;EXPLOITATION;OIL SPILLS;SOCIO-ECONOMIC FACTORS;CONSTRUCTION;ECONOMICS;ECOSYSTEMS;OFFSHORE OPERATIONS

<054021>
TITLE: Arctic Engineering Geology (TAPS)
PROJECT NUMBER: 9310-00002
PRINCIPAL INVESTIGATOR: Ferrians, O.J. Jr.
ADDRESS: U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025
AFFILIATION: Geological Survey, Menlo Park, Calif. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$321,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (10%);ANALYTICAL (90%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Alaska;COASTS/Alaska
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To obtain geologic data needed for the planning, construction, and operation of the TransAlaska Pipeline (TAPS). In particular (1) to prepare for the Technical Advisory Board to the Department of Interior Task Force on Oil Development and for the Federal Task Force on Alaskan Oil Development an environmental impact statement, and prepare and review technical stipulations on the alignment, construction, and operation of TAPS, and (2) obtain geologic and engineering-geologic data needed for development of TAPS.
APPROACH: Geologic and engineering-geologic mapping, modelling of heat flow from a pipeline in permafrost, measurements of seismicity, studies of the permafrost, and synthesis of borehole data from surficial deposits. Evaluate new techniques, such as remote sensing, that will aid in the rapid determination and distribution and character of permafrost and other geologic-environmental features and consequently will facilitate solving engineering-geologic problems.
RESULTS: Most of the objectives of this project have been accomplished. More than 50 reports have been published, including environmental and technical stipulations and data resulting from geologic, seismic, and engineering-geologic studies. Current activities emphasize the collection of basic geologic, seismic, and hydrologic data important to the construction and safe operation of the pipeline.
PROJECT MILESTONES: (1) Completion of collection and synthesis of geotechnical data continuing. (2) Completion of collection and synthesis of seismic data continuing. (3) Completion of collection and synthesis of hydrologic data continuing.
KEYWORDS: ARCTIC REGIONS;ENVIRONMENTAL ENGINEERING;ALASKA;TRANSPORT;ENVIRONMENTAL IMPACTS;PETROLEUM;NATURAL GAS;ALASKA OIL PIPELINE;GEOLOGICAL SURVEYS;HEAT FLOW;PERMAFROST;SEISMIC SURVEYS;REMOTE SENSING;CONSTRUCTION;BASELINE ECOLOGY;OIL SPILLS;VISCOSITY;GROUND SUBSIDENCE

<054022>
TITLE: Geothermal Investigations, Subsurface Environmental Impact
PROJECT NUMBER: 9700-01522
PRINCIPAL INVESTIGATOR: Christiansen, R.L.
ADDRESS: U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025
AFFILIATION: Geological Survey, Menlo Park, Calif. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$550,000
TECHNOLOGY: GEOTHERMAL/General (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To assess the impact of geothermal development and utilization on the subsurface environment in terms of the possibilities of increased seismic activity, and subsidence, and changes in ground water flow and quality.
APPROACH: (1) Establish vertical and horizontal control nets for monitoring subsidence associated with subsurface fluid withdrawal. (2) Establish seismic nets for monitoring induced microearthquake activity. (3) Collect hydrologic data in order to establish baseline standards for the quality and flow of ground water.
RESULTS: (1) Reports of land subsidence and earthquake activity in the Imperial Valley and The Geysers, California. (2) Preliminary assessments of ground deformation and seismic activity in the Gulf Coast; Long Valley, California; and the Raft River and Bruneau-Grandview areas, Idaho. (3) Hydrologic data from Long Valley, Imperial Valley, and Raft River area.
PROJECT MILESTONES: (1) Subsidence monitoring: Start Imperial Valley, FY 76; continuing surveillance, FY 77,

FY 78, and FY 79. (2) Earthquake monitoring: Start preliminary risk assessment, Imperial Valley, FY 76; continuing surveillance, FY 77, FY 78, and FY 79. (3) Baseline ground water studies: Start Imperial Valley, FY 76; continuing surveillance, FY 77, FY 78, and FY 79.
KEYWORDS: GEOTHERMAL ENERGY;LAND USE;ENVIRONMENTAL IMPACTS;EARTHQUAKES;SEISMIC SURVEYS;GROUND SUBSIDENCE;GROUND WATER;IMPERIAL VALLEY;GEYSERS GEOTHERMAL FIELD;CALIFORNIA;HYDROLOGY

<054023>
TITLE: Arctic Environmental Studies Program
PROJECT NUMBER: 9310-01546
PRINCIPAL INVESTIGATOR: Ferrians, O.J. Jr.
ADDRESS: U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025
AFFILIATION: Geological Survey, Menlo Park, Calif. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$407,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Alaska;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: To investigate energy-related transportation corridors and other areas of development in Alaska in order to obtain base-line geotechnical data needed to aid in (1) planning, designing, operating, and maintaining engineering structures, (2) minimizing adverse environmental impacts of construction and operation of engineering projects, and (3) evaluating the feasibility of proposed engineering projects.
APPROACH: (1) Map and study the major surficial geologic units in transportation corridors and make interpretations of the potential engineering problems and availability of construction materials. (2) Collect and synthesize seismic data. (3) Study geologic processes that are especially active in Alaska. (4) Observe environmental problems that arise during construction and operation of the TransAlaska oil pipeline in order to evaluate methods for controlling adverse environmental impacts.
RESULTS: (1) Reports and maps on the engineering geology, permafrost, Pleistocene and Holocene stratigraphy, seismicity, and glacial geology of the transportation corridors and other areas. (2) Reports synthesizing engineering-geologic data made available during construction of the TransAlaska oil pipeline. (3) Environmental impact statements. (4) Recommendations for minimizing adverse environmental impacts in the operation and maintenance of oil and gas pipelines.
PROJECT MILESTONES: (1) Complete geologic studies in Central Brooks Range June 1978. (2) Complete seismic studies June 1977. (3) Complete engineering-geologic studies of Arctic Coastal Plain February 1978. (4) Complete collection and synthesis of TAPS geotechnical data December 1982.
KEYWORDS: ARCTIC REGIONS;GEOLOGICAL SURVEYS;BASELINE ECOLOGY;PETROLEUM;NATURAL GAS;TRANSPORT;SEISMIC SURVEYS;ALASKA;PIPELINES;ENVIRONMENTAL IMPACTS;ENVIRONMENTAL ENGINEERING;GROUND SUBSIDENCE;PERMAFROST

<054027>
TITLE: Hydrology of the Oil Shale Area, Uinta Basin, Utah
PROJECT NUMBER: UT-75-113
PRINCIPAL INVESTIGATOR: Norvitch, R.F.
ADDRESS: U.S. Geological Survey, 8002 Federal Building, 125 South State St., Salt Lake City, UT 84138
AFFILIATION: Geological Survey, Salt Lake City, Utah (USA). Water Resources Div.
MONITORING AGENCY: Geological Survey, Lakewood, Colo. (USA)
DIVISION: Water Resources Division
MONITOR: Arnow, Theodore
TELEPHONE: F234-4118
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Geological Survey FY77:$660,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Upper Colo. River;HYDROGRAPHIC AREAS/Other hydrographic areas Rocky Mt. States
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: A study of the hydrology of oil shale in the Uinta Basin is being initiated that will be comprehensive, span several years, produce about 30 reports, require several million dollars, and must yield results applicable to water supply and environmental problems. Existing data are minimal and the anticipated problems diverse. The problem is to design and conduct an efficient hydrology study that will provide a scientific basis for water supply and other development decisions within not more than 6 years. Design the investigation so that the objectives, individually and collectively, may be attained within about 5 years, with a minimum expenditure of funds and efficient use of manpower. Identify each project objective and document each project schedule, estimated costs, manpower requirement, data requirement, and report products. Provide a series of data and interpretive reports that will provide a comprehensive analysis of the hydrology of the oil shale area, oriented toward problems of water supply and the impacts of oil shale development.
APPROACH: Design the data collection system including preliminary locations and depths of proposed test holes, streamflow sites, parameters and frequencies of observations. Develop preliminary drilling specifications. Initiate data collection where baseline and project information are known to be required. Develop plan of study that documents objectives, approaches, schedules, and costs of each component of the comprehensive study. Produce the planned series of reports identified in plan of study during following 5 years.
RESULTS: Information is being collected to define the hydrologic system. A drilling contract for $341,000 was accepted to define the lithology and water bearing zones of the Green River formation. The work is 80% complete. Four artificial controls were installed at stream gaging sites. Thirty shallow wells were drilled in the alluvial valleys that are tributaries to the White and Green Rivers.
PROJECT MILESTONES: Two more artificial controls will be installed. Six data collection platforms will be installed as early flood warning devices. Eight pumping sediment samplers will be installed at existing gaging stations. Surveys of accumulated sediment in old BLM reservoirs will be made to estimate sediment yield from the area.
KEYWORDS: HYDROLOGIC BUDGET;UTAH;GEOLOGICAL SURVEYS;HYDROLOGY;OIL SHALES;AQUIFERS;WATER RESOURCES;WATER REQUIREMENTS

<054030>
TITLE: Hydrology of the Madison Limestone in North Dakota, South Dakota and Wyoming
PROJECT NUMBER: CR-76-192
PRINCIPAL INVESTIGATOR: Cushing, E.M.
ADDRESS: U.S. Geological Survey, Mail Stop 406, Box 25046, Denver Federal Center, Lakewood, CO 80225
AFFILIATION: Geological Survey, Lakewood, Colo. (USA)
MONITORING AGENCY: Geological Survey, Lakewood, Colo. (USA)
DIVISION: Water Resources Division
MONITOR: Dutcher, Lee C.
TELEPHONE: F234-3661
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$1,706,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Northern Great Plains;HYDROGRAPHIC AREAS/Other hydrographic areas Upper Missouri River Basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Major development of coal within the area will place a heavy demand on the area's limited water resources. Surface water is poorly distributed in time and space. It is fully appropriated in part of the area, and in the rest its use will require storage reservoirs and distribution systems. Preliminary studies indicate that the Madison limestone and associated rocks might provide a significant percentage of the total water requirements for coal development. However, the effects of large sustained withdrawals of water from these rocks on the hydrologic system are not known. Evaluate quantity of water that may be available from the Madison, define chemical and physical properties of the water, determine effects of existing developments on potentiometric head, storage, recharge and discharge, spring flow and streamflow, and pattern of ground-water flow, predict possible hydrologic effects of proposed withdrawals of water for large-scale developments at selected rates and locations, determine the better locations for wells and the type of construction and development of deep wells to obtain optimum yields, and design network of observation wells and streamflow gages to monitor effects of additional developments on the hydrolcgic system.
APPROACH: Assemble, review, and assess available geologic and hydrologic data, prior studies, and oil company information. Purchase borehole and surface geophysical information and other pertinent data from oil companies. Define structure and stratigraphy; determine aquifer boundaries and geologic parameters that control permeability. Translate these parameters into hydrologic terms. Design test-drilling program; drill and test aquifer. Refine preliminary digital simulation model of system, and design monitoring network. Predict effects of various patterns of water-supply development on potentiometric surface, recharge, discharge, springs, streamflow, and water quality that could result from these developments. Operate monitoring network and refine predictions.
RESULTS: A model of the Madison aquifer will be developed and calibrated to permit planners to ascertain the water supply available, and impacts of various levels of withdrawal.
PROJECT MILESTONES: Compile and further evaluate available data, purchase and analyze surface and borehole geophysical data to extend point data between wells, delineate permeable zones, collect and analyze water samples, construct additional gaging and climatological stations, evaluate existing wells for monitoring network, collect available data from current test drilling by oil and coal industries, begin petrologic studies, refine and extend existing geohydrologic maps, prepare drilling specifications, begin test drilling and aquifer testing, refine preliminary digital simulation model, and use model to estimate range of possible effects that anticipated water developments of the Madison might impose on hydrologic system.
KEYWORDS: NORTH DAKOTA;SOUTH DAKOTA;WYOMING;HYDROLOGY;COAL;ENERGY SOURCE DEVELOPMENT;WATER REQUIREMENTS;ENVIRONMENTAL IMPACTS;WATER;WATER RESOURCES;AQUIFERS;CHEMICAL PROPERTIES;GROUND SUBSIDENCE

<054032>
TITLE: Water and Its Relation to Economic Development in the Green River and Great Divide Basins, Wyoming
PROJECT NUMBER: WY-75-030
PRINCIPAL INVESTIGATOR: Lowman, H.W.
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AFFILIATION: Geological Survey, Cheyenne, Wyo. (USA). Water Resources Div.
MONITORING AGENCY: Geological Survey, Cheyenne, Wyo. (USA). Water Resources Div.
DIVISION: Water Resources Division
MONITOR: West, Samuel W.
TELEPHONE: F328-2111
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$267,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Rocky Mountain and northern Great Plains;HYDROGRAPHIC AREAS/Other hydrographic areas Upper Colorado River and Upper Missouri River Basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development of extensive coal, oil, gas, trona, and oil-shale resources in the project area will require a projected increase in water consumption of 480,000 acre-feet per year by 1990. Development of energy resources in other parts of the state also will require large amounts of water; transbasin diversion of Green River water to other areas could total an additional 270,000 acre-feet per year. Water planners and managers need much more information about available ground and surface water, present quality of the waters, and the impacts on water supply and quality caused by development of energy resources. The study will be designed to gather information and make available to interested industrial, agricultural, and governmental people interpretive reports that describe: (1) the distribution and quality of surface water in space and time; (2) relationships between surface water and ground water, (3) the distribution, quantity, and quality of ground water, and (4) hydrology-related aspects of the environment. Efforts of the study will be directed towards: (1) describing the water resources and hydrologic relationships that presently exist; (2) developing predictive methods that may be used to describe future conditions, including reactions to increased water development; (3) establishing monitoring programs for detecting possible changes in water parameters.
APPROACH: Compile and evaluate existing water data, conduct literature search for present hydrologic knowledge of the area. Prepare planning report during first year of project, outlining the specific techniques to be used in subsequent phases. Regarding water quality, particular attention will be given to trace metals, biological parameters, and trend analysis. Channel-geometry techniques, erts imagery, and detailed statistical analyses will be applied to surface-water studies. Aquifer tests and bore hole and surface geophysical surveys will be used in ground-water studies. Digital models will be developed for chemical-quality and surface-water systems.
RESULTS: During the 15-month period ending September 1976, a comprehensive planning report was completed that

summarizes the project study plan and outlines particular methods of approach to be utilized in the study. An interdisciplinary approach was used to collect data and prepare the hydrology sections of four interagency reports on reclamation and environmental impact. A helicopter was used advantageously to visit a large number of ephemeral streams during snow-melt runoff in 1976. At each site, the discharge and channel features were measured and samples of water were collected for chemical, sediment, and biologic analyses. Analyses of existing data on stream temperature, dissolved solids, and suspended sediment were completed and reports were begun for these items. A three-variable regression model for dissolved solids was developed that is much more descriptive than existing two-variable models. Flood-plain surveys were completed of most of the area's streams. A large number of observation wells were completed in the coal and oil-shale areas.
PROJECT MILESTONES: A helicopter will be used to aid data collection of a large number of springs and streams. Two different sampling schemes, once during base flow and again during snowmelt runoff, are planned. Interpretive reports concerning hydraulic characteristics, stream temperature, dissolved solids, suspended sediment, travel time, biology, and ground-water supply will be completed. Models of streamflow and water quality will be investigated and developed for small basins in oil-shale and coal areas. Several small basins will be instrumented for collection of weather and streamflow data for calibration of the model.
KEYWORDS: RUNOFF;CHANNEL MORPHOLOGY;WATER;COMPUTER CODES;ENERGY SOURCE DEVELOPMENT;WATER REQUIREMENTS;ECONOMICS;ECONOMIC IMPACT;WYOMING;WATER RESOURCES;BASELINE ECOLOGY;COAL;PETROLEUM;NATURAL GAS;OIL SHALES;HYDROLOGY;CONSUMPTION RATES;WATER POLLUTION

<054033>
TITLE: Effects of Mining and Related Activities on the Shallow Ground Water System
PROJECT NUMBER: MT-75-048
PRINCIPAL INVESTIGATOR: Slagle, S.E.
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AFFILIATION: Geological Survey, Billings, Mont. (USA). Water Resources Div.
MONITORING AGENCY: Geological Survey, Billings, Mont. (USA). Water Resources Div.
DIVISION: Water Resources Division
MONITOR: Pike, George M.
TELEPHONE: F585-5263
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$299,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Rocky Mt. states;HYDROGRAPHIC AREAS/Other hydrographic areas Upper Missouri River Basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Strip mining and the related aspects of coal development can be expected to cause ground-water levels and ground-water quality to change. The public, industry, and government need to know the extent of change in order to take and enforce mitigating measures. Water availability and water quality need to be known in order for other agencies to evaluate alternate sources of water. Define and understand the regional and local flow systems in aquifers above the Pierre shale. Develop a semi-quantitative conceptual model as a basis for predictive models. Develop predictive models to assess the effects of mining on water levels and the yield of wells and springs. Develop ''first estimate'' water-quality models to predict rate and direction of movement of poor quality water from spoil banks and other sources. Utilize all of the models to evaluate and revise the data collection program. Assure that the data collection and interpretation (modeling) programs meet the needs of other Federal and State agencies.
APPROACH: Combine the accumulated geologic and hydrologic information to develop conceptual models of the hydrolcgic system on both large and small scales. Collect additional data needed for more complete understanding of the hydrologic system. Develop digital models, first, to test and modify the concepts and evaluate the data-collection network then to predict the effects of mining and related activities on ground-water levels and the discharge of springs. Using the hydraulic models, try to develop water-quality models to determine or predict leachate migration and the movement of other poor quality water.
RESULTS: Inventoried about 450 wells in the field. Collected about 180 water samples for chemical analyses. Cased test holes for aquifer testing and water-level monitoring. Completed geologic map for entire study area. Selected wells for observation well network for overall study area. Completed structure contour map of the top of the Beardam shale. Initiated compilation of sand-shale ratio, isopach, transmissivity, and potentiometric-surface maps of the Tongue River and Lebo members of the Fort Union Formation and a structure contour map of the top of the Lebo member.
PROJECT MILESTONES: Complete sand-shale ratio, isopach, transmissivity, and potentiometric-surface maps of the Tongue River and Lebo members of the Fort Union Formation and the structure contour map of the top of the Lebo member. Complete well inventory. Continue water-quality sampling. Install recorders for monitoring of water levels. Run aquifer tests. Make low-flow investigations of streams. Enter data into system 2000. Case test holes drilled by government and industry on areas of government minerals, if available.
KEYWORDS: TRANSMISSIVITY;STORAGE COEFFICIENT;GROUND WATER;COAL MINING;ENVIRONMENTAL IMPACTS;SURFACE MINING;WATER QUALITY;WATER RESOURCES;WATER REQUIREMENTS;AQUIFERS;PLANNING;SPOIL BANKS

<054051>
TITLE: Impact of Outer Continental Shelf (OCS) Development on Coastal Land and Environmental Resources
PROJECT NUMBER: G-18
PRINCIPAL INVESTIGATOR: Lins, H.F.
ADDRESS: LIA, Geography Program, MS-710, Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$13,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (60%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (15%);WASTE MANAGEMENT (5%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;COASTS/Gulf;COASTS/Far West;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To assess the land use impact, specifically and generally, of Outer Continental Shelf

(OCS) oil and gas development through the use of remote sensing techniques.
APPROACH: Examination of OCS-related land use change in three sample sites (Kenai, Alaska; Santa Barbara, California; and Morgan City, Louisiana), using high-altitude aircraft photography.
SULTS: USGS Journal of Research article.
YWORDS: CONTINENTAL SHELF;PETROLEUM INDUSTRY;NATURAL GAS INDUSTRY;TERRESTRIAL ECOSYSTEMS;LAND USE;OFFSHORE SITES;ENVIRONMENTAL IMPACTS;REMOTE SENSING;HYDROCARBONS

<054052>
TITLE: Aquifer Testing, Piceance Creek Basin, NW Colorado
PROJECT NUMBER: CO-75-062
PRINCIPAL INVESTIGATOR: Weeks, J.B.
ADDRESS: USGS, Denver Federal Center, Box 25046, Lakewood, CO 80225
AFFILIATION: Geological Survey, Lakewood, Colo. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
DIVISION: Water Resources Division
MONITOR: Biesecker, James E.
TELEPHONE: F234-5092
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$375,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (10%);PROCESSING, CONVERSION (60%);WASTE MANAGEMENT (30%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Leachates from oil shale (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Problem: Evaluation and prediction of the impact of oil-shale development on the water resources of the Piceance Basin requires a knowledge of the transmissive and storage properties of the aquifer. Existing data are inadequate to reliably define the regional variations in aquifer properties and the vertical permeability of the confining layer, which separates the aquifers, has only been estimated. During previous studies in the Piceance Basin, the USGS accepted responsibility for plugging wells left open for hydrologic study. These wells need to be plugged to prevent the flow of water between aquifers. Objective is to define the regional variation of transmissivity and storage coefficient of the two principal aquifers and the leakage of the confining layer. The data will be used to update the data used in the existing digital model of ground-water flow which can be used to evaluate the impact of oil-shale develcpment on the hydrology of the Piceance Basin. Plug or complete existing wells to prevent the flow of water through the well bore between aquifers.
APPROACH: Aquifer test data collected by private companies will be analyzed and used to improve the definition of aquifer properties in the Piceance Basin. About twenty wells which are open to more than one aquifer will be plugged or partially plugged and completed as observation wells.
RESULTS: Results last year: aquifer test data were collected at 3 sites utilizing the observation wells drilled by contract under project CO 75-061. Aquifer test results reported by private development were compiled. Leaky-aquifer tests conducted by private companies indicate that it may not be feasible to determine the leakage of the Mahogany Zone confining layers. Consequently, contract specifications were prepared for the rehabilitation of 8 wells and the contract ($35,610 plus reimbursibles) was awarded and completed. The reconditioned wells will be used as observation wells for project CO 75-061.
PROJECT MILESTONES: Plans next year: (1) evaluate the feasibility of conducting leaky-aquifer tests; and (2) prepare a contract for either leak-aquifer or conventional aquifer testing.
KEYWORDS: STORAGE COEFFICIENT;TRANSMISSIVITY;COLORADO;HYDROLOGY;AQUIFERS;TESTING;OIL SHALE INDUSTRY;ENVIRONMENTAL IMPACTS;ENERGY SOURCE DEVELOPMENT;WATER RESOURCES;BASELINE ECOLOGY;DATA ACQUISITION;PICEANCE CREEK BASIN;COMPUTER CODES;CHEMICAL EFFLUENTS

<054053>
TITLE: Maxey Flats Investigation
PROJECT NUMBER: KY-75-031
PRINCIPAL INVESTIGATOR: Zehner, H.H.
ADDRESS: USGS, 572 Federal Building, Louisville, KY 40202
AFFILIATION: Geological Survey, Louisville, Ky. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
DIVISION: Water Resources Division
MONITOR: Emery, Philip P.
TELEPHONE: F352-5241
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Problem: Continuous burial of ''low level'' radioactive wastes has been taking place at Maxey Flats, KY, from 1963 to the present. Although the geology has been well-defined, little is known about the hydrology of the site. Moving water would be the principal transport mechanism for isotopes to offsite areas. Further definition and quantification of the various flow systems, at and around the site, need to be done. Knowledge of the hydrology of the site is needed in determining the ramifications involved in establishing other sites in similar hydrogeologic terrains. Objectives: (1) to further describe and define the various units which may transit water in the area; (2) to define and quantify the flow systems in these units; (3) to define the inorganic (non-isotopic) quality of water in the hydrologic units; and (4) to investigate the inorganic (non-isotopic) and organic character of the leachates in the disposal-pit water.
APPROACH: (1) Drill at least one piezometer nest of four tubes to obtain cores and data on zones of saturation, hydraulic heat distribution, and water quality. (2) Continue water level and conductivity measurements on some wells existing on site, as has been done during the past year. (3) Aquitard - test piezometer tubes.
RESULTS: Results last year: (1) routine water level, pH, and conductivity measurements made on all existing wells at the burial site; (2) four wells were drilled in June and July 1976 to depths of 53, 84, 138, and 323 ft.; (3) the well to 323 ft. was cored from top to bottom and cores have been sent for hydrologic and radiochemical analyses; (4) six trench water samples have been analyzed by Oak Ridge National Laboratory; and (5) 16 trench water samples were obtained for analysis by Brookhaven National Laboratory.

PROJECT MILESTONES: Plans next year: (1) 4 additional test holes, including one corehole, will be drilled in the spring of 1977; these holes will be located approximately in the center of the ''old'' trench area; (2) Racker tests will be conducted on all wells drilled in 1976 and 1977; and (3) chemical analyses will be done on water from these wells.
KEYWORDS: EFFLUENTS;STORAGE COEFFICIENT;TRANSMISSIVITY;NUCLEAR ENERGY;AQUIFERS;RADIOACTIVE EFFLUENTS;WATER;RADIONUCLIDE MIGRATION;KENTUCKY;RADIOACTIVE WASTE DISPOSAL;UNDERGROUND DISPOSAL;ENVIRONMENTAL IMPACTS;SITE SELECTION;HYDROLOGY

<054054>
TITLE: Sheffield Site Investigation, Bureau County, Illinois
PROJECT NUMBER: IL-76-024
PRINCIPAL INVESTIGATOR: Foster, J.B.
ADDRESS: USGS, P.O. Box 1026, Champaign, IL 06103
AFFILIATION: Geological Survey, Champaign, Ill. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
DIVISION: Water Resources Division
MONITOR: Martens, Lawrence A.
TELEPHONE: F958-9137
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Problem: Site near Sheffield, IL, is being used to bury ''low level'' radioactive wastes. Site has been in operation since August 1967. Although the gross geology has been well defined, hydrologic knowledge of the site is inadequate. Moving water (essentially ground water) would be the principal transport mechanism for isotopes to off site areas. Definition and quantification of the various flow systems in and around the site are necessary for determining the containment or rate of movement of radioisotopes with the ground water from the sites. Knowledge gained from the study of the microhydrology of this site will be applied to the problem of developing criteria to be used in establishing future sites. Objective is to describe and define in detail the hydrogeologic units which may or do transmit water in and adjacent to the site. The flow systems in these units will be defined and quantified. The water in the various units will be sampled and analyzed to determine the inorganic (non-isotopic) quality of the water. In addition, the water samples will be checked for the presence of radionuclides. The inorganic, organic, and radionuclide character of the leachates in the disposal-pit water will be determined. The possibility of developing a predictive digital waste transport model of the glacial till on which the site is located will be explored.
APPROACH: (1) It will require definition of microhydrology and distribution of radioisotopes. (2) Existing data will be reviewed. (3) Existing observation wells will be tested and logged, and additional wells will be installed to base of till. (4) Piezometers will be installed at various depths in till and in any sand lenses that have either been previously located or are encountered in new drilling. (5) Obtain undisturbed cores from drilled wells; obtain cores below refuse trenches; analyze cores for ions contained in the pore water and absorbed by the till minerals. (6) Install control wells in nearby areas. (7) Measure and sample small streams; look for springs and storm runoff from site. (8) Sample stream sediment for possible absorbed ions. (9) Evaluate hydrologic relationship of dissected till plain at site with adjacent disturbed strip mined areas.
RESULTS: Results last year: (1) Initial test drilling program has been completed. (2) Twenty-four wells were drilled, each well penetrated the glacial materials overlying the Pennsylvanian shale bedrock. (3) Shelby tube and/or split spoon samples were collected from land surface to bedrock. (4) Gamma ray logs were run on 5 existing monitor wells. (5) These logs were used to select points for collecting gamma spectral data. (6) Based on a qualitative evaluation of these logs there were no radionuclides present above the normal background nuclides present in the rock.
PROJECT MILESTONES: Plans next year: (1) complete analysis of test drilling data; (2) prepare hydrogeologic framework of site for purpose of planning additional test drilling and data collection needs; (3) complete field evaluation of coefficients of storage and transmissivity of most permeable zone in glacial material; and (4) prepare preliminary basis of a flow model to evaluate areal extent of sand lense, rates of flow, and coefficients of leakage of impermeable rocks which overlies the sand lense and underlies the floor of burial trenches.
KEYWORDS: TRANSMISSIVITY;WATER QUALITY;BASELINE ECOLOGY;ILLINOIS;RADIOACTIVE WASTES;RADIONUCLIDE MIGRATION;SITE SELECTION;UNDERGROUND;RADIOACTIVE WASTE DISPOSAL;GROUND WATER;HYDROLOGY;GEOLOGICAL SURVEYS;UNDERGROUND DISPOSAL;WATER;RADIOISOTOPES

<054055>
TITLE: Heat Transfer Across an Air-Water Interface
PROJECT NUMBER: SR-73-033
PRINCIPAL INVESTIGATOR: Jubson, H.E.
ADDRESS: USGS, Gulf Coast Hydroscience Center, Bay St. Louis, MS 39529
AFFILIATION: Geological Survey, Bay St. Louis, Miss. (USA). Gulf Coast Hydroscience Center
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
DIVISION: Water Resources Division
MONITOR: Baker, Robert A.
TELEPHONE: F494-3130
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$113,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Problem: need to obtain a better understanding for predicting evaporation. The objective of this project is to improve current methods for prediction of water temperature and evaporation under both natural and altered conditions.
APPROACH: Models will be developed for the following categories: (1) cases where the vertical temperature stratification is an important factor; (2) cases where the lateral temperature gradient dominates the process; and (3) cases where the water is mixed. In developing these models studies will be conducted on

energy transfer processes such as evaporation, conduction and radiation and sensitivity analysis will be performed on model parameters such as net absorbed radiation, air temperature, and wind speed.
ULTS: Results last year: the data collection phase of a field project to study temperature variations in a well mixed open channel has been completed and the data processed into engineering units. One hundred forty of the 365 days of data have been selected for detailed modeling. Any missing data for these days have been interpolated from other sources. Analysis of the radiation data indicate that different types of instruments give different values of longwave radiation, especially during the daylight hours.
PROJECT MILESTONES: Plans next year: (1) modeling of the 140 days of data will be completed in order to (A) verify the one-dimensional stream temperature model and (B) to determine the variation of the surface heat exchange coefficient with meteorologic and hydraulic variables; and (2) a IWRI manual on energy budget studies will be written and the Salton Sea report completed.
KEYWORDS: HEAT TRANSFER;TEMPERATURE GRADIENTS;WATER;EVAPORATION;MIXING;MATHEMATICAL MODELS;COMPUTER CODES;METEOROLOGY;WEATHER;THERMODYNAMICS

<054056>
TITLE: Gechydrology and Radioactive Solute Migration, Beatty Disposal Site, Nye County, Nevada
PROJECT NUMBER: NV-77-072
PRINCIPAL INVESTIGATOR: Nichols, W.D.
ADDRESS: USGS, Federal Building, 2800 Cottage Way, Sacramento, CA 95825
AFFILIATION: Geological Survey, Sacramento, Calif. (USA)
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
DIVISION: Water Resources Division
MONITOR: McClelland, E.J.
TELEPHONE: F468-4606
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Low-level solid radioactive waste has been buried at a site near Beatty, Nevada, from 1962 to the present. Geology and hydrology of the site is poorly known. The net downward soil moisture flux is unknown; consequently the potential rate of downward movement of radioactive solutes cannot be determined for present climatic conditions. Objectives: Estimate average potential rate of soil moisture flux and downward transport of radioactive solutes or leachates in the unsaturated zone beneath the burial site, and of the lateral movement of radioactive solutes or leachates in the regional aquifer. Attempt to determine if radionuclides from buried waste have migrated into the unsaturated zone beneath the burial trenches. Assess the geologic and geohydrologic suitability of the site for low-level radioactive solid waste burial. Contribute to the development of guidelines and criteria for selecting new burial sites.
APPROACH: Calculate soil moisture flux from measurements of matric potential, soil moisture, and unsaturated conductivity. Determine infiltration indirectly by measuring evaporation and surface runoff. Obtain new data on regional ground-water system by drilling several deep wells. Drill beneath waste burial trenches and sample for radioactive contamination. Conduct detailed geologic and hydrologic evaluation of burial site area.
PROJECT MILESTONES: (1) Preliminary analysis of soil moisture flux. (2) Preliminary analysis of radionuclide migration. (3) Project report. (4) Case history-suggested site selection criteria.
KEYWORDS: TRANSMISSIVITY;RADIOACTIVE WASTES;UNDERGROUND DISPOSAL;GEOLOGY;HYDROLOGY;SOILS;RADIONUCLIDE MIGRATION;GROUND WATER;CONTAMINATION;COMPUTER CODES;AQUIFERS

<054057>
TITLE: Water Resources of the Powder River Structural Basin in Wyoming in Relation to Energy Development
PROJECT NUMBER: WY-75-032
PRINCIPAL INVESTIGATOR: Lowry, M.E.
ADDRESS: USGS, P.O. Box 1125, Cheyenne, WY 82001
AFFILIATION: Geological Survey, Cheyenne, Wyo. (USA). Water Resources Div.
MONITORING AGENCY: Geological Survey, Washington, D.C. (USA)
DIVISION: Water Resources Division
MONITOR: West, Samuel W.
TELEPHONE: F328-2111
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$182,000
TECHNOLOGY: FOSSIL FUEL/Coal (90%);FOSSIL FUEL/Oil Shale (10%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The problems are those related to large water requirements for development of energy resources in the water-short Powder River and the impacts resulting from such development. An average annual requirement of 250,000 acre-feet of water per year is projected by 1990. Part of the initial demand could be supplied by surface water and/or ground water from aquifers of upper cretaceous or tertiary age. The impacts of mining, reclamation, transbasin diversions, off-channel and other reservoirs on the shallow aquifers, stream systems, and quality of water is not known. The objectives of the first phase will be to determine the adequacy of existing data to describe water availability and assess possible impact of the pending development, and to identify specific subjects that should be studied by the district. The findings of the first phase will be used to identify major thrusts for the second phase, which will constitute district's program in the basin during the succedding four years. A data-collection system will be designed, based on findings of the first phase, to meet data needs for thrusts and obtain benchmark information.
APPROACH: The existing data and data-collection program will be evaluated and a data-collection program, which is coordinated with other governmental and industrial programs, will be implemented. Various study techniques including those for determination of aquifer properties, streamflow analysis, channel geometry, isotope study, biological assay, water budgets, modeling, and geophysics will be explored and those that have merit will be pursued in the second phase of the study.
RESULTS: Results last year: during the 15-month period ending September 1976, the second year of the study, emphasis continued to be on data collection and construction. Three new gages were installed and six coal-test holes were completed as observation wells. The Emria site was instrumented with 2 SR recorders, 3 rainfall recorders, and two water-level recorders. Wells in the recluse model mine area were sampled

under a program with the EPA. Water resource sections for three coal EIS were written. Statistical and storage analyses for the North Platte River system were started. A comprehensive planning report for the project was prepared but not released.
PROJECT MILESTONES: Plans next year: (1) emphasis on data collection and construction will contnue; however, increased time will be spent on interpretation and reports; (2) only one new gage will be constructed, but there are tentative plans for completion of 15 coal test holes as observation wells; and (3) data collection at 3 of 10 intensive study sites is nearly complete, except for monitoring; emphasis on data collection will shift to other intensive study sites and to the basin reconnaissance.
KEYWORDS: CHANNEL GEOMETRY;WATER RESOURCES;WYOMING;ENERGY SOURCE DEVELOPMENT;WATER REQUIREMENTS;COAL;OIL SHALES;DATA ACQUISITION;BASELINE ECOLOGY;AQUIFERS;WATER QUALITY;COMPUTER CALCULATIONS;FLOW RATE;STREAMS

<054058>
TITLE: Energy Lands
PROJECT NUMBER: 9530-01931
PRINCIPAL INVESTIGATOR: Maberry, J.O.
ADDRESS: U. S. Geological Survey, Denver Federal Center, Mail Stop 913, Box 25046, Denver, CO 80225
AFFILIATION: Geological Survey, Denver, Colo. (USA)
77 FUNDING: Geological Survey FY77:$2,132,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (60%);ANALYTICAL (40%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To acquire, interpret, and disseminate geologic, hydrologic, geochemical, and related information that will assist in analyzing and solving environmental problems associated with energy resource extraction and utilization; and planning, siting, and construction of energy conversion and distribution facilities.
APPROACH: The programs assemble basic geologic, geochemical, engineering, and interpretive earth-science investigations into the environmental aspects of energy resource recovery, transmission, and conversion.
RESULTS: Maps and reports characterizing environmental earth science aspects are being prepared for areas of Montana, North Dakota, Wyoming, Utah, Colorado, New Mexico, Arizona, Oklahoma, Kansas, and Texas.
PROJECT MILESTONES: (1) Complete surficial geologic mapping in the eastern Powder River Basin, Wyoming. (2) Complete compilation of remote sensing techniques of land use, landform, and vegetation maps of Sheridan County, Wyoming. (3) Continue engineering-geologic studies in the western Powder River Basin, Wyoming. (4) Continue investigations into the rates of erosion and surficial and bedrock geologic mapping in northwest Colorado. (5) Complete environmental studies of the Texas Lignite Belt and continue them into Oklahoma and Kansas. (6) Continue baseline geochemistry studies.
KEYWORDS: ENVIRONMENTAL GEOLOGY;ENGINEERING GEOLOGY;MONTANA;NORTH DAKOTA;WYOMING;UTAH;COLORADO;NEW MEXICO;ARIZONA;OKLAHOMA;KANSAS;TEXAS;GEOCHEMICAL SURVEYS;GEOLOGICAL SURVEYS;HYDROLOGY;ENERGY SOURCES;SOILS;SULFUR COMPOUNDS

<054059>
TITLE: Remote Sensing of High Temperature Geothermal Areas of Iceland (Task within larger project: Geological and Geophysical Remote Sensing of Iceland)
PROJECT NUMBER: 6-7030-24006
PRINCIPAL INVESTIGATOR: Williams, R.S. Jr.
ADDRESS: USGS, EROS/LIA MS730, Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: Land Information and Analysis Office
MONITOR: Williams, Richard S., Jr.
TELEPHONE: F928-7873
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Geological Survey FY77:$30,000
TECHNOLOGY: GEOTHERMAL/General (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Iceland;HYDROGRAPHIC AREAS/Other hydrographic areas Mid-Atlantic Ridge
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The overall objective of the binational cooperative research project in Iceland is to determine the scientific and operational use of aerial and satellite photography and/or imagery to monitor and to study the dynamic geological and geophysical environment of Iceland. The geothermal studies, a task of the project, involve, for the next 3 years, the preparation of a professional paper on aerial photographic, aerial thermographic, and satellite imagery studies of the 17 high-temperature areas of Iceland.
APPROACH: All aerial photography and thermography has been acquired during aerial surveys: ca. 1945, ca. 1960, 1968, and 1973, for the former; and 1966, 1968, and 1973 for the latter. Preparation of the text will be a binational endeavor, with the USGS supporting its personnel. Each high-temperature geothermal area will be treated as a separate chapter in the monograph and will be well illustrated. This is the concluding phase of the geothermal project in Iceland.
RESULTS: The primary product will be a comprehensive monograph on the use of remotely-sensed data in the analysis of high-temperature geothermal areas in Iceland. Aerial photography and thermography will be correlated with ground-based geological and geophysical data to provide a complete reference work to Iceland's high-temperature geothermal areas. The monograph should aid in the exploration for exploitable high-temperature geothermal areas in the U.S. and other areas.
PROJECT MILESTONES: (1) FY 1976 and 1977 Bibliographic search of Iceland's geothermal literature. (2) Transitional Quarter Collation of all aerial and satellite data of Iceland. (3) FY 1978 Research analysis and preparation of text. (4) FY 1979 and FY 1980 Publication.
KEYWORDS: REMOTE SENSING;ICELAND;GEOPHYSICAL SURVEYS;GEOTHERMAL FIELDS;INFRARED SPECTRA;WATER;LAND USE

<054060>
TITLE: Fire Suppression for Offshore Platforms
PRINCIPAL INVESTIGATOR: Finger, D.
ADDRESS: 2800 Powder Mill Road, Adelphi, MD 20783
AFFILIATION: Harry Diamond Labs., Adelphi, Md. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: Conservation Division
MONITOR: Gregory, John B.
TELEPHONE: C(703)860-7531
TYPE OF FUNDING: Interagency agreement-USGS
77 FUNDING: Geological Survey
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Investigate state of art of fire detection and suppression systems in use in Navy, Army, and oil industry, etc. to determine if improvements can be made for application on offshore platforms.
APPROACH: Field surveys, model testing.
RESULTS: Confirm present techniques of suggesting improvements as result of experimentation or survey.
PROJECT MILESTONES: Start 1 May 1976. Complete 1 October 1977.
KEYWORDS: OFFSHORE PLATFORMS;FIRE PREVENTION;NATURAL GAS WELLS;OIL WELLS;SAFETY;OIL SPILLS

<054061>
TITLE: Inspection Procedures for Subsea Production Systems
PRINCIPAL INVESTIGATOR: Walters, W.
ADDRESS: 2800 Powder Mill Road, Adelphi, MD 20783
AFFILIATION: Harry Diamond Labs., Adelphi, Md. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: Conservation Division
MONITOR: Gregory, John B.
TELEPHONE: C(703)860-7531
TYPE OF FUNDING: Interagency agreement-USGS-CD
77 FUNDING: Geological Survey
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (90%);TRANSPORTATION (10%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oil spills (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Marine;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To define the requirements and methodology for performing government inspections on oil and gas production systems which are located on the ocean floor.
APPROACH: Reviewing Shell and Exxon subsea system designs.
RESULTS: Report on the methodology with recommendations for system improvements which would make inspections easier, or improved instrumentation.
PROJECT MILESTONES: (1) Shell system report 8-77. (2) Exxon system report 9-77. (3) Decision on extension to include system mods 10-77.
KEYWORDS: UNDERWATER FACILITIES;IN-SERVICE INSPECTION;NATURAL GAS WELLS;OIL WELLS;SEA BED;OIL SPILLS;SAFETY

<054062>
TITLE: Ultrasonic Flow Meter Experiment for Offshore Oil Pipeline Leakage Detection
PRINCIPAL INVESTIGATOR: Holmes, A.
ADDRESS: 2800 Powder Mill Road, Adelphi, MD 20783
AFFILIATION: Harry Diamond Labs., Adelphi, Md. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: Conservation Division
MONITOR: Gregory, John B.
TELEPHONE: C(703)860-7531
TYPE OF FUNDING: Interagency agreement-USGS-CD
77 FUNDING: Geological Survey FY77:$222,500
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oil spills (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Marine;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT;OS
PROJECT DESCRIPTION: To evaluate the usage of ultrasonic flowmetering devices to measure crude oil flow, i.e., in the unprocessed condition containing sand, water, etc., for purposes of detecting leakages between metering stations.
RESULTS: Looking for an acceptable method for detecting crude oil pipeline leaks.
PROJECT MILESTONES: (1) Set up experiment 1 Jan 78. (2) Data recording complete 1 Jan 79. (3) Final report 1 June 79.
KEYWORDS: METERING;AN EXPERIMENTAL SECTION OF PIPING WILL BE ERECTED AT A SHORE TERMINAL WHICH RECEIVES UNPROCESSED CRUDE FROM THE OUTER CONTINENTAL SHELF FIELD. SOME OF THE CRUDE WILL BE DIVERTED TO THE TEST SECTION WHICH WILL BE INSTRUMENTED WITH TWO METERING STATIONS CONSISTING MAINLY OF ULTRASONIC METERS FROM 3 OR 4 MANUFACTURERS. UNDER VARYING FLOW RATES AND CONSISTENCIES, THE METERS WILL BE EVALUATED.;PIPELINES;LEAKS;LEAK TESTING;FLOWMETERS;PETROLEUM;TRANSPORT;OIL SPILLS;SAFETY

<054063>
TITLE: Council on Environmental Quality: Environmental Statistics/Indicators
PROJECT NUMBER: R11
PRINCIPAL INVESTIGATOR: Smith, E.T.
ADDRESS: USGS, National Center MS750, Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
TYPE OF FUNDING: Interagency agreement-USGS
77 FUNDING: Geological Survey FY77:$6,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Environmental (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Compilation of a directory of national environmental statistics to cover such areas as air/water quality, land use, mineral resources, energy, food/fiber, and others. Presentation of these statistics in graphical form in a publication on environmental indicators.
APPROACH: Statistics will be assembled largely from Federal sources, e.g., land use and minerals data from USGS, food/fiber data from USDA, and so forth for each statistical area. Interpretive analyses will be prepared to evaluate the data for significance and probable trends in each subject area. A contract will be let by CEQ with CEQ, GS, and EPA, the sponsors of the activity, providing program direction, guidance and review. In addition, the Federal Project managers will arrange for advice and review by experts in the various categories covered. The statistics will be periodically updated and published, when significant changes warrant.
RESULTS: Two reports will be pubished: The Compendium of Environmental Statistics and Presentation of Environmental Indicators. Selected tables and graphs will appear in the CEQ annual report.
KEYWORDS: ENVIRONMENTAL INDICATORS;DATA COMPILATION;ENVIRONMENT;STATISTICS;USA;LAND USE;MINERAL RESOURCES;AIR QUALITY;WATER QUALITY;ENERGY;FOOD;FORECASTING

<054064>
TITLE: Environmental Planning and Western Coal Development
PROJECT NUMBER: R3
PRINCIPAL INVESTIGATOR: Smith, E.T.
ADDRESS: USGS National Center MS750, Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Geological Survey, Reston, Va. (USA)
DIVISION: Resource and Land Investigations (RALI) Program
MONITOR: Smith, Ethan T.
TELEPHONE: C(703)860-6717
TYPE OF FUNDING: Grant No.-AER75-12939
77 FUNDING: National Science Foundation FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (40%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (20%)
POLLUTANTS: PARTICULATES (10%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (90%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Construction of alternative scenarios to describe possibilities for development of western coal in the Powder River Basin, and the consequences of such development in terms of environmental, socio-economic, and land-use variables. Transfer of this technology to the in-place planning community in states such as Wyoming and Montana.
APPROACH: Scenarios will be constructed to show the interrelationships among amount of coal produced, mine mouth power generation, coal gasification, slurry pipelines, and unit trains. Scenarios will be interfaced with environmental assessment model to forecast the secondary and higher order impacts of each alternative.
RESULTS: Report describing project, methodology, and application will be produced for NSF as project sponsor. This report will be transferred to the planning community to increase their capabilities to cope with coal develcpment.
KEYWORDS: EFFLUENTS;ENERGY SOURCE DEVELOPMENT;COAL INDUSTRY;ENVIRONMENTAL IMPACTS;PLANNING;AEROSOLS;SOCIO-ECONOMIC FACTORS;LAND USE;TECHNOLOGY TRANSFER;WYOMING;MONTANA;COAL GASIFICATION;POWER GENERATION;TECHNOLOGY ASSESSMENT;COAL;COMPUTER CODES;CONSTRUCTION;ECONOMICS

<054065>
TITLE: DEROCS Computer Program
PROJECT NUMBER: R1a
PRINCIPAL INVESTIGATOR: Marcus, P.A.
ADDRESS: U.S. Geological Survey, RALI Program, National Center (MS750), Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
77 FUNDING: Geological Survey FY77:$1,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (50%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop a computer program which generates offshore energy development scenarios and onshore service base requirements.
APPROACH: Based on work accomplished by the New England River Basins Commission on onshore facilities siting associated with OCS energy development.
RESULTS: Computer model.
KEYWORDS: PORT FACILITIES;SERVICE BASES;COMPUTER CODES;D CODES;ECONOMICS;ENERGY FACILITIES;COMPUTER-AIDED DESIGN;NATURAL GAS;PETROLEUM;SITE SELECTION

Department of Interior/Bonneville Power Administraton

<055001>
TITLE: Substation Acoustical Study
PROJECT NUMBER: RPP 6020
PRINCIPAL INVESTIGATOR: Sawley, R.J. Kugler, B.A.
ADDRESS: 21120 Vanowen Street, Canoga Park, CA 91303
AFFILIATION: Bolt, Beranek and Newman, Inc., Canoga Park, Calif. (USA)
MONITORING AGENCY: Bonneville Power Administration, Portland, Oreg. (USA)
DIVISION: Branch of Materials and Procurement
MONITOR: Jarvis, Burton H.
TELEPHONE: P429-3361
TYPE OF FUNDING: Contract No.-BPA 14-03-6020N
77 FUNDING: Bonneville Power Administration FY77:$36,200
TECHNOLOGY: FOSSIL FUEL/General (75%);NUCLEAR/General (25%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: NOISE, VIBRATION/Noise (100%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To determine sound level compliance with noise control regulations for the various substations and where necessary, to develop methods for controlling excessive noise.
APPROACH: Initial field surveys of 34 substations of concern in Oregon and Washington to measure levels of compliance with state standards. Investigations of potential for land developments around substations of concern.
RESULTS: Recommendations for amelioration of excessive noise levels at substations not in compliance with state standards. Design of equipment to accomplish these recommendations.
KEYWORDS: INSTRUMENTATION;TRANSFORMER;SUBSTATION;DESIGN;ELECTRIC POWER;LOAD MANAGEMENT;POWER TRANSMISSION;NOISE;ENVIRONMENTAL EFFECTS;CONTROL;POWER SUBSTATIONS;POWER SYSTEMS;CONSTRUCTION

<055007>
TITLE: Process of Energy Routing to Minimize Impacts From Transmission Systems
PRINCIPAL INVESTIGATOR: Murray, T.J.
ADDRESS: P.O. Box 3621, Portland, OR 97208
AFFILIATION: Bonneville Power Administration, Portland, Oreg. (USA)
MONITORING AGENCY: Bonneville Power Administration, Portland, Oreg. (USA)
DIVISION: E and C Environmental Coordinator's Office
MONITOR: Murray, Timothy J.
TELEPHONE: P429-4995
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Bonneville Power Administration FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/Coal (10%);NUCLEAR/General (5%);HYDROELECTRIC (85%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: PARTICULATES (5%);ORGANICS (20%);NOISE, VIBRATION (15%);VISUAL AESTHETICS (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (10%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Demonstrate the on-project usefullness of a planning methodology which optimizes transmission corridors based upon resource/environmental considerations in conjunction with other factors comprising BPAs facility siting process.
APPROACH: Natural resource and socio-economic information is inventoried and given relative importance ratings; this data is then processed with a computer to optimize a transmission corridor in the context of minimizing interactions with constraints or problem areas.
RESULTS: This demonstration is expected to show that the use of the PERMITS methodology on selected complex projects will provide the decisionmaker with resource-responsive optimized corridors which will enhance his opportunity for balancing environmental and non-environmental factors.
PROJECT MILESTONES: This project is to be phased with BPAs siting/EIS program and is expected to terminate in 1978.
KEYWORDS: ELECTRIC POWER;POWER TRANSMISSION LINES;ENVIRONMENTAL EFFECTS;SITE SELECTION;LAND USE;SOCIO-ECONOMIC FACTORS;CONSTRUCTION;TERRESTRIAL ECOSYSTEMS;WATER REQUIREMENTS

<055010>
TITLE: Study of the Effects of Transmission Lines on Raptors (Hawks, Eagles)
PROJECT NUMBER: PR IEA-26
PRINCIPAL INVESTIGATOR: Lee, J.M.
ADDRESS: P.O. Box 3621, Portland, OR 97208
AFFILIATION: Bonneville Power Administration, Portland, Oreg. (USA)
MONITORING AGENCY: Bonneville Power Administration, Portland, Oreg. (USA)
DIVISION: Engineering and Construction Division, Environmental Coordinator's Office
MONITOR: Lee, J.M.
TELEPHONE: P429-4529
TYPE OF FUNDING: Contract No.-14-03-7159N;Agency in-house effort
77 FUNDING: Bonneville Power Administration FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
RGY CYCLE: ELECTRICAL TRANSMISSION (100%)
LUTANTS: NOXIOUS GAS/O/sub 3/ (10%);RADIATION/Electric;RADIATION/Magnetic (50%);NOISE, VIBRATION/Corona noise (40%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the status of raptor (hawks, eagles, osprey) nesting on BPA transmission

line towers and to study birds living in high electric, magnetic field, and corona noise environments.
APPROACH: BPA helicopter patrol observers were given training in collection of information on nesting raptors. Such information will be collected on all routine helicopter patrol flights beginning in the spring of 1977. Measurements of electric fields in transmission towers where birds nest will be made. Estimates will be made as to the amount of raptor production occurring on BPA transmission structures. A small number of raptor nest platforms will be installed where maintenance problems exist.
RESULTS: The results are expected to show that transmission lines are a positive factor for many kinds of birds because they provide nesting habitats in tree-less areas.
PROJECT MILESTONES: Four raptor nest platforms were installed during early spring of 1977 and two of the platforms were utilized by raptors.
KEYWORDS: RAPTORS ;POWER TRANSMISSION LINES;ENVIRONMENTAL IMPACTS;BIRDS;REPRODUCTION;MAINTENANCE;ELECTROMAGNETIC FIELDS;BIOLOGICAL EFFECTS

<055011>
TITLE: HVdc Transmission Line Biological Study
PROJECT NUMBER: PR IEA-19
PRINCIPAL INVESTIGATOR: Griffith, D.B.
ADDRESS: Drawer P, Boulder, CO 80302
AFFILIATION: Western Interstate Commission for Higher Education, Boulder, Colo. (USA)
MONITORING AGENCY: Bonneville Power Administration, Portland, Oreg. (USA)
DIVISION: Engineering and Construction Division, Environmental Coordinator's Office
MONITOR: Lee, J.M.
TELEPHONE: P429-4529
TYPE OF FUNDING: Contract No.-14-03-6070 N
77 FUNDING: Bonneville Power Administration FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: RADIATION/Electric;RADIATION/Magnetic-d.c. (20%);NOISE, VIBRATION/Corona (30%);SPECIFIED OTHER POLLUTANTS/Construction (50%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine what, if any, effects the +- 400 kV Celilo-Sylmar d-c transmission line has on crops, natural vegetation, wildlife, and domestic animals, which are detectable by field investigations.
APPROACH: Two primary study areas were established along the Oregon portion of the d-c line. Within these areas plants and animals are systematically sampled on the right-of-way and in nearby control areas off the right-of-way. Parameters studied include species diversity and relative abundance. Observations of animal behavior on and near the right-of-way are also included.
RESULTS: Results of the study are expected to be the first reported biologic effect of a HVdc transmission line. The results will provide data for an environmental statement being prepared for a proposed second d-c line.
PROJECT MILESTONES: Final report for the study is expected to be completed by July 15, 1977.
KEYWORDS: ELECTROMAGNETIC FIELDS;BIOLOGICAL EFFECTS;POWER TRANSMISSION LINES;ENVIRONMENTAL IMPACTS;NOISE;TERRESTRIAL ECOSYSTEMS;WILD ANIMALS;PLANTS;DOMESTIC ANIMALS

<055012>
TITLE: Biological Studies of an 1100/1200kV Prototype Transmission Line
PROJECT NUMBER: PAR No. IEA-29
PRINCIPAL INVESTIGATOR: Rogers, L.E.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Bonneville Power Administration, Portland, Oreg. (USA)
DIVISION: E and C Division, Environmental Coordinator's Office
MONITOR: Lee, Jack M.
TELEPHONE: P429-4529
TYPE OF FUNDING: Contract No.-14-03-6033N
77 FUNDING: Bonneville Power Administration FY77:$76,200
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: NOXIOUS GAS/O/sub 3/ (10%);RADIATION/60 Hz electric (50%);NOISE, VIBRATION/Corona noise (20%);SPECIFIED OTHER POLLUTANTS/Clearing-construction (20%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine what, if any, short-term effects a prototype 1100/1200 kV ac transmission line has on natural vegetation, crops, wildlife, cattle, and honey bees. Of primary interest are possible effects on animal behavior and the vigor and growth of plants.
APPROACH: Beginning one growing season before energization of the prototype line plants and animals were systematically sampled on the right-of-way and in nearby control areas of the right-of-way. Sampling will continue for two growing seasons following energization and comparisons will be made between right-of-way and control areas. During the summers of 1977 and 1978, cattle and honey bee colonies will be studied. Data being developed by laboratory studies being conducted elsewhere by others on biologic effects of electric fields will supplement results of the 1100/1200 kV study.
RESULTS: A final report is expected on the project in October 1978. Results of the biological study along with engineering and economic studies will determine the desirability of constructing 1100/1200 kV transmission lines in the BPA service area.
PROJECT MILESTONES: All three phases of the 1100/1200 kV test line were energized on May 10, 1977 and the biological study is now in the post-energization phase.
KEYWORDS: ELECTRIC POWER;POWER TRANSMISSION LINES;ENVIRONMENTAL EFFECTS;TERRESTRIAL ECOSYSTEMS;UHV AC SYSTEMS;PLANTS;WILD ANIMALS;CATTLE;BEHAVIOR;GROWTH;INSECTS;BIOLOGICAL EFFECTS;ELECTRIC FIELDS;NOISE

Department of Transportation

<060001>
TITLE: Software Development and Air Pollution Dispersion Model Testing
PROJECT NUMBER: 59077
ADDRESS: Cambridge, MA 02114
AFFILIATION: Input Output Computer Services, Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Transportation Systems Center
MONITOR: Darling, E.M.
TELEPHONE: C(617)494-2000
TYPE OF FUNDING: Contract No.-DOT-TSC-1172
77 FUNDING: Department of Transportation FY77:$9,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective calls for software development and air pollution dispersion model testing and evaluation.
APPROACH: A FORTRAN computer program will be written to model the dispersion of pollutants from one or more moving point sources. The TSC/EPA highway air pollution dispersion model will be reprogrammed to incorporate new features such as a new integration method and new conversion criteria to improve computer efficiency. A comparison will be made of predictions of five highway air pollution dispersion models. Model validation experiments will be conducted using two highway air pollution data samples to compute model performance measures.
KEYWORDS: EMISSIONS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;MATHEMATICAL MODELS;PERFORMANCE TESTING;COMPUTER CODES;POINT SOURCES;MOBILITY;COMPUTER CALCULATIONS;ROADS;EXHAUST GASES;DIFFUSION;PLUMES

<060003>
TITLE: Morgantown Post PRT Impact Evaluation
PROJECT NUMBER: 144511
ADDRESS: Morgantown, WV 26506
AFFILIATION: West Virginia Univ., Morgantown (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Transportation Systems Center
MONITOR: Schaeffer, K.H.
TELEPHONE: C(617)494-2000
TYPE OF FUNDING: Contract No.-DOT-TSC-1316
77 FUNDING: Department of Transportation FY77:$162,200
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The contractor will examine the Personal Rapid Transit that was built in Morgantown, WV, as a demo by the Urban Mass Trans Administration. There are 6 objectives: (1) measure the service/accessibility of system; (2) determine the nature of system patronage; (3) describe operating costs/revenues of system; (4) examine the attitudes of people in community toward system; (5) measure the impact of PRT upon travel/traffic, economy, society, and environment in corridor; and (6) create methodology for extrapolation.
KEYWORDS: PATRONAGE;WEST VIRGINIA;TRANSPORTATION SYSTEMS;RAPID TRANSIT SYSTEMS;ENVIRONMENTAL IMPACTS;HUMAN POPULATIONS;BEHAVIOR;ECONOMICS;SOCIO-ECONOMIC FACTORS;SYSTEMS ANALYSIS

<060005>
TITLE: Benefits Cost Associate Areawide Demand Responsive Transportation
PROJECT NUMBER: 144532
ADDRESS: Cambridge, MA 02138
AFFILIATION: Multisystems, Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Transportation Systems Center
MONITOR: Sturm, J.C.
TELEPHONE: C(617)494-2000
TYPE OF FUNDING: Contract No.-DOT-TSC-1334
77 FUNDING: Department of Transportation FY77:$239,600
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Identify and define benefits due to costs associated with deployment of various hypothetical Areawide Demand Responsive Transportation systems in the urban/suburban environment.
APPROACH: Contractor shall perform in-depth analysis of the economic, social, mobility and other impacts that these deployments may have on individual communities and the nation. Impact estimates are to be made on transit users, non-users, transit operators, and on communities as a whole. Information essential in forming Federal policy.
KEYWORDS: COST BENEFIT ANALYSIS;TRANSPORTATION SYSTEMS;RAPID TRANSIT SYSTEMS;PLANNING;SYSTEMS ANALYSIS;URBAN AREAS;ENVIRONMENTAL IMPACTS;SOCIAL IMPACT;ECONOMIC IMPACT;HUMAN POPULATIONS;BEHAVIOR;GOVERNMENT POLICIES;INFORMATION NEEDS;PUBLIC OPINION

Department of Transportation/Assistant Secretary - Environment, Safety, and Consumer Affairs

<061001>
TITLE: Atmospheric Measurements and Monitoring (AM and M)
PROJECT NUMBER: 36015
PRINCIPAL INVESTIGATOR: Massa, R.
ADDRESS: Burlington, MA 01830
AFFILIATION: Dynatrend, Inc., Burlington, Mass. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Office of the Secretary (OST); TST
MONITOR: Coroniti, S.C.
TELEPHONE: C(202)426-4227
TYPE OF FUNDING: Contract No.-DOT-OS-20104
77 FUNDING: Department of Transportation FY77:$2,800
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The overall objective is to provide scientific, technical and management services necessary to expeditiously implement the Atmospheric Monitoring and Experiments Subprogram and to maintain effective coordination with the other subprogram of the Climatic Impact Assessment Program (CIAP).
KEYWORDS: EARTH ATMOSPHERE;MONITORING;CLIMATES;AIR QUALITY;EQUIPMENT;AIR POLLUTION MONITORS;AIR SAMPLERS;METEOROLOGY;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS

<061002>
TITLE: Optimal Internal Organization for New and Existing Urban Passenger Transportation Enterprise
PROJECT NUMBER: 58349
ADDRESS: Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Office of the Secretary (OST); TST
TYPE OF FUNDING: Contract No.-DOT-OS-40079
77 FUNDING: Department of Transportation FY77:$5,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
APPROACH: Tasks include: (1) define and quantify the dimensions of the concepts of organization, technology and socio-economic environment so that they can be related to transportation; (2) identify suitable research hypothesis relating technological and environmental factors to organizational structure and behavior; and (3) conduct sample field surveys to obtain data on passenger transit organizations suitable to the testing of hypotheses and the formulation of findings and conclusions concerning optimal internal organizations for new and existing urban passenger transportation enterprises.
KEYWORDS: URBAN AREAS;TRANSPORTATION SYSTEMS;ORGANIZING;TECHNOLOGY ASSESSMENT;SOCIO-ECONOMIC FACTORS;ENVIRONMENT;BEHAVIOR;HUMAN POPULATIONS;PLANNING;TECHNOLOGY UTILIZATION;TRANSPORT

<061003>
TITLE: Transport of Solid Commodities via Freight Pipeline
PROJECT NUMBER: 58489
PRINCIPAL INVESTIGATOR: Zandi, I.
ADDRESS: Philadelphia, PA 19714
AFFILIATION: Pennsylvania Univ., Philadelphia (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Office of the Secretary (OST); TST
MONITOR: Ryan, D.C.
TELEPHONE: C(202)426-4208
TYPE OF FUNDING: Grant No.-DOT-OS-50119
77 FUNDING: Department of Transportation FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);CONSERVATION/General (60%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: Objectives are: (1) to explore the feasibility and viability of the freight pipeline as an effective mode of tranporting solid commodities over long distances; and (2) if the conclusion of that exploration is positive, to evaluate the issues surrounding the freight pipeline.
APPROACH: The research shall focus on evaluation of the concept through a technical and market feasibility study. In specific terms, the study is expected to quantify, as much as possible, the traffic, social, economic, energy, legal, regulatory, institutional, political, and environmental impacts of freight pipeline within the context of a number of varied, but possible, scenarios.
KEYWORDS: TRANSPORTATION SYSTEMS;PIPELINES;ENVIRONMENTAL IMPACTS;FEASIBILITY STUDIES;SOLIDS

<061004>
TITLE: Development of a Comprehensive Automotive Study
PROJECT NUMBER: 58756
ADDRESS: Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Office of the Secretary (OST); TST
MONITOR: Brooks, M.L.
TELEPHONE: C(202)426-4058
TYPE OF FUNDING: Grant No.-DOT-OS-50237
77 FUNDING: Department of Transportation FY77:$120,000
TECHNOLOGY: CONSERVATION/General (100%)

ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Reduce auto use (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
ONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
ARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
...OACH: Tasks include: (1) actions to ensure efficient use of existing road space, to reduce automobile use, to improve automobile performance, and to expand the availability or flexibility of automobile transportation; (2) identify and describe the typical operating environments of each of the actions; (3) assess the transportation, economic, financial, environmental and urban development implications and impacts of the actions; and (4) develop a methodology for combining the individual actions into a comprehensive automotive strategy.
KEYWORDS: EMISSIONS;REDUCE AUTO USE;AUTOMOBILES;SYSTEMS ANALYSIS;PERFORMANCE;LAND USE;ROADS;TRANSPORTATION SYSTEMS;OPERATION;ECONOMICS;URBAN AREAS;POLLUTION REGULATIONS;SOCIO-ECONOMIC FACTORS;ENERGY CONSERVATION;PLANNING;DECISION MAKING

<061005>
TITLE: Development of a Systems Risk Methodology for Single and Multi-Modal Transportation Systems
PROJECT NUMBER: 58924
PRINCIPAL INVESTIGATOR: Ang, A.
ADDRESS: Urbana, IL 61801
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Office of the Secretary (OST); TST
MONITOR: Reichart, B.K.
TELEPHONE: C(202)426-0210
TYPE OF FUNDING: Grant No.-DOT-OS-50238
77 FUNDING: Department of Transportation FY77:$30,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The intention is to develop and verify a probabilistic systems methodology for the quantitative risk assessment of existing or future transportation systems and develop preliminary risk models for estimating the probability of failure of each major component (i.e., vehicle, facilities, environment, operation, equipment, and human factors) in air, rail and highway systems.
KEYWORDS: TRANSPORTATION SAFETY;TRANSPORTATION SYSTEMS;COST BENEFIT ANALYSIS;PLANNING;DECISION MAKING;ENERGY MODELS;VEHICLES;ENVIRONMENT;OPERATION;EQUIPMENT;PUBLIC OPINION;HUMAN POPULATIONS;BEHAVIOR;SAFETY;AIRCRAFT;RAILWAYS;ROADS;SYSTEMS ANALYSIS;SOCIOLOGY

<061007>
TITLE: Conduct Workshop - Health Effects of Transportation Related Air Pollutants
PROJECT NUMBER: 160374
ADDRESS: Research Triangle Park, NC 27709
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Office of the Secretary (OST); TST
MONITOR: Strombotne, R.L.
TELEPHONE: C(202)426-2022
TYPE OF FUNDING: Contract No.-DOT-AS-70027
77 FUNDING: Department of Transportation FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Auto emissions (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The purpose of the workshop is to assist DOT to identify and assess the requirements for research and development in the area of the impacts on health of pollutants emitted into the atmosphere by all types of transportation vehicles.
APPROACH: DOT and EPA will jointly convene the workshop on this subject. This workshop is envisioned as a two-day session in which expertise will be applied to the question of health effects of both primary and secondary pollutants associated with highway vehicles (i.e., NOx, SO2, HC, CO, Pb, Mn, H2SO4, O3, PAN, etc.). Individuals with a particular knowledge of various aspects of the subject area (including toxicological testing systems, atmospheric chemistry, and characterization of mobile sources of pollutants) will be invited to participate.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;EDUCATION;TRANSPORTATION SYSTEMS;NITROGEN OXIDES;SULFUR DIOXIDE;HYDROCARBONS;CARBON MONOXIDE;LEAD;MANGANESE;SULFURIC ACID;OZONE;PHOTOCHEMICAL OXIDANTS;EXHAUST GASES;MEETINGS;INHALATION;AUTOMOBILES

Department of Transportation/Federal Aviation Administration

<062002>
TITLE: Reduce Noise Levels of Turbojet and Turbofan Engines
PROJECT NUMBER: 36321
ADDRESS: Knoxville, TN 37916
AFFILIATION: Tennessee Univ., Knoxville (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Power, J.K.
TYPE OF FUNDING: Grant No.-DOT-FA72WA-3068
77 FUNDING: Department of Transportation FY77:$71,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOISE, VIBRATION/Jet engines (100%)

CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Study of feasible methods for reducing the noise levels of turbofan and turbojet aircraft.
KEYWORDS: TURBOJET ENGINES;NOISE POLLUTION ABATEMENT;DESIGN;ENVIRONMENTAL IMPACTS;FEASIBILITY STUDIES

<062003>
TITLE: Development of Remote Sensing Wind and Wind Shear System
PROJECT NUMBER: 45427
PRINCIPAL INVESTIGATOR: Baren, D.
ADDRESS: Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Kraus, K.A.
TELEPHONE: C(202)426-8496
TYPE OF FUNDING: Contract No.-DOT-FA72WAI-281
77 FUNDING: Department of Transportation FY77:$220,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This agreement is to provide for the development and evaluation of a remote sensing wind and wind shear system to operate within the environment and be integrated into the National Airspace System.
KEYWORDS: REMOTE SENSING;TECHNOLOGY ASSESSMENT;WIND;METEOROLOGY;EARTH ATMOSPHERE;EQUIPMENT;AIR QUALITY;TURBULENCE;MONITORING;VELOCITY

<062004>
TITLE: Jet Noise Reduction
PROJECT NUMBER: 48675
PRINCIPAL INVESTIGATOR: Strings, E.J.
ADDRESS: Cincinnati, OH 45215
AFFILIATION: General Electric Co., Cincinnati, Ohio (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Contract No.-DOT-OS-30034
77 FUNDING: Department of Transportation FY77:$495,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOISE, VIBRATION/Jet noise (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
KEYWORDS: JETS;AIRCRAFT;NOISE POLLUTION ABATEMENT;AIR POLLUTION;ENGINES

<062007>
TITLE: Turbine Engine Particulate Emission Characterization
PROJECT NUMBER: 58742
ADDRESS: Chicago, IL 60616
AFFILIATION: IIT Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Contract No.-DOT-FA75-WA-3722
77 FUNDING: Department of Transportation FY77:$204,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Aircraft engines (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The study shall undertake the measurement and analysis of sample particulate emissions from three aircraft engines (JT3D, JT8D, and a JT9).
APPROACH: The particulate mass loading shall be measured and the particulate emission rate in lbs/hr shall be computed for all test conditions. The engines shall be sampled at five power settings corresponding to the five basic modes of aircraft operation, (take off, climb out, cruise, approach, and idle), as well as considering variations in atmospheric conditions. Tests on each engine shall be conducted using JET-A, (with various aromatic levels), JP-4, and JP-5 fuel in order to observe the effects of fuel type on particulate emissions.
KEYWORDS: TURBOJET ENGINES;EXHAUST GASES;AEROSOLS;PARTICLES;METEOROLOGY;JET ENGINE FUELS;POLLUTION CONTROL;OPERATION;ENVIRONMENTAL IMPACTS;CHEMICAL ANALYSIS;NITROGEN DIOXIDE;SULFUR DIOXIDE;AIRCRAFT

<062009>
TITLE: Aviation Weather and NOTAM System
PROJECT NUMBER: 59110
ADDRESS: Dallas, TX 75222
AFFILIATION: E-Systems, Inc., Dallas, Tex. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Tenenbaum, A.
TELEPHONE: C(202)426-8420
TYPE OF FUNDING: Contract No.-DOT-FA76WA-3770
77 FUNDING: Department of Transportation FY77:$342,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: TRANSPORTATION (100%)

CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
APPROACH: The Leesburg AWANS shall interface with the WMSC via a dedicated 2400 Baud Synchronous Circuit, and shall accept, store, buffer and selectively display alphanumeric weather and NOTAM information. The system shall accept and provide a video display of weather radar scope information available from the National Weather Service (NWS) weather radars through use of the NWS Radar Remoting System.
RESULTS: The performance of work shall include the fabrication, assembly, testing, installation, maintenance of, and FAA operator training support on an Aviation Weather and NOTAM System (AWANS).
KEYWORDS: AIRCRAFT;SAFETY;WEATHER;COMPUTER CODES;INFORMATION THEORY;EDUCATION;COMMUNICATIONS;DESIGN;DATA ACQUISITION SYSTEMS

<062010>
TITLE: Report on Wind Shear Profiles for Hazard Definition
PROJECT NUMBER: 59151
ADDRESS: Washington, DC
AFFILIATION: National Aeronautics and Space Administration, Washington, D.C. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Melervicz, F.V.
TELEPHONE: C(202)426-8427
TYPE OF FUNDING: Contract No.-DOT-FA76WAI-620
77 FUNDING: Department of Transportation FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
APPROACH: A set of wind profiles and wind shear characteristics which encompass the full range of wind shear environments, potentially encounterable by aircraft in the terminal area, shall be developed. Wind shear is defined as significant changes in wind speed and/or direction up to 500 meters above the ground that may adversely affect the approach, landing, or take-off of an aircraft.
KEYWORDS: AIRCRAFT;SAFETY;AVIATION PERSONNEL;WIND;VELOCITY;DATA ACQUISITION;WEATHER;HAZARDS

<062011>
TITLE: Concorde Air Pollution Monitoring
PROJECT NUMBER: 59188
ADDRESS: Concord, MA 01742
AFFILIATION: Environmental Research and Technology, Inc., Concord, Mass. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Contract No.-DOT-FA76WA-3817
77 FUNDING: Department of Transportation FY77:$94,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOISE, VIBRATION (50%);SPECIFIED OTHER POLLUTANTS/Aircraft emissions (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The purpose of this effort is to conduct an Installed Measurement Program to determine: (1) possible air quality change at the measurement sites during Concorde operations; (2) if pollutant concentration changes occur during specific Concorde events; (3) to provide actual on-site measurements of airport and neighborhood meteorological conditions; and (4) to provide ambient air quality data in the vicinity of Dulles International Airport during the presence of the Concorde and during normal airport operations.
KEYWORDS: DULLES INTERNATIONAL AIRPORT;CONCORDE;AIRCRAFT;EXHAUST GASES;AIR POLLUTION;SUPERSONIC TRANSPORT;MONITORING;AIRPORTS;DATA ACQUISITION;METEOROLOGY;NOISE POLLUTION;QUANTITY RATIO;AIR QUALITY;EARTH ATMOSPHERE;SURFACE AIR;ENVIRONMENTAL IMPACTS

<062012>
TITLE: Testing of Wind Shear Measuring Systems
PROJECT NUMBER: 59316
ADDRESS: Washington, DC
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Sowar, J.P.
TELEPHONE: C(202)426-8427
TYPE OF FUNDING: Contract No.-DOT-FA76WAI-622
77 FUNDING: Department of Transportation FY77:$207,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The main objective is meteorological (wind and temperature) instrumentation of the existing 500 foot tower located at Table Mountain, Colorado interfaced with on-site data logging and processing equipment.
KEYWORDS: WIND;VELOCITY;METEOROLOGY;COLORADO;DATA ACQUISITION SYSTEMS;DATA PROCESSING;COMPUTER CODES;WEATHER;EQUIPMENT;AIRCRAFT;SAFETY

<062013>
TITLE: Effects of Atmospheric Disturbances on STOL Approach Handling Qualities
PROJECT NUMBER: 59545
ADDRESS: Moffett Field, CA
AFFILIATION: National Aeronautics and Space Administration, Moffett Field, Calif. (USA). Ames Research Center
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Anderson, Jr.
TELEPHONE: C(202)426-8272
TYPE OF FUNDING: Contract No.-DOT-FA72WAI-285
77 FUNDING: Department of Transportation FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective is to evaluate the landing approach handling qualities in the presence of naturally occurring atmospheric disturbances. To accomplish this objective, it is necessary to model the disturbed atmosphere on the ground-based simulator, as determined from the actual measurements made in the in-flight simulator, and to mechanize on the ground-based simulator the exact model used on the in-flight simulation.
KEYWORDS: AIRCRAFT;SAFETY;SIMULATION;EARTH ATMOSPHERE;METEOROLOGY;AIR;WEATHER;AUTOMATION

<062015>
TITLE: Cooperative Stratospheric Aerosol Research Program
PROJECT NUMBER: 59790
ADDRESS: Laramie, WY 82071
AFFILIATION: Wyoming Univ., Laramie (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Long, V.G.
TELEPHONE: C(202)426-8251
TYPE OF FUNDING: Grant No.-DOT-FA76WA-3782
77 FUNDING: Department of Transportation FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Aerosols (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
KEYWORDS: EARTH ATMOSPHERE;AEROSOL MONITORING;STRATOSPHERE;MEASURING METHODS;MEASURING INSTRUMENTS;AIR POLLUTION;AEROSOLS;ULTRAVIOLET RADIATION

<062016>
TITLE: Noise Levels and Field Investigations
PROJECT NUMBER: 59840
ADDRESS: Washington, DC 20417
AFFILIATION: Trans Systems Corp., Washington, D.C. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Gebhardt, A.E.
TELEPHONE: C(202)426-3038
TYPE OF FUNDING: Contract No.-DOT-FATQWAI-706
77 FUNDING: Department of Transportation FY77:$18,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOISE, VIBRATION/Aircraft engine noise (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
APPROACH: Furnish personnel, facilities, equipment, materials and services necessary to develop data and procedures to determine the feasibility, practicality and costs of soundproofing buildings near airports as a means of alleviating the impact of aircraft noise.
KEYWORDS: NOISE POLLUTION;AIRCRAFT;PERSONNEL;EQUIPMENT;BUILDINGS;FEASIBILITY STUDIES;NOISE POLLUTION ABATEMENT;AIRPORTS;DESIGN;HEALTH HAZARDS;BIOLOGICAL EFFECTS;ENVIRONMENTAL IMPACTS

<062017>
TITLE: Modification of Signal Processing Interface Unit
PROJECT NUMBER: 59851
ADDRESS: Plainfield, NJ
AFFILIATION: Lockheed Electronics Co., Inc., Plainfield, N.J. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Cohen, M.
TYPE OF FUNDING: Contract No.-DOT-FA77NA-4003
77 FUNDING: Department of Transportation FY77:$109,500
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The intent is to effect modification of one Signal Processing and Interfacing Unit (SPIU) for use on the Beacon Collision Avoidance System (B-CAS). The modification work shall also assure that SPIU use in a Discrete Address Beacon System (DABS) environment shall not impair compatibility of the DABS with the B-CAS.
KEYWORDS: AIRCRAFT;SAFETY;COMMUNICATIONS;ACCIDENTS;SIGNALS;RADIO EQUIPMENT;MODIFICATIONS;EQUIPMENT INTERFACES

<062018>
TITLE: Data Interpretation on Measurement of Trace Gases
PROJECT NUMBER: 59958
PRINCIPAL INVESTIGATOR: Mai, H.L.
ADDRESS: Denver, CO 80201
AFFILIATION: Denver Univ., Colo. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Stephenson, J.L.
TELEPHONE: C(202)426-3205
TYPE OF FUNDING: Grant No.-DOT-FA77WA-3949
77 FUNDING: Department of Transportation FY77:$30,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/O3;NOXIOUS GAS/NO (100%)
CHARACTER OF STUDY: RESEARCH (100%)
PROJECT DESCRIPTION: The objective is to conduct a study and analysis to determine the error in deducing nitric oxide (NO) and nitrogen dioxide (NO2) altitude profiles as derived from infrared solar spectra obtained at high altitude (25 to 35 km) balloon altitudes during sunset and/or sunrise and to prepare a report which explains the results obtained and discuss the importance of these findings in the context of astratospheric ozone reduction estimation.
KEYWORDS: OZONE;AEROSOL MONITORING;DATA PROCESSING;NITROGEN DIOXIDE;NITRIC OXIDE;ERRORS;QUANTITY RATIO;INFRARED SPECTRA;SOLAR FLUX;ECOLOGICAL CONCENTRATION;STRATOSPHERE;CHEMICAL COMPOSITION

<062019>
TITLE: Drexel Tower Data Analysis for Wind Shear
PROJECT NUMBER: 59959
ADDRESS: Philadelphia, PA 19104
AFFILIATION: Drexel Univ., Philadelphia, Pa. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Tenenbaum, A.
TELEPHONE: C(202)426-8420
TYPE OF FUNDING: Grant No.-DOT-FA77WA-3938
77 FUNDING: Department of Transportation FY77:$30,000
TECHNOLOGY: SOLAR/Ocean, wind (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: The objective is to make an analysis of detailed wind and temperature data collected from 1,000 foot WFIL-KYW-TV station tower, located 12 miles north of Philadelphia International Airport, in order to determine characteristics of low-level wind shear such as frequency severity, duration and relationship to thunderstorm, frontal and inversion conditions.
KEYWORDS: PHILADELPHIA INTERNATIONAL AIRPORT;WIND;VELOCITY;TEMPERATURE GRADIENTS;WEATHER;DATA PROCESSING;PENNSYLVANIA;AIRPORTS;STORMS;TEMPERATURE INVERSIONS;AIRCRAFT;SAFETY

<062020>
TITLE: Airport and Community Noise Data
PROJECT NUMBER: 59968
ADDRESS: Seattle, WA 98104
AFFILIATION: Small Business Administration, Seattle, Wash. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Connors, G.T.
TELEPHONE: C(202)426-8272
TYPE OF FUNDING: Contract No.-DOT-FA77WAI-723
77 FUNDING: Department of Transportation FY77:$147,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: NOISE, VIBRATION/Aircraft noise (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
KEYWORDS: AIRPORTS;AIRCRAFT;NOISE POLLUTION;DATA ACQUISITION;COMMUNITIES;HUMAN POPULATIONS;SOCIO-ECONOMIC FACTORS;NOISE

<062021>
TITLE: Development of Model to Assess Environmental Effect of Commercial Aviations High Altitude Cruise Operations
PROJECT NUMBER: 59977
ADDRESS: Washington, DC
AFFILIATION: Space and Missile Systems Organization, Washington, D.C. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Broderick, A.J.
TELEPHONE: C(202)755-8933
TYPE OF FUNDING: Contract No.-DOT-FA77WAI-720
77 FUNDING: Department of Transportation FY77:$118,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Aircraft exhausts (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective is to develop a model for use in assessing the environmental effect of commercial aviations high altitude cruise operations. Since present fleets are too small, it is impossible to measure the environmental effects of aircraft exhaust products. Therefore, it is necessary to use mathematical models of atmospheric transport and chemistry to derive the required understanding.
KEYWORDS: AIRCRAFT;EXHAUST GASES;ENVIRONMENTAL IMPACTS;MATHEMATICAL MODELS;ENVIRONMENTAL TRANSPORT;COST BENEFIT ANALYSIS;DECISION MAKING;EARTH ATMOSPHERE;CHEMICAL PROPERTIES;AIR POLLUTION;STRATOSPHERE;MONITORING

<062023>
TITLE: Analysis of Aircraft Effects
PROJECT NUMBER: 160071
ADDRESS: Arlington, VA 22204
AFFILIATION: Institute for Defense Analyses, Arlington, Va. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Grant No.-DOT-FA77WA-3965
77 FUNDING: Department of Transportation FY77:$250,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Aircraft pollutants (100%)
PROJECT DESCRIPTION: Objectives are to: (1) summarize the status of research, in the U.S. and abroad, on the effects of high altitude aircraft operations on the stratosphere, with particular attention to effects on total-ozone column and climate; (2) undertake a review of the status of coupled chemistry-transport models of the effects of high altitude aircraft operations on climate; (3) summarize the state of knowledge with respect to the relationship between decreased ozone amount and changes in skin cancer incidence rates; and (4) summarize data on the location, nature and amount of each natural atmospheric perturbation which has occurred over the last 20 years.
KEYWORDS: AIRCRAFT;EXHAUST GASES;ENVIRONMENTAL IMPACTS;AIR POLLUTION;METEOROLOGY;STRATOSPHERE;MONITORING;ENVIRONMENTAL TRANSPORT;OZONE;CLIMATES;DATA ACQUISITION;NEOPLASMS;SKIN;MATHEMATICAL MODELS;EARTH ATMOSPHERE

<062024>
TITLE: Effects of Supersonic Transport on Air Quality
PROJECT NUMBER: 160072
ADDRESS: Argonne, IL 60439
AFFILIATION: Energy Research and Development Administration, Argonne, Ill. (USA). New Brunswick Lab.
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Grant No.-DOT-FA77WAI-736
77 FUNDING: Department of Transportation FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Aircraft pollutants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
APPROACH: Tasks are: (1) adapt the airport vicinity air pollution (AVAP) model to accommodate the measurements data of the Concorde; (2) determine new estimates of air quality values and compare with values computed from the unadjusted model; and (3) determine effects of additional supersonic transport on air quality by use of measurement data and a real world airplane activity forecast.
KEYWORDS: CONCORDE;SUPERSONIC TRANSPORT;ENVIRONMENTAL IMPACTS;AIR QUALITY;AIRPORTS;MONITORING;EXHAUST GASES;EARTH ATMOSPHERE;MATHEMATICAL MODELS;FORECASTING;DATA PROCESSING;COMPUTER CALCULATIONS

<062025>
TITLE: Assessment of the Irritating/Debilitation Effects of Environmental Agents on Railroad Operating Crews
PROJECT NUMBER: 160255
PRINCIPAL INVESTIGATOR: Peay, J.
ADDRESS: Crane, IN 47522
AFFILIATION: Naval Weapons Support Center, Crane, Ind. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Grant No.-DOT-AR-74312
77 FUNDING: Department of Transportation FY77:$53,500
POLLUTANTS: NOXIOUS GAS (50%);NOISE, VIBRATION (50%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);ANALYTICAL (20%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;OS
PROJECT DESCRIPTION: Studies of crew exposure to gaseous agents and in-cab noise have been undertaken with a view towards determining whether or not previously established maximum permissible dose levels of these agents are exceeded during routine operations. Preliminary indications are that, except in isolated, non-typical cases, these maximum permissible dose levels generally are not exceeded. The FRA continues to annually receive a limited number of reports of acute cases of nausea, discomfort, irritation and perceived annoyance due to exposure to environmental agents--especially diesel exhaust fumes. While exposure to these agents may not constitute an innate health hazard in the medical sense, their presence in the work environment may contribute to degraded job performance which in turn could lead to unsafe behavior.
KEYWORDS: RAILWAYS;PERSONNEL;OCCUPATIONAL DISEASES;DIESEL FUELS;EXHAUST GASES;HEALTH HAZARDS;NOISE POLLUTION;BEHAVIOR;AIR POLLUTION

<062026>
TITLE: Reanalysis of FAA/NASA Test Data to Yield Ground Impedance Data
PROJECT NUMBER: 160339
ADDRESS: Seattle, WA 98103
AFFILIATION: Man-Acoustics and Noise, Inc., Seattle, Wash. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Grant No.-DOT-FA77WAI-766
77 FUNDING: Department of Transportation FY77:$45,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOISE, VIBRATION (100%)
APPROACH: The contractor shall use government furnished data to (1) select a minimum of five test runs which most clearly exhibit the effects of variations in ground impedance and (2) study meteorological, operational, and acoustic data to select tapes for further narrow band analysis. Selection criteria shall include the following: (1) meteorological stability; (2) aircraft altitude; and (3) surface condition

variability. Based on the results of Task I, a narrow ban analysis of the tape recorded noise data for each selected test run from microphones 1.2 meters above the concrete taxiway and the surface shall be conducted.
KEYWORDS: METEOROLOGY;ACOUSTIC MONITORING;OPERATION;AIRCRAFT;STABILITY;AIRPORTS;SITE SELECTION;DATA PROCESSING;TESTING;NOISE POLLUTION ABATEMENT;GOVERNMENT POLICIES;ENVIRONMENTAL ENGINEERING;TOPOGRAPHY

<062027>
TITLE: Study Characteristics of Sonic Booms and Stratospheric Winds
PROJECT NUMBER: 160341
ADDRESS: New York, NY 10027
AFFILIATION: Columbia Univ., New York (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Sellman, E.W.
TELEPHONE: C(202)426-3396
TYPE OF FUNDING: Grant No.-DOT-FA77WA-3997
77 FUNDING: Department of Transportation FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOISE, VIBRATION/Sonic boom (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Conduct a study of the characteristics of sonic booms and stratospheric winds.
APPROACH: The work shall include the following: (1) sonic booms on Long Island - calibrated instruments shall be installed at two locations toward the north shore to provide information on the strength of the signal at the closest point to the flight path to detect the decay of the signal with distance; and (2) stratospheric winds - determine the feasibility of using long-range sound from the Concorde of the analysis of data from the tripartite array of detectors and from this single station determine whether additional stations properly placed can give more precise information on stratospheric winds.
KEYWORDS: CONCORDE;SUPERSONIC TRANSPORT;ENVIRONMENTAL IMPACTS;WIND;ACOUSTIC MEASUREMENTS;STRATOSPHERE;MONITORING;MEASURING INSTRUMENTS;FEASIBILITY STUDIES;REMOTE SENSING;NOISE POLLUTION;AIRCRAFT

<062028>
TITLE: Study of Atmospheric Mechanisms
PROJECT NUMBER: 160410
ADDRESS: Hartford, CT 06120
AFFILIATION: Center for the Environment and Man, Inc., Hartford, Conn. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Contract No.-DOT-FA77WA-4055
77 FUNDING: Department of Transportation FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/General (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Perform a study of atmospheric mechanisms and accomplish the following tasks: (1) exhaust trail diffusion and chemistry; (2) distribution of trace constitutents; and (3) meteorological considerations.
KEYWORDS: EARTH ATMOSPHERE;CHEMICAL REACTION KINETICS;EXHAUST GASES;DIFFUSION;ENVIRONMENTAL TRANSPORT;TRACE AMOUNTS;CHEMICAL COMPOSITION;METEOROLOGY;AIRCRAFT;ENVIRONMENTAL IMPACTS;AIR;HYDROCARBONS

<062029>
TITLE: Report on Present State of Knowledge of Neurological/Neurosurgical Conditions
PROJECT NUMBER: 160418
ADDRESS: Chicago, IL 60610
AFFILIATION: American Medical Association, Chicago, Ill.
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Grant No.-DOT-FA77WA-4076
77 FUNDING: Department of Transportation FY77:$74,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The Office of Aviation Medicine has determined that it needs an authoritative statement concerning the current state of knowledge regarding selected neurological/neurosurgical conditions. This information is required in connection with a continuing review of regulatory standards, examination procedures, and airman certification decisions involving neurological/neurosurgical conditions in airman applicants.
KEYWORDS: AIRCRAFT;PERSONNEL;BEHAVIOR;NEUROLOGY;MEDICAL SURVEILLANCE;SAFETY;HUMAN POPULATIONS

<062030>
TITLE: Define and Develop a Combined Hazard Index
PROJECT NUMBER: 160426
ADDRESS: Long Beach, CA 90846
AFFILIATION: Douglas Aircraft Co., Inc., Long Beach, Calif. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
TYPE OF FUNDING: Contract No.-DOT-FA77WA-4019
77 FUNDING: Department of Transportation FY77:$58,800
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (50%);ANALYTICAL (50%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
APPROACH: The combined hazard index shall be time scaled against a specific postcrash cabin fire environment

and cover an assumed maximum emergency evacuation period of five minutes. If a specific combustion hazard becomes critical within the five minute limit, it shall be identified and accounted for in the combined hazard ranking. The cabin fire environment shall be simulated by full-scale tests representative of an actual post-crash accident scenario and fire.
KEYWORDS: AIRCRAFT;SAFETY;ACCIDENTS;HAZARDS;EMERGENCY PLAN;FIRES;PROBABILITY

<062031>
TITLE: Draft and Final Environmental Impact Statement for the Aircraft Allocation Policies
PROJECT NUMBER: 160447
PRINCIPAL INVESTIGATOR: Hawkes, T.W. III
ADDRESS: Tampa, FL 33622
AFFILIATION: Greiner Environmental Sciences, Inc., Tampa, Fla. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Federal Aviation Administration
MONITOR: Dupree, J.R.
TELEPHONE: C(202)426-8420
TYPE OF FUNDING: Contract No.-DOT-FA77WA-4050
77 FUNDING: Department of Transportation FY77:$74,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);NOISE, VIBRATION (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Dulles Airport, National Airport, BWI Airport
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Preparation of a draft and final Environmental Impact Statement (EIS) for the existing operation of and the aircraft allocation policies proposed for National and Dulles airports. The documents will be responsive to the Order of the United States Court of Appeals for the Fourth Circuit in the case of Virginians for Dulles, et al. vs. John Volpe, individually and as Secretary of Transportation, et al.
APPROACH: In addition, the report will be prepared in compliance with the National Environmental Policy Act, other related Federal legislation, Council on Environmental Quality (CEQ) guidelines and applicable DOT and FAA Orders. In order to fully assess the regional impacts, the secondary effects of the policy alternatives in terms of its impact on Baltimore-Washington International (BWI) Airport will also be considered.
KEYWORDS: BALTIMORE-WASHINGTON INTERNATIONAL AIRPORT;DULLES AIRPORT;NATIONAL AIRPORT;AIRCRAFT;DISTRIBUTION;ALLOCATIONS;AIRPORTS;ENVIRONMENTAL IMPACTS;RECOMMENDATIONS;LEGISLATION;GOVERNMENT POLICIES;EXHAUST GASES;AIR POLLUTION ABATEMENT;NOISE POLLUTION ABATEMENT;COST BENEFIT ANALYSIS;REGIONAL ANALYSIS

Department of Transportation/Urban Mass Transit Administration

<066001>
TITLE: Automated Guideway Transit Technology Program
PROJECT NUMBER: 59050
PRINCIPAL INVESTIGATOR: Johnson, A.R.
ADDRESS: Pasadena, CA 91103
AFFILIATION: Jet Propulsion Lab., Pasadena, Calif. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Urban Mass Transportation Administration
MONITOR: Hoyler, R.C.
TELEPHONE: C(202)426-8483
TYPE OF FUNDING: Grant No.-DOT-AT-60008
77 FUNDING: Department of Transportation FY77:$30,000
TECHNOLOGY: CONSERVATION/End use (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The primary objective of this study is to update and reevaluate previous work done on dual-mode and to examine the AMTV in one of its possible modes of use. Specific objectives are: (1) to define and quantify the costs, effects upon urbana air quality, and the possible energy conservation impact of pallet and non-pallet approaches to Dual-Mode Transportation Systems; and (2) to develop the methodology and evaluate the feasibility of AMTV automatic guideway transit system control and scheduling algorithms.
KEYWORDS: ECONOMICS;AUTOMATION;RAPID TRANSIT SYSTEMS;TECHNOLOGY ASSESSMENT;AIR QUALITY;URBAN AREAS;ENVIRONMENTAL IMPACTS;ENERGY CONSERVATION;SIMULATION;EVALUATION;FEASIBILITY STUDIES;ALGORITHMS;CONTROL SYSTEMS;ENERGY CONSUMPTION;COMBUSTION;EXHAUST GASES;AIR POLLUTION;GLOBAL ASPECTS;DESIGN

<066002>
TITLE: Socio-Economic Analyses for the Automated Guideway Transit (AGT) Program
PROJECT NUMBER: 160265
ADDRESS: McLean, VA 22101
AFFILIATION: Mitre Corp., McLean, Va. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Urban Mass Transportation Administration
MONITOR: Price, S.P.E.
TELEPHONE: C(202)426-4022
TYPE OF FUNDING: Contract No.-DOT-UT-50016/11
77 FUNDING: Department of Transportation FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/General (50%);CONSERVATION/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)

APPROACH: The contractor shall perform independent studies, analyses and technical review as follows: (1) perform technical analyses needed for the design and development of the various elements of the UMTA AGT Socio-Economic Research Program; (2) conduct evaluation studies on the various elements of the Socio-Economic Research program; and (3) provide technical review and input at the direction of UMTA. The areas to be rreviewed include (a) socio-economic analyses, (b) economic, environmental, and energy impact analyses, and (c) technical documentation review.
KEYWORDS: TECHNOLOGY ASSESSMENT;AUTOMATION;SOCIO-ECONOMIC FACTORS;RAPID TRANSIT SYSTEMS;EVALUATION;REVIEWS;ENVIRONMENTAL IMPACTS;ENERGY CONSUMPTION;COST;FOSSIL FUELS;ENERGY CONSERVATION;COMBUSTION

<066003>
TITLE: Automated Guideway Transit Technology Program Vehicle Lateral Control and Switching
PROJECT NUMBER: 160446
ADDRESS: Denver, CO 80207
AFFILIATION: Otis Elevator Co., Denver, Colo. (USA)
MONITORING AGENCY: Department of Transportation, Washington, D.C. (USA)
DIVISION: Urban Mass Transportation Administration
TYPE OF FUNDING: Contract No.-DOT-UT-70088
77 FUNDING: Department of Transportation FY77:$869,500
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
APPROACH: Technological obstacles have been identified in the areas of network operation, vehicle control, safety, reliability and maintainability which must be resolved before AGT systems can successfully enter revenue service. Other critical areas such as energy utilization, land use requirements and environmental impacts must also be evaluated to assure the acceptance by society of these new transportation modes.
KEYWORDS: TRANSPORTATION SYSTEMS;SYSTEMS ANALYSIS;AUTOMATION;CONTROL;ENERGY DEMAND;LAND USE;ENVIRONMENTAL IMPACTS;SAFETY;RELIABILITY;MAINTENANCE;ENERGY CONSUMPTION

Environmental Protection Agency

<070501>
TITLE: Identification Manual for Freshwater Snails (Gastropoda) of North America
PROJECT NUMBER: A-612-A-6
PRINCIPAL INVESTIGATOR: Burch, J.B.
ADDRESS: University of Michigan, Ann Arbor, MI 48104
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Klemm, Donald J.
TELEPHONE: C(513)684-7336
TYPE OF FUNDING: Contract No.-68-03-1280
77 FUNDING: Environmental Protection Agency FY77:$15,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Prepare a manual for the identification of the freshwater snails of North America.
APPROACH: The literature on the geographic distribution, ecology and taxonomy of the snails will be consolidated and incorporated into a single report.
RESULTS: Identification manual for the freshwater snails of North America, containing information on their distribution and ecology.
PROJECT MILESTONES: 12/78 Complete Manual for Identification of Snails.
KEYWORDS: SNAILS;INVENTORIES;USA;AQUATIC ECOSYSTEMS;MANUALS;FRESH WATER;ECOLOGY

<070502>
TITLE: Determination of Trace Metals in Effluents by Differential Pulse Anodic Stripping Voltammetry
PROJECT NUMBER: A-612-A-7
PRINCIPAL INVESTIGATOR: Kinard, J.T.
ADDRESS: Harden and Blanding Streets, Columbia, SC 29204
AFFILIATION: Benedict Coll., Columbia, S.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gales, Morris E., Jr.
TYPE OF FUNDING: Grant No.-R-803490-01
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/Heavy (50%);SPECIFIED OTHER POLLUTANTS/Toxics (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Anodic stripping voltammetry has enjoyed a moderate degree of popularity as an analytical technique; however, its application to water chemistry has been primarily with finished and other relatively clean waters. An extensive study as to its suitability for waste water and effluent

analysis has not been made. The objective of this study is to investigate the applicability of electro-chemical systems and procedures for the detection of inorganic species in industrial and domestic wastes by utilizing the techniques of anodic and cathodic stripping voltammetry and scanning coulometry.
KEYWORDS: SURFACE WATERS;WATER POLLUTION;MONITORING;LIQUID WASTES;WASTE DISPOSAL;CHEMICAL EFFLUENTS;WATER CHEMISTRY;ELECTROCHEMISTRY;VOLTAMETRY;WATER POLLUTION MONITORS;DESIGN

<070503>
TITLE: State-of-the-Art Report on Freshwater Mussel Taxonomy and Ecology
PROJECT NUMBER: A612A-11
PRINCIPAL INVESTIGATOR: Isom, B.
ADDRESS: TVA, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Weber, Cornelius I.
TELEPHONE: C(513)684-7337
TYPE OF FUNDING: Interagency agreement-EPA
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To prepare a review of the current status of freshwater mussel taxonomy and ecology.
APPROACH: The task will be carried out under an Interagency Agreement with the Tennessee Valley Authority. The work will be done by experts on mussel taxonomy and ecology on the TVA staff, and by consultants currently under contract with the TVA, who have extensive personal knowledge in this field and who will compile, review, and summarize the literature.
RESULTS: State-of-the-art report discussing the taxonomy, geographic distribution, and ecology of the freshwater mussels of the United States.
PROJECT MILESTONES: 7/78 Publish state-of-the-art report on mussel taxonomy and ecology.
KEYWORDS: FRESHWATER MUSSELS;AQUATIC ECOSYSTEMS;FRESH WATER;MOLLUSCS;ECOLOGY;ANATOMY;PHYSIOLOGY;GENETIC VARIABILITY;INVENTORIES;TAXONOMY

<070504>
TITLE: Prepare Identification Manual for Rotifers
PROJECT NUMBER: A-612-A-12
PRINCIPAL INVESTIGATOR: Gannon, J.
ADDRESS: Douglas Lake Biological Station, Pellston, MI 49769
AFFILIATION: Michigan Univ., Pellston (USA). Douglas Lake Biological Station
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Weber, Cornelius I.
TELEPHONE: C(513)684-7337
TYPE OF FUNDING: Grant No.-R804652-01
77 FUNDING: Environmental Protection Agency FY77:$12,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop an identification manual for the common species of rotifers in the United States.
APPROACH: The grantee will use personal knowledge of rotifer identification and consolidate published information on the taxonomy and ecology of the rotifers to prepare a key for their identification and summarize data on their environmental requirements and pollution tolerance.
RESULTS: An Agency report containing a key to the identification of the rotifers and summary data on their envirconmental requirements and pollution tolerance.
PROJECT MILESTONES: 9/78 Complete identification manual for the Rotifers.
KEYWORDS: ROTIFERS;AQUATIC ORGANISMS;INVENTORIES;PHYSIOLOGY;WATER POLLUTION;TOLERANCE;BIOLOGICAL EFFECTS;MANUALS;TAXONOMY

<070505>
TITLE: Prepare State-of-the-art Report on Toxic Substances in Aquatic Organisms
PROJECT NUMBER: A-612-A-13
PRINCIPAL INVESTIGATOR: McKown, M.
ADDRESS: 7700 GSRI Ave., Baton Rouge, LA 70808
AFFILIATION: Gulf South Research Inst., Baton Rouge, La. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Weber, Cornelius I.
TELEPHONE: C(513)684-7337
TYPE OF FUNDING: Grant No.-R-805344-01
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To determine the current status of methodology for the collection and analysis of aquatic organisms for bioaccumulation of toxic substances.

APPROACH: The principal investigator will search the literature to obtain information on methods of sample collection, preservation, preparation and analysis for toxic substances. Special emphasis will be placed on the toxic substances listed in the ''Consent Decree.'' The methods will be evaluated and the data on oxic substances will be compiled and coded for computer storage.
LTS: State-of-the-art report on toxic substances in aquatic organisms.
ECT MILESTONES: 7/78 Publish state-of-the-art report on toxic substances in aquatic organisms.
KEYWORDS: AQUATIC ORGANISMS;BIOLOGICAL ACCUMULATION;TOXIC MATERIALS;DATA COMPILATION;SAMPLING;CHEMICAL ANALYSIS;MEASURING METHODS;DATA PROCESSING;COMPUTER CODES;WATER POLLUTION;BIOASSAY;MONITORING

<070506>
TITLE: Provide Methods for Measuring Radionuclides Required to Enforce Existing EPA Standards and Regulations
PROJECT NUMBER: A-621-A-1
PRINCIPAL INVESTIGATOR: Montgomery, D.
ADDRESS: 26 West St. Clair Ave., Cincinnati, OH 45268
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Krieger, Herman L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$83,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To improve methods for C-14 by utilizing absorbents compatible to liquid scintillation counting by determining the optimum condition required for the adsorption of a maximum volume of CO2 into an organic amine liquid scintillation counting solution for C-14 analysis.
APPROACH: Carbon dioxide gas obtained from controlled combustion of environmental and biological samples is carefully absorbed under controlled conditions in a mixture of organic amine and a compatible liquid scintillation solution. Approximately 2 to 3 liters of CO2 must be adsorbed in enough solution to be counted in an ordinary scintillation vial. This solution containing 1.7 g carbon will give approximately 20 counts/min. For a 1000 min counting time, a counting error less than 3% dpm/g 18 +- 0.6 for environmental carbon is anticipated.
RESULTS: Establish optimum conditions for this study.
PROJECT MILESTONES: (1) 10/75 Report-Analysis of C-14 and H-3 in Reactor Stack Gas. (2) 12/77 Complete Methodology for C-14 Using Compatible Absorbents.
KEYWORDS: CARBON 14;TRITIUM;RADIOMETRIC ANALYSIS;GASEOUS WASTES;RADIOACTIVE EFFLUENTS;NUCLEAR POWER PLANTS;STACK DISPOSAL;SURFACE AIR;AIR SAMPLERS;CARBON DIOXIDE;SAMPLING;SAMPLE PREPARATION;ADSORPTION;SCINTILLATION COUNTERS;PERFORMANCE TESTING;RADIATION MONITORING

<070507>
TITLE: Provide Methods for Measuring Radionuclides Needed to Gather Data on Non-regulated Pollutants Warranting Concern by EPA
PROJECT NUMBER: A-621-A-2
PRINCIPAL INVESTIGATOR: Krieger, H.L.
ADDRESS: 26 West St. Clair Avenue, Cincinnati, OH 45268
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Krieger, Herman L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop methods for 226-Ra in coal, slag, fly ash and scrubber sludge at coal-fired power plants, and determine any potential radiation hazard. Develop and test methodology to quantify discharges from nuclear medicine facilities, and determine any potential radiation hazard.
APPROACH: Each 1000 megawatt plant burns 10 to the 6th tons of coal annually. With 226Ra levels averaging 1.0 pCi/gm, a significant activity could be discharged with particulates in stack effluent. Samples of coal and by-products from operating plants are being analyzed for 226Ra to ascertain whether 226Ra could be present in stack effluent. Normal treatment processes do not remove radiopharmaceuticals that are discharged into the sewer. Tertiary treated sewage effluent will be utilized in power plant coolant operations and present a potential radiation hazard. Methodology for those radiopharmaceuticals discharged from hospitals is being developed and tested.
RESULTS: The sensitivity and validity of the methodology has to be improved, and air samplers will be installed in the stacks to corroborate activity discharge calculations. Procedures for 131-I, 51-Cr and 57-Co have been tested, and procedures for 75Se and 99Tc are in process. Upon completion, the methods will be tested at plants that utilize tertiary treated sewage in their operations.
PROJECT MILESTONES: (1) 3/76 Report--Interim Radiochemical Methodology for Drinking Water. (2) 3/78 Modify Methods for 210-Po and 210-Pb in Mill Tailings. (3) 9/78 Report--Hazard from 226-Ra from Fossil Fuel lants. (4) 12/78 Complete Methodology for Nuclides in Tertiary Treated Sewage.
ORDS: US EPA;POLLUTION LAWS;RADON 226;POSSIL-FUEL POWER PLANTS;RADIOACTIVE EFFLUENTS;RADIOMETRIC NALYSIS;AIR SAMPLERS;RADIOPHARMACEUTICALS;CHEMICAL PREPARATION;SEWAGE;RADIOACTIVITY;RADIATION MONITORING;IODINE 131;CHROMIUM 51;COBALT 57;SELENIUM 75;TECHNETIUM 99;SURFACE AIR

<070508>
TITLE: Fundamental Studies for Development of Electrochemical COD and TOC Analyzers
PROJECT NUMBER: A-612-A-5
PRINCIPAL INVESTIGATOR: Lobring, L.B.
ADDRESS: 26 West St. Clair Avenue, Cincinnati, OH 45268
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lobring, Larry B.
TELEPHONE: C(513)684-7301
TYPE OF FUNDING: Contract No.-D7-F1015
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop an automatic on-line Total Organic Carbon (TOC)/Chemical Oxygen Demand (COD) Analyzer which is less costly to operate than conventional measurement systems and avoids use of environmental polluting reagents.
APPROACH: A ''bread board'' TOC/COD Analyzer will be assembled to measure TOC and COD in samples after manual addition of reagents. The pCO2 sensor, developed for this project, ultraviolet reactor and coulometric persulfate sensor will be incorporated into this ''breadboard'' system.
RESULTS: This development phase of the project will demonstrate the feasibility of providing a reliable on-line monitoring instrument.
PROJECT MILESTONES: (1) 2/77 Design, fabricate or assemble TSA. (2) 9/77 Design, fabricate and assemble persulfate cell. (3) 9/77 Design, fabricate and assemble persulfate sensor. (4) 9/77 Design, fabricate and assemble CO2 sensor.
KEYWORDS: BIOCHEMICAL OXYGEN DEMAND;CARBON;ORGANIC COMPOUNDS;MEASURING METHODS;SURFACE WATERS;SAMPLING;WATER QUALITY

<070509>
TITLE: Prepare Methods Manual for Field and Laboratory Studies of Aquatic Organisms
PROJECT NUMBER: A-612-A-9
PRINCIPAL INVESTIGATOR: Weber, C.I.
ADDRESS: 26 W. St. Clair, Cincinnati, OH 45268
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Weber, Cornelius I.
TELEPHONE: C(513)684-7337
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Prepare and periodically update a manual describing recommended methods for field and laboratory studies of aquatic organisms.
APPROACH: A national committee of senior EPA biologists screens, selects, and describes methodology which is incorporated into a unified manual describing techniques for the collection and analysis of plankton, periphyton, macrophyton, macroinvertebrates, and fish. The methods are compiled, edited and printed by the staff of the Aquatic Biology Section, Environmental Monitoring and Support Laboratory, USEPA, Cincinnati, Ohio. The manual is revised periodically, as required, to keep it current.
RESULTS: Agency Methods Manual
PROJECT MILESTONES: (1) 12/73 Published 1st edition of Aquatic Biology Methods Manual. (2) 12/77 Published 2nd edition of Aquatic Biology Methods Manual. (3) 12/80 Published 3rd edition of Aquatic Biology Methods Manual.
KEYWORDS: WATER POLLUTION;MONITORING;MANUALS;AQUATIC ORGANISMS;SAMPLING;CHEMICAL ANALYSIS;BIOASSAY;BIOLOGY;PLANKTON;FISHES;INVERTEBRATES;AQUATIC ECOSYSTEMS

<070510>
TITLE: Evaluation of a Flameless and Hydride Generation in the Atomic Absorption Methods for Determining Organic and Inorganic Arsenic and Selenium in Industrial Effluents
PROJECT NUMBER: A-612-A-19
PRINCIPAL INVESTIGATOR: Kinard, J.T.
ADDRESS: Harden and Blanding Streets, Columbia, SC 29204
AFFILIATION: Benedict Coll., Columbia, S.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Cales, Morris E., Jr.
TYPE OF FUNDING: Grant No.-R-805237-01
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: SOLAR/Biomass (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Heavy (50%);SPECIFIED OTHER POLLUTANTS/Toxis (50%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This research comprises a comparative study of a number of leading methods for the

determination of arsenic and selenium, and serves to demonstrate the applicability of each for complex matrices that exist for samples such as industrial and domestic effluents.
APPROACH: By utilizing the techniques of flame and flameless atomic absorption spectrophotometry it should be possible to effect the appraisal of various sample pretreatment procedures including the Parr Acid Digestion Bomb Technique for the determination of total arsenic and selenium in effluents charged with a variety of their organic and inorganic species.
RESULTS: At the conclusion of this investigation the most applicable hydride generation-flame atomic absorption spectrophotometric method for determining organic and inorganic arsenic and selenium in an industrial domestic-effluent matrix will have been identified. In addition the advantages of this method and the graphite furnace method, when employed for routine determination of total arsenic and selenium in effluents, will have been determined and compared.
KEYWORDS: SPECTROPHOTOMETRY;CHEMICAL EFFLUENTS;MONITORING;ARSENIC;SELENIUM;LIQUID WASTES;SPECTROPHOTOMETRY;WATER CHEMISTRY;QUANTITATIVE CHEMICAL ANALYSIS;TOXIC MATERIALS

<070511>
TITLE: Evaluation of the Tekmar LSC-1 Volatiles Sampler
PROJECT NUMBER: A-614E-21
PRINCIPAL INVESTIGATOR: Smith, L.S.
ADDRESS: Dept. of Chemistry, Wilberforce, OH 45384
AFFILIATION: Central State Univ., Wilberforce, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gales, Morris E., Jr.
TYPE OF FUNDING: Grant No.-R804723-01
77 FUNDING: Environmental Protection Agency FY77:$30,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Evaluate the Telmar LSC-1 volatiles sampler and optimize operating conditions for the analysis of a variety of volatile organic compounds in water.
KEYWORDS: WATER POLLUTION;SAMPLERS;ORGANIC COMPOUNDS;CHEMICAL ANALYSIS;VOLATILE MATTER;EVAPORATION;PERFORMANCE

<070512>
TITLE: Develop Quality Assurance Procedures and Reference Samples for Aquatic Biology
PROJECT NUMBER: A-612-A-8
PRINCIPAL INVESTIGATOR: Collins, G.B.
ADDRESS: 26 W. St. Clair Ave., Cincinnati, OH 45268
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Weber, Cornelius I.
TELEPHONE: C(513)684-7337
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: To develop quality assurance procedures and reference materials, and carry out interlaboratory evaluation and validation of aquatic biology methods considered potentially suitable for routine use by Agency field and laboratory personnel.
APPROACH: The studies are carried out jointly with personnel in the Quality Assurance Branch, EMSL. Descriptions of the methods are prepared and reference samples are developed and distributed to participating laboratories. The results are evaluated and reported jointly with the QA Branch. Methods which meet the established criteria are included in the Biological Methods Manual. Reference materials currently under development include: standard toxicants for bioassays; Sedgwick-Rafter plankton and periphyton counting and identification; chlorophyll determination ATP measurement; diatom identification; and macroinvertebrate identification.
RESULTS: Quality assurance procedures, biological reference materials, and data on the accuracy and precision of biological methods.
PROJECT MILESTONES: (1) 1/69 Develop plankton counting reference sample. (2) 1/73 Develop spectrophotometric chlorophyll reference sample. (3) 12/76 Develop fluorometric chlorophyll reference sample. (4) 12/77 Develop ATP reference sample. (5) 12/78 Develop standard toxicant reference samples. (6) 12/78 Develop plankton and periphyton identification samples. (7) 12/78 Develop macroinvertebrate counting, sorting, and identification samples. (7) 12/79 Develop diatom identification reference samples.
KEYWORDS: QUALITY ASSURANCE;AQUATIC ECOSYSTEMS;SAMPLERS;WATER POLLUTION;MONITORING;STANDARDS;ACCURACY;BIOASSAY;MEASURING METHODS;BIOCHEMISTRY;TOXICITY;WASTE WATER;PLANKTON;TECHNOLOGY ASSESSMENT

<070513>
TITLE: Standardize Field and Laboratory Methods for Biomonitoring
PROJECT NUMBER: A-617-A-10
PRINCIPAL INVESTIGATOR: Collins, G.B.
ADDRESS: 26 W. St. Clair Ave., Cincinnati, OH 45268
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Weber, Cornelius I.
TELEPHONE: C(513)684-7337

TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop, evaluate and standardize field and laboratory methods for biomonitoring programs to measure the biological properties and ecological effects of effluents, and to determine the biological integrity of surface waters.
APPROACH: Projects include studies of methods for sample collection and preparation; organism counts and identification; measurements of biomass and metabolic rates; effluent bioassay; bioaccumulation of toxic substances; and data handling and interpretation. Methods are developed for all communities of aquatic organisms, including: phytoplankton, zooplankton, periphyton, macrophyton and macroalgae, macroinvertebrates, and fish. Research projects are carried out inhouse and under grant and contract.
RESULTS: Output includes methods which are included in the EPA Aquatic Biology Methods Manual, manuals for the identification of aquatic organisms, reports on the environmental requirements and pollution tolerance of aquatic organisms, computer systems for data storage and retrieval, and guidelines for biomonitoring programs.
PROJECT MILESTONES: (1) 7/73 Report on artificial substrate performance. (2) 7/73 Report on plankton and periphyton methodology. (3) 7/74 Identification manual for Stenonema mayflies. (4) 7/76 Implement computerized biological data handling system (BIO-STORET). (5) 12/77 Report on environmental requirement and pollution tolerance of Midges. (6) 12/77 Revised identification manual for centric diatoms. (7) 7/78 New methods for chlorophyll measurements. (8) 12/78 Sediment oxygen demand method. (9) 12/79 Methods for measuring bioaccumulation of toxic substances. (10) 12/79 Develop models of diatom communities.
KEYWORDS: BIOASSAY;STANDARDS;CHEMICAL EFFLUENTS;SAMPLING;SAMPLERS;MEASURING METHODS;MEASURING INSTRUMENTS;BASELINE ECOLOGY;COMPUTER CODES;B CODES;DATA PROCESSING;TOLERANCE;AQUATIC ORGANISMS;BIOLOGICAL ACCUMULATION;BIOLOGICAL MODELS;WATER POLLUTION;WASTE WATER;TOXICITY

<070514>
TITLE: Provide Methods, Samples and Procedures Required to Enforce Existing and Planned EPA Standards
PROJECT NUMBER: A-621-C-23
PRINCIPAL INVESTIGATOR: Winter, J.
ADDRESS: 26 W. St. Clair Ave., Cincinnati, OH 45268
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Clements, Harold
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Samples available for pesticides, herbicides, polychlorinated biphenyls, volatile organics, selected metals, minerals, nutrients and demand parameters in response to Water Laws.
APPROACH: Design, develop and prepare sample concentrates for above parameters.
RESULTS: Samples available: (1) endrin, lindane, methoxychlor, toxaphene in the pesticide series; (2) chlorophenoxy acids; (3) mineral parameters; (4) nutrient parameters; (5) demand parameters; (6) volatile organics; (7) trace metals (arsenic, cadmium, lead, mercury and selenium).
PROJECT MILESTONES: Samples available for endrin, indane, methoxy chlor, toxaphene, mineral parameters, nutrients, demand, arsenic, cadmium, lead, mercury, selenium and volatile organics.
KEYWORDS: US EPA;WATER QUALITY;STANDARDS;LEGAL ASPECTS;POLLUTION LAWS;SURFACE WATERS;SAMPLING;QUANTITATIVE CHEMICAL ANALYSIS;PESTICIDES;POLYCYCLIC AROMATIC HYDROCARBONS;ARSENIC;CADMIUM;LEAD;MERCURY;SELENIUM;TOXIC MATERIALS;CALIBRATION STANDARDS;NUTRIENTS;CHLORINE;MONITORING

<070515>
TITLE: Develop and Operate National Laboratory Evaluation Systems
PROJECT NUMBER: A-621-C-24
PRINCIPAL INVESTIGATOR: Britton, P.
ADDRESS: 26 W. St. Clair Ave., Cincinnati, OH 45268
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Winter, John A.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Evaluation of Performance of EPA, State, Water Supply and NPDES Laboratories.
APPROACH: Conduct interlaboratory performance evaluation studies on parameters of interest. Provide repeats to responsible authorities.
RESULTS: EPA and State Pollution Control Laboratories evaluated annually--1976. EPA and State Water Supply Laboratories evaluated annually--1977.

PROJECT MILESTONES: (1) 9/76 EPA and State Pollution Control Laboratories evaluated. (2) 9/77 EPA and State Water Supply Agencies evaluated. (3) 9/77 Intrastate Pollution Control and Water Supply Laboratory evaluations begun. (4) 9/78 Evaluation of EPA and State Laboratories continue.
KEYWORDS: USA;DRINKING WATER;WATER QUALITY;RESEARCH PROGRAMS;WATER POLLUTION;EVALUATION;US EPA;LIQUID WASTES;SEWAGE;WASTE DISPOSAL

<070516>
TITLE: Technical Services to Support the Quality Assurance Program
PROJECT NUMBER: A-621-A-26
PRINCIPAL INVESTIGATOR: Kowalslri, V.
ADDRESS: P.O. Box 19070, Cincinnati, OH
AFFILIATION: Bionetics, Inc., Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Berg, Edward L.
TELEPHONE: C(513)684-7326
TYPE OF FUNDING: Contract No.-68-03-2490
77 FUNDING: Environmental Protection Agency FY77:$188,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Turbidity (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To provide the Quality Assurance Branch, EMSL-Cincinnati with technical support services.
APPROACH: A fully equipped water chemistry laboratory and equipment to produce Quality Control Samples was set up and staffed by contractor personnel.
RESULTS: The Technical Service laboratory has finalized the setting up of all instruments and associated equipment to make the laboratory functional. Technical Service personnel are currently developing turbidity and suspended solid QC samples. Other activities include the distribution of quality control samples throughout the country and the development of an EPA manual on Sampling and Sample Preservation of Waters/Wastewaters. Upon concluding the development of the QC samples, new directives will be given for the development of additional QC samples. Output: Turbidity Quality Control Sample, Suspended Solids QC Sample, and Handbook for Sampling and Sample Preservation of Waters/Wastewaters.
PROJECT MILESTONES: (1) 1/78 Development of a Suspended Solid QC Sample. (2) 8/77 Development of a Handbook for Sampling and Sample Preservation of Waters/Wastewaters. (3) 8/77 Development of Turbidity QC Sample.
KEYWORDS: SUPPORT SEVICES;WATER POLLUTION;SURFACE WATERS;MONITORING;WATER CHEMISTRY;LABORATORY EQUIPMENT;CHEMICAL EFFLUENTS;LIQUID WASTES;WASTE DISPOSAL

<070517>
TITLE: Calibration of 90 Degrees V-Notch Weirs Using Parameters Other than Weir Head
PROJECT NUMBER: A-621-C-26
PRINCIPAL INVESTIGATOR: Eli, R.N.
ADDRESS: Department of Civil Engineering, Morgantown, WV 26506
AFFILIATION: West Virginia Univ., Morgantown (USA). Dept. of Civil Engineering
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITOR: Berg, Ed
TELEPHONE: C(513)684-7326
TYPE OF FUNDING: Grant No.-R-80531201
77 FUNDING: Environmental Protection Agency FY77:$23,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the proposed research is to develop, by means of a laboratory investigation, a less cumbersome and more accurate means of determining discharge over a 90 degree V-notch weir by taking direct measurements at the weir plate.
APPROACH: Compliance monitoring in connection with NPDES permits requires a procedure that can be easily applied in the field with a minimum of tools or instrumentation. Weir head, the level pool head above the weir crest, is a difficult measurement to make since it must be made some distance upstream of the crest. Therefore, the main thrust of the investigation will be to select a new parameter that can be measured in the vicinity of the weir plate.
RESULTS: The new parameter is to be related to discharge by defining an empirical relationship by means of calibration tests to be conducted over the discharge range of approximately 0 to 5 cubic feet per second. Drawdown of the water surface in the vicinity of the weir plate will require careful definition of the new measurement parameter.
PROJECT MILESTONES: 10/78 Report on New Parameters for Measuring Flow Through a 90 Degree V-Notch Weir.
KEYWORDS: WATER;FLOW RATE;MEASURING INSTRUMENTS;CALIBRATION;DAMS

<070518>
TITLE: Investigate Instrumentation for Automatic Water Monitoring and Sampling and Provide Guidance and Specifications to EPA and Other Federal Agencies
PROJECT NUMBER: A-621-A-33
PRINCIPAL INVESTIGATOR: Mentink, A.F.
ADDRESS: 26 W. St. Clair, Cincinnati, OH
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Mentink, A.F.
TELEPHONE: C(513)684-7324
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$240,000

TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide Agency with instrumentation adaptable to continuous monitoring of effluents and provide opinion to Corps of Engineers and ORSANCO on network approach to water quality monitoring at reservoirs and river basins through documentation.
APPROACH: Acquire selected instrumentation, investigate under laboratory and field conditions for design and performance, providing design modification for selected application where appropriate; and, through literature research provide concepts of advanced monitoring approaches through documentation for EPA and other Agency general usage.
RESULTS: Reports completed on ammonia, dissolved oxygen, residual chlorine, automatic sampling instrumentation and opinions rendered to ORSANCO and Corps of Engineers on advanced concepts.
PROJECT MILESTONES: (1) 6/77 Documentation on continuous measurements of ammonia, dissolved oxygen. (2) 7/77 Documentation on automatic sampling systems. (3) 9/77 Documentation on residual chlorine measurement and opinions to ORSANCO and Corps of Engineers regarding new system concepts.
KEYWORDS: WATER QUALITY;MONITORING;SAMPLERS;WASTE WATER;WASTE MANAGEMENT;BASELINE ECOLOGY;AUTOMATION;DESIGN;PERFORMANCE;DATA COMPILATION;TECHNOLOGY ASSESSMENT;AMMONIA;OXYGEN;CHLORINE

<070519>
TITLE: Develop a Program for Validating the Equivalency of Analytical Measurement Systems
PROJECT NUMBER: A-621-34
PRINCIPAL INVESTIGATOR: Lobring, L.
ADDRESS: 26 W. St. Clair, Cincinnati, OH
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lobring, Larry
TELEPHONE: C(513)684-7301
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$300,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop and maintain a program for validating the equivalency of analytical measurement systems for pollutants and/or contaminant measurements for water quality or water supply.
APPROACH: Applications received will be reviewed and technically evaluated. When appropriate, external review will be requested and coordination of this review mechanism will be in-house effort. Provide central management and operation of the equivalency program and coordination of responses to appropriate offices.
RESULTS: Recommendation to the appropriate Deputy Assistant Administrator or EPA regional office to approve or disapprove proposed alternate procedures.
PROJECT MILESTONES: (1) 12/75 Drinking water regulations effective. (2) 4/77 Guidelines Established for Test Procedures. (3) 7/77 Equivalency Group formed.
KEYWORDS: QUANTITATIVE CHEMICAL ANALYSIS;STANDARDS;WATER QUALITY;WATER POLLUTION;RECOMMENDATIONS;MEASURING METHODS;MEASURING INSTRUMENTS;QUALITY ASSURANCE

<070520>
TITLE: Production of Water Quality Control Samples for the QA Program
PROJECT NUMBER: A-621-A-35
PRINCIPAL INVESTIGATOR: Allen, G.
ADDRESS: 2982 N. Cleveland Ave., Roseville, MN 55113
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Berg, Ed
TELEPHONE: C(513)684-7326
TYPE OF FUNDING: Contract No.-68-03-2553
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The Quality Assurance Branch, EMSL-Cincinnati, is responsible for producing quality control samples needed by the agency operational monitoring programs in the acquisition of accurate and legally-defensible ambient and source environmental monitoring data.
APPROACH: To help meet these objectives, this extramural effort shall produce various types of quality control samples for the water supply program, the NPDES permit program, and Water Quality programs. Such QC samples shall contain nitrates, fluorides, turbidity, herbicides, pesticides, trace metals, nutrients, demand, minerals, oils and grease, phenols, volatile organics, polynuclear aromatics, and chlorinated phenols.
PROJECT MILESTONES: (1) 9/77 Trace Metals QC Samples for Water Supply Program. (2) 10/77 Pesticide QC Samples. (3) 11/77 Nitrate-Fluoride QC Samples for Water Supply Program. (4) 12/77 Minerals QC Samples. (5) 1/78 Demand QC Samples. (6) 2/78 Nutrients QC Samples. (7) 3/78 Turbidity QC Samples for Water Supply Program. (8) 78 Other QC Samples.

KEYWORDS: EFFLUENTS;WATER POLLUTION;MONITORING;QUALITY CONTROL;QUALITY ASSURANCE;SAMPLING;RELIABILITY;STANDARDIZATION;WASTE MANAGEMENT;ENVIRONMENT;NITRATES;FLUORIDES;HERBICIDES;PESTICIDES;TRACE AMOUNTS;METALS;NUTRIENTS;MINERALS;OILS;GREASES;AROMATICS;ORGANIC COMPOUNDS;ORGANIC CHLORINE COMPOUNDS;PHENOLS;TURBIDITY

<070521>
TITLE: Provide Quantitative Services to the QA Branch, EMSL-Cincinnati
PROJECT NUMBER: A-621-A-37
PRINCIPAL INVESTIGATOR: Going, J.E.
ADDRESS: 425 Volker Blvd., Kansas City, MO 64110
AFFILIATION: Midwest Research Inst., Kansas City, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Simes, Guy
TELEPHONE: C(513)684-7326
TYPE OF FUNDING: Contract No.-68-03-2405
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Quality Control Samples are designed, developed and produced by the Quality Assurance Branch or an outside contractor. Whatever the production source, a significant number of samples are withdrawn from the lot and submitted to referee analytical laboratories to verify that the QC samples are prepared according to specifications. MRI is one of two referee laboratories engaged in verifying organic quality control samples.
PROJECT MILESTONES: 9/77 Complete Analytical Verification of QC Samples produced inhouse and on contract.
KEYWORDS: SUPPORT SERVICES;QUALITY ASSURANCE;MONITORING;WASTE WATER;SAMPLING;RELIABILITY;CHEMICAL ANALYSIS

<070522>
TITLE: Provide Quantitative Analytical Services to QA Branch
PROJECT NUMBER: A-621-A-38
PRINCIPAL INVESTIGATOR: Atkins, P.
ADDRESS: 3983 Research Park Dr., Ann Arbor, MI 48104
AFFILIATION: Environmental Control Technology, Inc., Ann Arbor, Mich. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Simons, P.
TELEPHONE: C(513)684-7326
TYPE OF FUNDING: Contract No.-68-03-2406
77 FUNDING: Environmental Protection Agency FY77:$5,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Quality Control Samples are designed, developed, and prepared by the Quality Assurance Branch or by a contract laboratory according to exact instructions. Whatever the production source, the samples must be analyzed by independent analytical laboratories to assure that the samples were prepared according to instructions. Encotec is one of two independent laboratories who analyze and report the results back to the Quality Assurance Branch, EMSL-Cin.
PROJECT MILESTONES: 9/77 Complete Analytical Verification of QC Samples produced on contract and inhouse.
KEYWORDS: QUANTITATIVE CHEMICAL ANALYSIS;QUALITY ASSURANCE;WASTE MANAGEMENT;WATER POLLUTION;MONITORING;SAMPLING;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;STANDARDIZATION

<070523>
TITLE: Development of Microbiological Quality Control Check Samples and Performance Evaluation Samples for Use in EPA Water Laboratories
PROJECT NUMBER: A621C-39
PRINCIPAL INVESTIGATOR: Gherna, R.L.
ADDRESS: 12301 Parklawn Dr., Rockville, MD 20852
AFFILIATION: American Type Culture Collection, Rockville, Md.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Simes, Guy
TELEPHONE: C(513)684-7326
TYPE OF FUNDING: Contract No.-68-03-2219
77 FUNDING: Environmental Protection Agency FY77:$52,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (a) The program is divided into two phases, the first phase is to develop and standardize a method (including cultural conditions, lyophilization, and rehydration) designed to yield stable qualitative and quantitative sets of known numbers of freeze-dried preparations of Escherichia coli, Klebsiella pneumoniae, Enterobacter aerogenes, Streptococcus faecalis, and Pseudomonas aeruginosa.

(b) Phase II: To prepare a pre-arranged number of quantitative test units suitably labelled and a set of qualitative cultures to include the following microorganisms: Streptococcus faecalis var. liquefaciens; Streptococcus bovis; Streptococcus equinus; Streptococcus salivarius; Salmonella typhi; Salmonella enteritidis; Salmonella choleraesuis; Providencia; Citrobacter freundii; Proteus morganii; Arizona.
APPROACH: After standardization of the counts, a shelf life study will be done for one year on the test units in order to determine the reduction in numbers, if any, over a given period of time. A small number of replicate quantitative test units will be provided to EPA for evaluation.
PROJECT MILESTONES: 6/78 Production of 25,000 microbiological QC samples.
KEYWORDS: MICROORGANISMS;SAMPLERS;PERFORMANCE TESTING;QUALITY ASSURANCE;STANDARDIZATION;MEASURING METHODS;STANDARDIZATION;QUANTITATIVE CHEMICAL ANALYSIS;QUALITATIVE CHEMICAL ANALYSIS;LABELLED COMPOUNDS;WATER QUALITY;MONITORING;BACTERIA;BIOCHEMISTRY;WASTES

<070524>
TITLE: Research, Conduct Tests, Development of Performance Specifications, and Evaluation Methodologies for Automatic Waste Water Samplers
PROJECT NUMBER: A-621A-41
PRINCIPAL INVESTIGATOR: Shelley, P.E.
ADDRESS: 2150 Fields Rd., Rockville, MD 20850
AFFILIATION: Analytical Services Center, Inc., Rockville, Md. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Mentink, A.F.
TYPE OF FUNDING: Contract No.-68-03-2470
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The primary objective is to obtain well-defined specifications for automatic water sampling instrumentation acquisition considering sample degradation during storage and transfer.
APPROACH: Acquire several production model automatic samplers and determine the favorable features through ''exactly'' controlled samples and selecting the most favorable components available.
PROJECT MILESTONES: 10/77 Deliver four sampling systems and specifications for automatic sampling equipment.
KEYWORDS: WASTE WATER;WATER POLLUTION;SAMPLERS;AUTOMATION;PERFORMANCE TESTING;WASTE MANAGEMENT;SPECIFICATIONS;SAMPLING;PRESERVATION;STORAGE;TRANSPORT;QUALITY ASSURANCE

<070525>
TITLE: Continuous Monitoring of Total Dissolved Gas Pressure
PROJECT NUMBER: A-625-C-14
PRINCIPAL INVESTIGATOR: D'Aoust, B.D.
ADDRESS: 1000 Seneca St., Seattle, WA 98101
AFFILIATION: Virginia Mason Research Center, Seattle, Wash. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Kopp, J.F.
TYPE OF FUNDING: Grant No.-R804175-02
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Non-metal inorganics (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the project is the further development of simple, inexpensive instrumentation using the existing principle of a diffusion membrane and electronic pressure transducer to measure and record total dissolved gas pressures. Alternatives for membrane materials, configurations and mechanical interfaces and signal analysis will be explored, constructed and field tested.
KEYWORDS: DISSOLVED GAS;MONITORING;AUTOMATION;MEASURING INSTRUMENTS;GASEOUS WASTES;GASES;WATER;THERMAL EFFLUENTS;MEASURING METHODS;FISHES;HYDROELECTRIC POWER PLANTS;THERMAL POWER PLANTS;NUCLEAR ENERGY;THERMAL POLLUTION;WATER POLLUTION;WASTE HEAT;SUPERSATURATION;TEMPERATURE EFFECTS

<070526>
TITLE: Ion Exchange Membranes Applied to New Methods of Sampling Enrichment and Speciation in Water Analysis
PROJECT NUMBER: A-625-C-15
PRINCIPAL INVESTIGATOR: Blaedel, W.J.
ADDRESS: Department of Chemistry, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA). Dept. of Chemistry
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Kopp, J.F.
TYPE OF FUNDING: Grant No.-R804179-01
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Heavy (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The general objective is to employ the transport, enrichment, and exclusion capabilities of ion exchange membranes as new tools in water analysis. There are two specific objectives. (1) A cation exchange membrane envelope for sampling and enrichment of trace cations in a water sample will be

designed, constructed, and studied. In principle, for water samples of low or moderate ionic strengths, enrichments of two orders of magnitude should be achievable by transport of the trace cations from the water sample through the membrane into a small volume of an acceptor solution of controlled composition. The acceptor solution would then be used for measurement of the trace ion concentrations, at higher levels, and more easily than the original water sample. (2) A copper ion-selective electrode will be covered with a cation exchange membrane, trapping a small volume of an acceptor solution of controlled composition in between. Upon immersion in a water sample, any trace Cu(II) in the water sample should be enriched in the acceptor solution, to levels that can be more easily measured by the copper ion-selective electrode.
RESULTS: The enrichment factors for both of these devices are in principle independent of the properties of the membrane and of all of the properties of the trace cation except the charge. With proper design, these devices should operate in the nanomolar concentration region (down to about 0.1 ppb), and they should be capable of on-site use.
KEYWORDS: ION EXCHANGE MATERIALS;SEPARATION PROCESSES;MEMBRANES;SAMPLING;WATER QUALITY;METALS;MONITORING;MEASURING INSTRUMENTS;COPPER IONS;SAMPLERS;CATIONS;TRACE AMOUNTS;DESIGN;MONITORING;ION EXCHANGE;ENRICHMENT

<070527>
TITLE: Comparative Selectivity Study of the Nitrogen Oxide Electrode and Solid State Nitrate Electrode for Determination of Nitrate
PROJECT NUMBER: A-625C-20
PRINCIPAL INVESTIGATOR: Wilson, R.F.
ADDRESS: 3201 Wheeler Ave., Houston, TX 77004
AFFILIATION: Texas Southern Univ., Houston (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gales, Morris E., Jr.
TYPE OF FUNDING: Grant No.-R805212-01
77 FUNDING: Environmental Protection Agency FY77:$48,600
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Nitrates (40%);SPECIFIED OTHER POLLUTANTS/Nutrients, waste water residuals (60%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this study is to evaluate the nitrate electrodes and optimize conditions for the analysis of nitrate in a variety of water and waste water samples. The completion of this research should provide EPA with a selective, efficient and economical method for the quantitative determination of nitrate.
KEYWORDS: NITRATES;CHEMICAL ANALYSIS;MONITORING;ELECTRODES;COMPARATIVE EVALUATIONS;ION SELECTIVE ELECTRODE ANALYSIS;WASTE WATER;PERFORMANCE;SAMPLING;ECONOMICS;EFFICIENCY;MANUALS

<070528>
TITLE: Evaluation of the Dionex Ion Exchange Chromatograph for Natural Water Samples Analysis
PROJECT NUMBER: A-625C-22
PRINCIPAL INVESTIGATOR: Schlueter, A.
ADDRESS: Dept. of Chemistry, Wilberforce, OH 45384
AFFILIATION: Central State Univ., Wilberforce, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gales, Morris E., Jr.
TYPE OF FUNDING: Grant No.-R805329-01
77 FUNDING: Environmental Protection Agency FY77:$36,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES/Sulfates;PARTICULATES/Nitrates;PARTICULATES/Nonmetal inorganics (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The ion-exchange chromatograph manufactured by Dionex Corp. has the potential of separating and quantitatively determining the concentrations of anions and cations present in natural waters. This project will evaluate the Dionex ion-exchange chromatograph to determine its ability and limitations in analyzing natural water samples for anions and cations.
KEYWORDS: WATER RESOURCES;WATER POLLUTION;ION EXCHANGE CHROMATOGRAPHY;SEPARATION PROCESSES;QUANTITATIVE CHEMICAL ANALYSIS;FRESH WATER;ANIONS;CATIONS;TECHNOLOGY ASSESSMENT;MEASURING METHODS

<070529>
TITLE: Provide Quantitative Analytical Services to the QA Branch
PROJECT NUMBER: A-625C-36
PRINCIPAL INVESTIGATOR: Dunstan, G.
ADDRESS: 2030 Wright Ave., Richmond, CA 94804
AFFILIATION: LFE Environmental Analysis Labs., Richmond, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Berg, Ed
TYPE OF FUNDING: Contract No.-68-03-2404
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Waste products (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Quality Control samples are designed, developed and produced by the Quality Assurance Branch of an outside contractor. Whatever the production source, a significant number of samples must be withdrawn from the Lot and submitted to a referee analytical laboratory to verify that the QC samples are prepared according to specifications. LFE Environmental Analysis, Inc. is one of two referee laboratories engaged in verifying organic and inorganic Quality Control samples.
PROJECT MILESTONES: 9/77 Complete analytical verification of QC samples produced inhouse and on contract.
KEYWORDS: QUALITY ASSURANCE;MONITORING;SAMPLING;ENVIRONMENT;CHEMICAL EFFLUENTS;WASTE WATER;SEWAGE;WATER POLLUTION CONTROL;WATER POLLUTION;POLLUTION CONTROL EQUIPMENT;IN-SERVICE INSPECTION

<070530>
TITLE: New Approaches to the Preservation of Contaminants in Water Samples
PROJECT NUMBER: A-625C-42
PRINCIPAL INVESTIGATOR: Saxena, J.
ADDRESS: Merrill Lane, Syracuse, NY 13210
AFFILIATION: Syracuse Univ. Research Corp., N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Simes, Guy
TELEPHONE: C(513)684-7325
TYPE OF FUNDING: Grant No.-R804609-01
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (30%);SPECIFIED OTHER POLLUTANTS/Nutrients, multiple (70%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The overall objective of the three year study is to devise a new, more effective and pollution-free method of preservation of water and wastewater samples. Approaches such as the use of antibiotics and bacteriolytic enzymes for controlling microorganisms may offer a distinct possibility and an improvement over existing procedures.
APPROACH: The second year of the project will be devoted to determination of the relative effectiveness of the preservatives selected for further study, in preventing alteration in sample test parameters. The effect of water parameters such as PH, particulate matter, industrial contaminant, etc. on the preservation method will also be ascertained. Studies will also be initiated to study the effectiveness of the preservation method as a function of storage parameters and sample handling.
RESULTS: The first year of the project was devoted to evaluation of the effectiveness of several antibiotics/antibiotics mixtures and bacteriolytic enzymes in controlling microorganisms in water and wastewater samples as revealed by viable cell count and oxygen consumption rates. After testing a large number of antibiotics singly and in mixture of 2-4, 5-7 antibiotic mixtures have been selected based on their effectiveness in controlling microorganisms in wastewater and natural water samples. Commercially available lysozyme preparations failed to control microorganisms when added with or without EDTA and Tris. Analysis of nutrients in the presence of antibiotics has revealed that the combinations which include erythromycin or ampicillin cause interference in some analytical determinations.
PROJECT MILESTONES: (1) 9/77 Evaluation of the effectiveness of several antibiotics in controlling water/wastewater samples. (2) 9/78 Evaluate the effectiveness of preservatives selected in the first year of study in detail and under various experimental conditions similar to the environment.
KEYWORDS: WATER;SAMPLING;WASTE WATER;QUALITY ASSURANCE;PRESERVATION;PRESERVATIVES;ANTIBIOTICS;MICROORGANISMS;SAMPLE PREPARATION;MANUALS;EDTA;WATER POLLUTION

<070531>
TITLE: Develop Quality Assurance Procedures and Reference Samples for Aquatic Biology
PROJECT NUMBER: A612A-08
PRINCIPAL INVESTIGATOR: Weber, C.I.;Collins, G.B.;Klemm, D.J.;Lewis, P.A.;McFarland, B.H.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Weber, C.I.
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To develop quality assurance procedures and reference materials, and carry out interlaboratory evaluation and validation of aquatic biology methods considered potentially suitable for routine use by Agency field and laboratory personnel.
APPROACH: The studies are carried out jointly with personnel in the Quality Assurance Branch, EMSL. Descriptions of the methods are prepared and reference samples are developed and distributed to participating laboratories. The results are evaluated and reported jointly with the QA Branch. Methods which meet the established criteria are included in the Biological Methods Manual. Reference materials currently under development include: standard toxicants for bioassays; Sedgwick-Rafter plankton and periphyton counting and identification; chlorophyll determination ATP measurement; diatom identification; and macroinvertebrate identification.
RESULTS: Quality assurance procedures, biological reference materials, and data on the accuracy and precision of biological methods.
PROJECT MILESTONES: 01/69-Develop plankton counting reference sample; 01/73-Develop spectrophotometric chlorophyll reference sample; 12/76-Develop fluorometric chlorophyll reference sample; 12/77-Develop ATP reference sample; 12/78-Develop standard toxicant reference samples; 12/78-Develop plankton and periphyton identification samples; 12/78-Develop macroinvertebrate counting, sorting, and identifying; 12/79-Develop diatom identification reference samples.
KEYWORDS: AQUATIC ECOSYSTEMS;SAMPLING;QUALITY ASSURANCE;STANDARDIZATION;BIOASSAY;HAZARDOUS MATERIALS;PLANKTON;PROTOZOA;CHLOROPHYLL;CHEMICAL ANALYSIS;SURFACE WATERS;AQUATIC ORGANISMS;INVERTEBRATES;WATER POLLUTION;BIOLOGICAL EFFECTS

<070532>
TITLE: Standardize Field and Laboratory Methods for Biomonitoring
)JECT NUMBER: A612A-10
[NCIPAL INVESTIGATOR: Weber, C.I.;Collins, G.B.;Klemm, D.J.;Lewis, P.A.;McFarland, B.H.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Weber, C.I.
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To develop, evaluate and standardize field and laboratory methods for biomonitoring programs to measure the biological properties and ecological effects of effluents, and to determine the biological integrity of surface waters.
APPROACH: Projects include studies of methods for sample collection and preparation; organism counts and identification; measurements of biomass and metabolic rates; effluent bioassay; bioaccumulation of toxic substances; and data handling and interpretation. Methods are developed for all communities of aquatic organisms, including: phytoplankton, zooplankton, periphyton, macrophyton and macroalgae, macroinvertebrates, and fish. Research projects are carried out inhouse and under grant and contract.
RESULTS: Output includes methods which are included in the EPA Aquatic Biology Methods Manual, manuals for the identification of aquatic organisms, report on the environmental requirements and pollution tolerance of aquatic organisms, computer systems for data storage and retrieval, and guidelines for biomonitoring programs.
PROJECT MILESTONES: 07/73-Report on artificial substrate performance; 07/73-Report on plankton and periphyton methodology; 07/74-Identification manual for Stenonema mayflies; 07/76-Implement computerized biological data handling system (BIO-STORE); 12/77-Report on environmental requirement and pollution tolerance; 12/77-Revised identification manual for centric diatoms; 07/78-New methods for chlorophyll measurements; 12/78-Sediment oxygen demand method.
KEYWORDS: AQUATIC ECOSYSTEMS;HAZARDOUS MATERIALS;BIOLOGICAL EFFECTS;AQUATIC ORGANISMS;WATER POLLUTION;BIOASSAY;BIOMASS;SAMPLING;SURFACE WATERS;METABOLISM;PHYTOPLANKTON;ZOOPLANKTON;ALGAE;INVERTEBRATES;FISHES;TOLERANCE;COMPUTER CALCULATIONS;DATA ANALYSIS;DATA COMPILATION;BIOLOGY;MANUALS

<070533>
TITLE: Technical Services to Support the Quality Assurance Program
PROJECT NUMBER: A612A-26
PRINCIPAL INVESTIGATOR: Kovalski, V.
AFFILIATION: Bionetics, Inc., Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Berg, E.L.
77 FUNDING: Environmental Protection Agency FY77:$188,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To provide the Quality Assurance Branch, EMSL-Cincinnati with technical support services.
APPROACH: A fully equipped water chemistry laboratory and equipment to produce Quality Control samples was set up and staffed by contractor personnel.
RESULTS: The Technical Service laboratory has finalized the setting up of all instruments and associated equipment to make the laboratory functional. Technical Service personnel are currently developing turbidity and suspended solid QC samples. Other activities include the distribution of quality control samples throughout the country and the development of an EPA manual on Sampling and Sample Preservation of Waters/Wastewaters. Upon concluding the development of the QC samples, new directives will be given for the development of additional QC samples.
PROJECT MILESTONES: 01/78-Development of a suspended solid QC sample; 08/77-Development of a handbook for sampling and sample preservation of waters/wastewaters; 08/77-Development of turbidity QC sample.
KEYWORDS: WATER QUALITY;SURFACE WATERS;SAMPLING;CHEMICAL ANALYSIS;HAZARDOUS MATERIALS;QUALITY ASSURANCE;WATER POLLUTION

<070534>
TITLE: Parametric Assessment and Optimization of Volatile Organic Analysis Methods
PROJECT NUMBER: A614E-16
PRINCIPAL INVESTIGATOR: Hoehn, R.C.;Randall, C.W.
AFFILIATION: Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lichtenberg, J.J.
77 FUNDING: Environmental Protection Agency FY77:$77,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objectives of this project are (1) to determine the applicability of the Bellar-Lichtenberg methods for volatile organics analysis (VOA) in water to a variety of types of compounds and (2) to investigate the variations in analytical precision that are induced by modifications in the hardware, software, and sample-handling procedures. Variables to be investigated include: (1) sample size, container type, and the presence of heat space; (2) temperatures and times of storage; (3) methods of sparging samples, trapping efficiencies, and desorption methods; and (4) instrumentation variables such as column packing, column geometry, heating rate, and gas flow rate.
APPROACH: Once an optimum procedure for sampling, handling, and analysis has been devised, its applicability to a variety of types of organic compounds will be investigated. Groups of compounds to be studied include ethers, alcohols, mercaptans, amines, esters, nitriles, and a variety of aromatics, including simple, complex, halogenated, and conjugated types.
RESULTS: The project is to be developmental in nature and is designed for a one-year period. The work will be entirely bench-scale experimentation, and the results will be statistically analyzed in an attempt to identify those variables that significantly affect the results of the VOA. This work will identify areas requiring additional research, and hopefully be instrumental in devising a standard method for the sampling, handling and analysis of volatile organic compounds that may possibly be in drinking water.
KEYWORDS: WATER POLLUTION;MONITORING;ORGANIC COMPOUNDS;CHEMICAL ANALYSIS;SURFACE WATERS;SAMPLING;SAMPLE PREPARATION;STORAGE;ETHERS;ALCOHOLS;THIOLS;AMINES;ESTERS;NITRILES;AROMATICS

<070535>
TITLE: Recovery Studies of Pesticides from Surface Waters
PROJECT NUMBER: A614E-17
PRINCIPAL INVESTIGATOR: McGrath, T.F.
AFFILIATION: Susquehanna Univ., Selinsgrove, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lichtenberg, J.J.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The study will determine accuracy and precision data for a variety of pesticides in surface and drinking water.
APPROACH: The official EPA method using liquid-liquid extraction and gas chromatographic techniques will be employed.
KEYWORDS: WATER POLLUTION;MONITORING;SURFACE WATERS;DRINKING WATER;SAMPLING;CHEMICAL ANALYSIS;GAS CHROMATOGRAPHY;SEPARATION PROCESSES

<070536>
TITLE: Development and Application of an Ozone Voltammetric Membrane Electrode
PROJECT NUMBER: A614E-18
PRINCIPAL INVESTIGATOR: Mancy, K.H.;Wise, K.D.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Kopp, J.F.
77 FUNDING: Environmental Protection Agency FY77:$50,000
PROJECT DESCRIPTION: The purpose of this project is the development and application of a membrane electrode system capable of in situ measurement of dissolved ozone. There is a pressing need for such a sensor system, especially in view of recent interest in the utilization of ozone as an alternative to chlorine in water and wastewater treatment processes.
APPROACH: An inherent part of this study is the development of a process controlled ozonator for water treatment applications in which the rate of ozone generation is controlled by membrane electrode measurement. This system will be tested on a pilot plant scale and in water supply and waste treatment plants. Furthermore, the membrane electrode under investigation is inherently capable of measurement of ozone in gaseous and nonaqueous media. The feasibility of these particular applications will also be investigated.
KEYWORDS: OZONE;ELECTRODES;VOLTAMETRY;MEMBRANES;QUANTITATIVE CHEMICAL ANALYSIS;MEASURING METHODS;WATER TREATMENT;AQUEOUS SOLUTIONS

<070537>
TITLE: Provide Methods for Measuring Radionuclides Required to Enforce Existing EPA Standards and Regulations
PROJECT NUMBER: A621A-01
PRINCIPAL INVESTIGATOR: Gold, S.;Montgomery, D.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Krieger, H.L.
77 FUNDING: Environmental Protection Agency FY77:$83,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To improve methods for C14 by utilizing absorbents compatible to liquid scintillation counting by determining the optimum condition required for the adsorption of a maximum volume of CO2 into an organic amine liquid scintillation counting solution for C14 analysis.
APPROACH: Carbon dioxide gas obtained from controlled combustion of environmental and biological samples is carefully absorbed under controlled conditions in a mixture of organic amine and a compatible liquid scintillation solution. Approximately 2 to 3 liters of CO2 must be adsorbed in enough solution to be counted in an ordinary scintillation vial. This solution containing 1.7 g carbon will give approximately 20 counts/min. For a 1000 min counting, a counting error less than 3 percent dpm/g 18 plus or minus 0.6 for environmental carbon is anticipated.
RESULTS: Establish optimum conditions for this study.
PROJECT MILESTONES: 10/75-Report-Analysis of C14 and H3 in reactor stack gas; 12/77-Complete methodology for C14 using compatible absorbents.
KEYWORDS: BIOLOGICAL MATERIALS;COMBUSTION;GASEOUS WASTES;CARBON DIOXIDE;CARBON 14;RADIOMETRIC ANALYSIS;LIQUID SCINTILLATION DETECTORS;LABELLED COMPOUNDS

<070538>
TITLE: Provide Methods for Measuring Radionuclides Needed to Gather Data on Non-Regulated Pollutants Warranting Concern by EPA
PROJECT NUMBER: A621A-02
PRINCIPAL INVESTIGATOR: Krieger, H.L.;Prishkorn, G.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Krieger, H.L.
77 FUNDING: Environmental Protection Agency FY77:$140,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: (1) Develop methods for Ra226 in coal, slag, fly ash and scrubber sludge at coal-fired power plants, and determine any potential radiation hazard. (2) Develop and test methodology to quantify discharges from nuclear medicine facilities, and determine any potential radiation hazard.
APPROACH: (1) Each 1000 megawatt plant burns 10 to the 6th power tons of coal annually. With Ra226 levels averaging 1.0 pCi/gm, a significant activity could be discharged with particulates in stack effluent. Samples of coal and by-products from operating plants are being analyzed for Ra226 to ascertain whether Ra226 could be present in stack effluent. (2) Normal treatment processes do not remove radiopharmaceuticals that are discharged into the sewer. Tertiary treated sewage effluent will be utilized in power plant coolant operations and present a potential radiation hazard. Methodology for those radiopharmaceuticals discharged from hospitals is being developed and tested.

RESULTS: (1) The sensitivity and validity of the methodology has to be improved, and air samplers will be installed in the stacks to corroborate activity discharge calculations. (2) Procedures for I-131, Cr-51 and Co-57 have been tested, and procedures for Se-75 and Tc-99 are in process. Upon completion, the methods will be tested at plants that utilize tertiary treated sewage in their operations.
PROJECT MILESTONES: 03/76-Report-Interim radiochemical methodology for drinking water; 03/78-Modify methods for Pc-210 and Pb-210 in mill tailings; 09/78-Report-Hazard from Ra-226 from fossil fuel plants; 12/78-Complete methodology for nuclides in tertiary treated sewage.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;COAL;COMBUSTION;GASEOUS WASTES;FLY ASH;SLAGS;SCRUBBERS;SLUDGES;RADIOACTIVITY;RADIUM 226;RADIOACTIVE EFFLUENTS;RADIATION MONITORING;AIR SAMPLERS;STACK DISPOSAL;LIQUID WASTES;NUCLEAR MEDICINE;RADIOPHARMACEUTICALS;CHEMICAL PREPARATION;RADIATION MONITORING;IODINE 131;CHROMIUM 51;COBALT 57;SELENIUM 75;TECHNETIUM 99;ENVIRONMENTAL TRANSPORT

<070539>
TITLE: Uses of Energy Dispersive X-Ray to Monitor Heavy Metals in Water
PROJECT NUMBER: A621A-40
PRINCIPAL INVESTIGATOR: Carlton, D.T.
AFFILIATION: Magnavox Co., Fort Wayne, Ind. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Mentink, A.P.
77 FUNDING: Environmental Protection Agency FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Automatic field measurement of dissolved metals by energy dispersive x-ray in surface and ground waters associated with energy resource mining operations.
APPROACH: This is accomplished by preconcentrating the dissolved heavy metals on ion-exchange, resin-loaded filter paper by means of a sample collection and preparation module and analyzing by energy dispersive x-ray fluorescence-all automatically.
PROJECT MILESTONES: 05/78-Systems available at Magnavox for acceptance; 07/78-Final reports delivered to EPA.
KEYWORDS: AIR POLLUTION;METALS;MONITORING;X-RAY FLUORESCENCE ANALYSIS

<070540>
TITLE: Comparative Selectivity Study of the Nitrogen Oxide Electrode and the Solid State Nitrate Electrode for Determination of Nitrate
PROJECT NUMBER: A622B-2
PRINCIPAL INVESTIGATOR: Wilson, R.F.
AFFILIATION: Texas Southern Univ., Houston (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gales, M.
77 FUNDING: Environmental Protection Agency FY77:$48,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The primary objective of this proposed study is to evaluate the selectivity of the nitrogen oxide and the nitrate ion selective electrodes by investigating potential interferences of other ions.
APPROACH: The data and percentage efficiency obtained using the nitrogen oxide selective electrode, after a cadmium reduction of nitrate to nitrite, will be compared with those obtained using the nitrate ion selective electrode for water and wastewater samples. Upon completion of the comparative study of the experimental variables that affect the electrodes, a method for the determination of nitrate using the electrode that gives the best accuracy will be proposed and its validity tested on water and wastewater samples.
RESULTS: The successful completion of this project should provide a reservoir of useful data on the quantitative determination nitrate nitrogen values.
PROJECT MILESTONES: 07/78-Complete evaluation of nitrogen oxide and solid state nitrate electrode; 12/78-Complete environmental sample analysis; 12/79-Final report.
KEYWORDS: WATER POLLUTION;MONITORING;NITRATES;QUANTITATIVE CHEMICAL ANALYSIS

<070541>
TITLE: Arsenic and Selenium in Industrial and Domestic Effluents-Applicability of the Parr Acid Digestion Bomb Technique for Sample Pretreatment
PROJECT NUMBER: A622B-3
PRINCIPAL INVESTIGATOR: Kinard, J.T.
AFFILIATION: Benedict Coll., Columbia, S.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gales, M.
77 FUNDING: Environmental Protection Agency FY77:$44,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This research comprises a comparative study of a number of leading methods for the determination of arsenic and selenium, and serves to demonstrate the applicability of each for complex matrices that exist for samples such as industrial and domestic effluent.
APPROACH: By utilizing the techniques of flame and flameless atomic adsorption spectrophotometry it should be possible to effect the appraisal of various sample pretreatment procedures including the Parr Acid Digestion Bomb technique for the determination of total arsenic and selenium in effluents charged with a variety of their organic and inorganic species.
RESULTS: At the conclusion of this investigation the most applicable hydride generation-flame atomic absorption spectrophotometric method for determining organic and inorganic arsenic and selenium in an industrial domestic-effluent matrix will have been identified. In addition, the advantages of this method and the graphite furnace method, when employed for routine determination of total arsenic and selenium in effluents, will have been determined and compared. Although this investigation is highly specific, it addresses the determination of two elements that have toxicological and perhaps carcinogenic characteristics, and exist in forms that have eluded total analytical characterization.
PROJECT MILESTONES: 09/78-Evaluate five methods for arsenic and selenium; 06/79-Test selected and modified method on industrial samples; 08/79-Draft final report; 09/79-Final report.
KEYWORDS: WATER POLLUTION;MONITORING;ARSENIC;SELENIUM;LIQUID WASTES;SAMPLE PREPARATION;CHEMICAL EFFLUENTS;QUANTITATIVE CHEMICAL ANALYSIS;CHEMICAL COMPOSITION

<070701>
TITLE: Microwave System to Prevent Hazardous Material Dike Failures
PROJECT NUMBER: B-610-A-192
PRINCIPAL INVESTIGATOR: Koerner, R.M.
ADDRESS: 32nd and Chestnut Streets, Philadelphia, PA 19104
AFFILIATION: Drexel Univ., Philadelphia, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brugger, John E.
TYPE OF FUNDING: Grant No.-R804763-01
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: STORAGE (100%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Hazardous materials (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The detection and location of water levels, water pockets, voids and various other discontinuities between different layers of earth or rock is critical in insuring the performance and safety of earth dams. Such underground anomalies are particularly undesirable in the earth dams and dikes that contain hazardous materials since these relatively small embankments are generally not engineered or constructed in a rigorous and professional manner.
APPROACH: One possible technique for detecting and monitoring such faults and weak areas is the use of microwaves. By beaming continuous or pulsed microwaves at the dike and recording the return signal as it is reflected from the anomaly, the location, type and depth of faults can be determined. A literature search (technical, equipment, legal and safety) will be undertaken and a number of laboratory experiments will be performed to assess the practicality of using microwaves for the non-destructive assessment of dike stability. Basic soil properties such as dielectric constant, conductivity, attenuation, phase shift, and velocity, will also be determined.
RESULTS: The final result of this project will be the detailed specification for an inexpensive, mobile, microwave unit (with known limitations) to determine underground water, irregularities, and discontinuities in small earthen dikes.
PROJECT MILESTONES: (1) 7/76 Funding package submitted. (2) 9/76 Award funds for project. (3) 9/77 Decision point, funding increment. (4) 9/78 Funding increment. (5) 7/79 Complete project. (6) 7/79 Final report received.
KEYWORDS: HAZARDOUS MATERIALS;SAFETY ENGINEERING;DAMS;WATER;EARTH CRUST;VOIDS;MICROWAVE EQUIPMENT

<070702>
TITLE: Automatic Loading Shutdown Hazardous Material Spill Prevention System
PROJECT NUMBER: B-610-A-193
PRINCIPAL INVESTIGATOR: Simmons, J.
ADDRESS: 8400 Westpark Dr., McLean, VA 22101
AFFILIATION: Science Applications, Inc., McLean, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brugger, John E.
TYPE OF FUNDING: Contract No.-68-03-2039
77 FUNDING: Environmental Protection Agency FY77:$17,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: TRANSPORTATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Hazardous materials (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective of this project is to design and demonstrate in actual use a transfer line system that will shut off automatically in the even of a line break or significant leak. The primary application of this system is for the loading and unloading of liquid hazardous materials from truck tankers, tank care, barges, etc.
APPROACH: The transfer line system consists of the line and a pneumatically operated shut-off valve at the inlet, which is activated by any abnormal flow difference between transfer line inlet and outlet, such as would result from a break or leak. The air supply for the pneumatic valve drive is controlled by a solenoid valve, which, when de-energized, vents the valve drive and closes the shut-off valve. The inlet and outlet flows are continuously sensed and compared electronically; any significant difference in flow causes a logic circuit to de-energize the solenoid valve. An alarm to warn the attendant is also activated. The system is fail-safe in that the loss of electric power and/or air pressure for the system will result in closure of the shut-off valve.
RESULTS: The transfer line will be designed and evaluated under laboratory conditions using water as the fluid being transferred. Subsequently, the system will be installed in a chemical plant and used under actual operating conditions for about a year.
PROJECT MILESTONES: (1) 2/79 Funding package submitted. (2) 6/74 Award funds for project. (3) 1/77 Funding increment. (4) 8/78 Final report received.
KEYWORDS: HAZARDOUS MATERIALS;SAFETY ENGINEERING;TRANSPORT;AUTOMATION;VALVES;CHEMICAL INDUSTRY;TOXINS;RESPIRATION

<070703>
TITLE: Document/Analyze Historical Data on Hazardous Spills
PROJECT NUMBER: B610A-194
PRINCIPAL INVESTIGATOR: Buckley, J.L.
ADDRESS: 1151 Boston-Providence Turnpike, Norwood, MA 02062
AFFILIATION: Factory Mutual Research Corp., Norwood, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brugger, John E.
TYPE OF FUNDING: Contract No.-68-03-0317
77 FUNDING: Environmental Protection Agency FY77:$41,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: TRANSPORTATION (33%);STORAGE (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Hazardous materials (50%)

CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
OJECT DESCRIPTION: The objective of this program is to collect and analyze documentation of spills of hazardous substances, which present dangers to the Nation's waterways.
APPROACH: These incidents will be classified by frequency, quantity and type of material, hazard potential, and other significant parameters which will describe the impact of the incident. Each spill incident will be documented and the total number of incidents examined will be treated statistically in order to draw conclusions and make recommendations for subsequent work concerned with the prevention of such spills and the development of appropriate devices, techniques, methods, and procedures.
PROJECT MILESTONES: (1) 2/74 FUNDING PACKAGE SUBMITTED. (2) 6/74 FUNDS AWARDED. (3) 5/77 INCREMENTAL FUNDING. (4) 8/78 FINAL REPORT.
KEYWORDS: HAZARDOUS MATERIALS;ACCIDENTS;DATA COMPILATION;DATA PROCESSING;OIL SPILLS;HYDROCARBONS;WATER POLLUTION;TOXICITY;RESPIRATION;HEALTH HAZARDS;ENVIRONMENTAL IMPACTS

<070704>
TITLE: Hazardous Material Spill Ultimate Disposal: Lab/Pilot Plant Biodegradation Study
PROJECT NUMBER: B-610A-578
PRINCIPAL INVESTIGATOR: Thuma, N.K.
ADDRESS: 5390 Cherokee Avenue, Alexandria, VA 22314
AFFILIATION: Atlantic Research Corp., Alexandria, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Thuma, Nora K.
TYPE OF FUNDING: Contract No.-68-03-2491
77 FUNDING: Environmental Protection Agency FY77:$23,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: TRANSPORTATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (40%);SPECIFIED OTHER POLLUTANTS/Hazardous materials (60%)
CHARACTER OF STUDY: RESEARCH/Laboratory (35%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (65%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this research project is to identify and evaluate pure culture strains of fungi, yeasts or bacteria which will biodegrade various organic hazardous waste materials. In the event of a spill, the selected organisms could be added to the spilled material and metabolically detoxify the hazardous compounds.
APPROACH: The program consists of two phases: a laboratory feasibility study and a pilot plant demonstration phase. The laboratory phase, to be conducted during the first six months, will consist of screening tests. Various cultures will be exposed to a hazardous material spill to determine the qualitative ability to assimilate and/or degrade the material. The best candidates will be selected for further parametric tests. The pilot plant demonstration phase will be conducted during a nine-month period. A pilot system will be designed, tested and evaluated to determine actual conditions and process parameters of the biodegradation system. Each pilot plant will have a capacity of about 10 lb (5 Kg) per batch or 2 lb (1 Kg) per hour of continuous operation.
RESULTS: Identification of organisms that will biodegrade organic hazardous waste materials.
PROJECT MILESTONES: (1) 1/76 FUNDING PACKAGE SUBMITTED. (2) 5/76 AWARD FUNDS FOR PROJECT. (3) FUNDING INCREMENT AWARDED. (4) 12/78 FINAL REPORT RECEIVED.
KEYWORDS: HAZARDOUS MATERIALS;BIODEGRADATION;CARCINOGENS;BACTERIA;BIOCHEMISTRY;TOXICITY;FUNGI;YEASTS;METABOLISM;ACCIDENTS;POLLTION CONTROL;WASTE MANAGEMENT;WASTE DISPOSAL;CLEANING;CHEMICAL EFFLUENTS;ENVIRONMENTAL EFFECTS;PILOT PLANTS

<070705>
TITLE: Control of SO2 and Particulate
PROJECT NUMBER: B-610-C-597
PRINCIPAL INVESTIGATOR: Devitt, T.W.
ADDRESS: 11499 Chester Rd., Cincinnati, OH 45245
AFFILIATION: PEDCO-Environmental, Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory-Cincinnati
MONITOR: Burckle, J.O.
TYPE OF FUNDING: Contract No.-68-02-2535
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The principal objective of this project is to compile and assess information generated in previous studies concerning fugitive and process particulate matter emissions in the nonferrous smelting industry. In addition to existing control systems, process modifications and systems in the demonstration stage will also be examined. Foreign control technologies will be reviewed. Performance evaluations will be conducted to determine the ability of certain control systems to meet existing Federal and State regulations.
APPROACH: Four Project task areas are delineated in the project work scope: (1) Conduct an in-depth study of existing and proposed control systems and process modifications for controlling fugitive emissions of hazardous particulate and SO2. (2) Revise and edit the three environmental assessment reports of the nonferrous metals industry prepared by PEDCO, Battelle, and Radian to provide a reference for State and local control agencies and industry. (3) Evaluate the results of demonstration testing of the Teller baghouse, a dry control technique for acid gas and particulate emissions from secondary aluminum smelters. (4) Evaluate all data generated under three PL-480 programs in Poland and Yugoslavia concerning the control of particulate and SO2 emissions from nonferrous smelters.

PROJECT MILESTONES: (1) 3/77 Funding package submitted. (2) 5/77 Award funds for project. (3) 11/77 Final report received.
KEYWORDS: HEAVY METALS;NON-POINT SOURCE POLLUTANTS;METAL INDUSTRY;POLLUTION CONTROL EQUIPMENT;INFORMATION SYSTEMS;PARTICLES;SULFUR DIOXIDE;AIR POLLUTION CONTROL;SMELTING;PERFORMANCE;EXHAUST GASES;DUSTS;NITROGEN COMPOUNDS;TOXIC MATERIALS

<070706>
TITLE: Wood Preserving Waste Recycle and Incineration System
PROJECT NUMBER: B610B-607
PRINCIPAL INVESTIGATOR: Holden, P.V.
ADDRESS: P.O. Box 518, Ridgefield, WA 98642 -
AFFILIATION: Pacific Wood Treating Corp., Ridgefield, Wash. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Dallons, Victor
TELEPHONE: F420-4701
TYPE OF FUNDING: Grant No.-S805179-01
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);CONSERVATION/General (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective is to evaluate a full sized recycle system for liquid wastes from a wood preserving plant where the wastes are concentrated by ultrafiltration and reverse osmosis with the concentrate incinerated and the permeate consumed as boiler feed water.
APPROACH: The approach consists of collecting data on the feed, reject, and product and maintaining a log of system performance, quantities processed, operating and maintenance expense, and operating problems.
RESULTS: The data will be tabulated and published in the American Wood Preservers Assn. (AWPA) proceedings. Also the results will be published in EPA Technical Report Series. The physical facility is under construction as of this date. Start-up is scheduled for April, 1977.
PROJECT MILESTONES: (1) 12/76 Funding Package Submitted. (2) 4/76 Award Funds for Project. (3) 10/77 Quarterly Report. (4) 1/78 Quarterly Report. (5) 4/78 Quarterly Report. (6) 7/78 Quarterly Report. (7) 10/78 Draft Final Report. (8) 1/79 Final Report Received.
KEYWORDS: INDUSTRIAL WASTES;LIQUID WASTES;ULTRAFILTRATION;OSMOSIS;COMBUSTION;WASTE PROCESSING;WOOD WASTES;RECYCLING

<070707>
TITLE: Color Removal from NSSC Effluents by Ultrafiltration
PROJECT NUMBER: B610B-629
PRINCIPAL INVESTIGATOR: Doshi, M.
ADDRESS: 1043 East South River Street, Appleton, WI 54911
AFFILIATION: Institute of Paper Chemistry, Appleton, Wis. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Scott, Ralph
TELEPHONE: F420-4696
TYPE OF FUNDING: Grant No.-R805502-01
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: PARTICULATES (33%);ORGANICS (33%);VISUAL AESTHETICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The primary objective of this project is to determine whether or not ultrafiltration can be used as a color removing tool from NSSC effluents. The secondary objective will be to define future work in the area of color removal technology.
APPROACH: Individual stream(s) in a selected NSSC mill will be chosen for this study. Ultrafiltration tubular modular design will be used at high velocities to prevent gel formation and suspended solids plugging. Laboratory experiments will be done to determine flux rates and color rejections as a function of concentration, time, applied pressure, and average velocity through the module. Samples will be analyzed for color, BOD5, TOC, carbohydrates and lignin. Limited analysis for potential toxicants will also be carried out before and after ultrafiltration.
RESULTS: A final report will be issued detailing project findings. If so indicated, the bench-scale research project will be moved to a mill site for additional on site research dependent on availability of funds at this point in time.
PROJECT MILESTONES: (1) 8/77 Funding Package Submitted. (2) 8/77 Award Funds for Project. (3) 6/78 Final Report Received.
KEYWORDS: WASTE WATER;PAPER INDUSTRY;WATER POLLUTION CONTROL;ULTRAFILTRATION;COLOR;BIOCHEMICAL OXYGEN DEMAND;SLURRIES;WASTE PROCESSING;BENCH-SCALE EXPERIMENTS;LIGNIN;CARBOHYDRATES;WASTE PROCESSING;TOXIC MATERIALS

<070708>
TITLE: Fugitive Dust from Oil Shale Extraction
PROJECT NUMBER: B623B-T52
PRINCIPAL INVESTIGATOR: Cotter, J.
ADDRESS: One Space Park, Redondo Beach, CA 90278
AFFILIATION: TRW, Inc., Redondo Beach, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Bates, E.R.
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Contract No.-68-03-2560
77 FUNDING: Environmental Protection Agency FY77:$63,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)

ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: PARTICULATES (100%)
ARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
GIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To conduct a survey of the quantity of fugitive dust produced by oil shale extraction at the Anvil Points, Colorado facility. To determine some of the major inorganic components of the dust.
APPROACH: High volume samplers will be used to collect fugitive dust at the mine, along the haul road, near the crusher, and near the spent shale disposal area. Mass source spectrometry will be used for elemental analysis. Particle size distribution will be determined by cascade impactors.
RESULTS: Identification of elements in fugitive dust from oil shale extraction operations.
PROJECT MILESTONES: (1) 7/77 Funding Package Submitted. (2) 7/77 Award Funds for Project. (3) 8/77 Initiate Sample Collection. (4) 10/77 Complete Sample Collection. (5) 11/77 Complete Analyses. (6) 1/78 Draft Final Report. (7) 4/78 Complete Final Report.
KEYWORDS: OIL SHALE PROCESSING PLANTS;ENVIRONMENTAL EFFECTS;DUSTS;SAMPLING;MASS SPECTROSCOPY;PARTICLE SIZE;AIR POLLUTION;QUANTITATIVE CHEMICAL ANALYSIS

<070709>
TITLE: Operation OHMSETT
PROJECT NUMBER: B-623-C-235
PRINCIPAL INVESTIGATOR: Ackerman, R.
ADDRESS: P.O. Box 156, Leonardo, NJ 07737
AFFILIATION: Mason and Hanger-Silas Mason Co., Inc., Leonardo, N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Parlow, John S.
TYPE OF FUNDING: Contract No.-68-03-0490
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (34%);TRANSPORTATION (33%);STORAGE (33%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;HYDROGRAPHIC AREAS/Other hydrographic areas Navigable waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this project is to provide an operations and maintenance staff and a mechanism for operating the OHMSETT facility.
APPROACH: The contractor provides a permanent staff of a manager, a secretary, an engineer, a chemist, an accountant/expediter and five technicians. Authority is provided in the contract for the local hiring of temporary personnel and the execution of small subcontracts as needed to operate and maintain the facility.
RESULTS: Efficient operation and maintenance of OHMSETT facility.
PROJECT MILESTONES: (1) 10/75 Funding Package Submitted. (2) 11/75 Award Funds for Project. (3) 10/77 Completion Date.
KEYWORDS: INSTRUMENTATION;TEST FACILITIES;MANPOWER;NATURAL GAS;PETROLEUM;STORAGE;TRANSPORT;OIL SPILLS;WATER;TOXINS;HAZARDOUS MATERIALS

<070710>
TITLE: Performance Testing Offshore Equipment
PROJECT NUMBER: B623C-246
PRINCIPAL INVESTIGATOR: Ackerman, R.
ADDRESS: 200 W. Vine St., Lexington, KY 40507
AFFILIATION: Mason and Hanger-Silas Mason Co., Inc., Lexington, Ky. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Parlow, J.S.
TYPE OF FUNDING: Contract No.-68-03-0490
77 FUNDING: Environmental Protection Agency FY77:$13,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oils and floating hazardous materials (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Evaluate performance of selected spill cleanup equipment.
APPROACH: Conduct controlled reproducible tests in EPA's OHMSETT test facility. Equipment evaluated includes two oil skimmers (Nacro class V and a prototype Oil Mop, Inc. ZRV) and a research prototype sorbent system (CEL). Final reports are being prepared.
RESULTS: Report on test results.
PROJECT MILESTONES: (1) 3/76 Funding package submitted. (2) 4/76 Award funds for project. (3) 10/77 Final report received.
KEYWORDS: OIL SPILLS;PERFORMANCE TESTING;SKIMMERS;COMPARATIVE EVALUATIONS;CLEANING;WATER POLLUTION;PETROLEUM;REMOVAL

<070711>
TITLE: Oil Spill and Oil Pollution Reports II
PROJECT NUMBER: B623C-266
PRINCIPAL INVESTIGATOR: Offen, H.W.
ADDRESS: University of California Marine Science Institute, Santa Barbara, CA 93106
AFFILIATION: California Univ., Santa Barbara (USA). Marine Science Inst.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McCarthy, L.T.
TYPE OF FUNDING: Grant No.-R805052-01
77 FUNDING: Environmental Protection Agency FY77:$49,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)

ENERGY CYCLE: EXTRACTION (33%);TRANSPORTATION (33%);STORAGE (34%)
POLLUTANTS: VISUAL AESTHETICS/Oil (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The purpose of this project is to prepare a quarterly publication serving as a single information source for: current oil spill events, scientific and technical publications relating to oil pollution research, oil pollution studies sponsored by government, industry and private and public institutions and oil pollution related ''Patent'' descriptions.
PROJECT MILESTONES: (1) 12/76 Funding Package Submitted. (2) 2/77 Award Funds for Project. (3) 3/79 Final Report Received.
KEYWORDS: OIL SPILLS;WATER POLLUTION;INFORMATION NEEDS;REVIEWS;PATENTS;BIBLIOGRAPHIES

<070712>
TITLE: Review and Analysis of Oil/Water Separation Literature
PROJECT NUMBER: B-623C-271
PRINCIPAL INVESTIGATOR: Ahlert, R.C.
ADDRESS: Rutgers, The State University of New Jersey, New Brunswick, NJ 08903
AFFILIATION: Rutgers--the State Univ., New Brunswick, N.J. (USA). Coll. of Engineering
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McCarthy, L.T.
TYPE OF FUNDING: Grant No.-R803978-01
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The project will identify, organize and interpret technical and commercial literature resources on oil/water separation.
RESULTS: Detailed information on design considerations and operating characteristics of systems, devices and processes, will be assembled.
PROJECT MILESTONES: (1) 5/75 Funding Package Submitted. (2) 6/75 Award Funds for Project. (3) 7/76 Grant Amendment. (4) 12/76 Grant Amendment. (5) 4/77 Grant Amendment. (6) 3/78 Final Report Received.
KEYWORDS: OILS;WATER;SEPARATION PROCESSES;BIBLIOGRAPHIES;OIL SPILLS

<070713>
TITLE: Petroleum Pipeline Leak Detection
PROJECT NUMBER: B-623C-298
PRINCIPAL INVESTIGATOR: Burghart, G.H.
ADDRESS: P.O. Box 2351, La Jolla, CA 92037
AFFILIATION: Science Applications, Inc., La Jolla, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Dorrler, J. Stephen
TYPE OF FUNDING: Contract No.-68-03-2532
77 FUNDING: Environmental Protection Agency FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (33%);TRANSPORTATION (33%);STORAGE (34%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oil (100%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);DEVELOPMENT/Laboratory scale (50%);FULL SCALE DEMONSTRATION (30%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project is intended to define the state-of-the-art of pipeline leak detection and to develop an improved technique or set of techniques to advance this area of technology.
APPROACH: Laboratory development tests.
RESULTS: To advance the state-of-the-art of leak detection to minimize environmental impacts of leaking pipelines.
PROJECT MILESTONES: (1) 2/76 Funding Package Submitted. (2) 4/77 Award Funds for Project. (3) 4/77 Funding Increment. (4) 2/78 Funding Increment. (5) 4/79 Final Report Received.
KEYWORDS: PIPELINES;LEAK TESTING;PETROLEUM;OPTIMIZATION

<070714>
TITLE: Effectiveness of Surface Mine Sedimentation Ponds
PROJECT NUMBER: B623B-319
PRINCIPAL INVESTIGATOR: Becker, B.
ADDRESS: 9190 Red Branch Road, Columbia, MD 21045
AFFILIATION: Hittman Associates, Inc., Columbia, Md. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hill, R.D.
TELEPHONE: C(513)684-4410
TYPE OF FUNDING: Contract No.-68-03-2139
77 FUNDING: Environmental Protection Agency FY77:$2,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (25%);ANALYTICAL (25%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To evaluate the effectiveness of sediment ponds in reducing suspended solids in the runoff from surface mining activities.
APPROACH: An in-field evaluation of the effectiveness of sediment ponds in reducing suspended solids in the runoff from surface mining activities was performed. Nine selected sedimentation ponds in the three eastern coal-mining states of Pennsylvania, West Virginia, and Kentucky were sampled under two different

operating conditions--a baseline and a rainfall event. Their theoretical and actual efficiency of removal of suspended solids were computed and compared.
RESULTS: In general, poor construction and inadequate maintenance of these ponds were found to be the major problem areas. The ponds had generally higher removal efficiencies during the baseline sampling period and much lower efficiencies during the storm event. The theoretically predicted efficiency of the ponds was essentially the same as the actual efficiency under baseline conditions. During the rainfall event, there was generally little or no correlation between the theoretical and actual efficiencies. The predicted efficiencies were found to be much higher than the actual efficiencies during the rainfall event in most cases.
PROJECT MILESTONES: (1) 7/74 Funding Package Submitted. (2) 10/74 Award Funds for Project. (3) 3/77 Funding Increment. (4) 11/77 Final Report Received.
KEYWORDS: COAL MINING;SURFACE MINING;PONDS;SEDIMENTATION;EFFICIENCY;SULFUR COMPOUNDS;REMOVAL;WASTE MANAGEMENT

<070715>
TITLE: Coal and the Environment Abstract
PROJECT NUMBER: B623B-320
PRINCIPAL INVESTIGATOR: Gleason, V.E.
ADDRESS: 350 Hochberg Rd., Monroeville, PA 15146
AFFILIATION: Bituminous Coal Research, Inc., Monroeville, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hill, R.D.
TELEPHONE: C(513)684-4410
TYPE OF FUNDING: Grant No.-R805336-01
77 FUNDING: Environmental Protection Agency FY77:$33,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (33%);COMBUSTION IN SITU (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to provide easy accessibility to the specific literature on the environmental problems related to coal production. The problems covered are coal mine drainage, disposal of the refuse material generated by coal mines and coal cleaning plants, and surface mine reclamation.
APPROACH: This objective will be attained by collecting all relevant information and preparing, on an annual rotating basis, abstract bibliographies of the literature for each subject area.
RESULTS: The refuse bibliography will be available early in 1978 and the reclamation bibliography early in 1979. Each bibliography will contain a listing of references to the mine drainage bibliography published in 1976.
PROJECT MILESTONES: (1) 5/77 Funding Package Submitted. (2) 6/77 Award Funds for Project. (3) 10/78 Final Report Received.
KEYWORDS: COAL MINING;ENVIRONMENTAL IMPACTS;BIBLIOGRAPHIES;ACID MINE DRAINAGE;WASTE DISPOSAL;LAND RECLAMATION

<070716>
TITLE: Pollution Control Guidelines for Coal Refuse Piles and Slurry Ponds
PROJECT NUMBER: B623B-325
PRINCIPAL INVESTIGATOR: Connell, J.P.
ADDRESS: P.O. Box 10023, Palo Alto, CA 94303
AFFILIATION: Wahler (W.A.) and Associates, Palo Alto, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Bates, Ed
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Contract No.-68-03-2344
77 FUNDING: Environmental Protection Agency FY77:$5,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop guidelines for construction of coal refuse piles and slurry ponds with emphasis on environmental protection of both air and water while maintaining structural stability of the material.
APPROACH: Review current literature and interview key government and industrial personnel for information on proper design of refuse disposal facilities. Evaluate in the field, coal refuse disposal sites and slurry pond installations. The study sites will be in the eastern U.S. and will be in both flat and more rugged terrains. Any water emanating from the disposal sites will be sampled four times, twice each in the wet and dry seasons. Various physical and water quality determinations will be made on each sample series.
RESULTS: A set of construction guidelines will be developed which will address haulage, compaction, layering, soil covering, preparation plant procedures, reclamation planning, and structural material stability. The guidelines will be based in part on the field studies and the literature search, and will conform to current MESA requirements.
PROJECT MILESTONES: (1) 3/75 Funding Package Submitted. (2) 12/75 Award Funds for Project. (3) 6/77 Funding Increment. (4) 9/77 Final Report Received.
KEYWORDS: COAL MINES;SPOIL BANKS;PONDS;WATER POLLUTION CONTROL;LAND POLLUTION CONTROL;POLLUTION REGULATIONS;WASTE DISPOSAL;LAND RECLAMATION;CONSTRUCTION;SLURRIES

<070717>
TITLE: Evaluation of Groundwater Pollution from Eastern Underground Coal Mines
PROJECT NUMBER: B623-331
PRINCIPAL INVESTIGATOR: Walker, W.H.
ADDRESS: 44 Sintsink Drive East, Port Washington, NY 11050
AFFILIATION: Geraghty and Miller, Inc., Port Washington, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Bates, E.
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Contract No.-68-03-2467
77 FUNDING: Environmental Protection Agency FY77:$74,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (90%);WASTE MANAGEMENT (10%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: Study the rate, direction of movement, and dilution of groundwater polluted by underground mining operations.
APPROACH: Assimilate and review state and Federal information related to groundwater pollution from Eastern coal mines. Evaluate groundwater pollution at nine mine sites.
RESULTS: Determine necessary corrective action and improvement in water quality that results.
PROJECT MILESTONES: (1) 2/76 Funding Package Submitted. (2) 9/76 Award Funds for Project. (3) 2/77 Funding Increment. (4) 7/78 Final Report Received.
KEYWORDS: INSTRUMENTATION;COAL MINES;UNDERGROUND MINING;GROUND WATER;WATER POLLUTION;HYDROLOGY;POLLUTION REGULATIONS;WATER POLLUTION ABATEMENT;SULFUR COMPOUNDS;ECOSYSTEMS

<070718>
TITLE: Evaluate Surface and Ground Water at Potential Strip Mine Sites
PROJECT NUMBER: B623B-357
PRINCIPAL INVESTIGATOR: Williams, T.T.
ADDRESS: Montana State University, Bozeman, MT 59715
AFFILIATION: Montana State Univ., Bozeman (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Newport, T.G.
TYPE OF FUNDING: Grant No.-R-803727-03
77 FUNDING: Environmental Protection Agency FY77:$482,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Major objective of this project is to identify possible impacts of coal mining and development in the Northern Great Plains on the surface and ground water systems of the surrounding area. Specific objectives are: (1) obtain an equation of balance for all water inflow and outflow in each of three study sites, one each in Montana, North Dakota and Wyoming; (2) characterize the overburden from a physical and chemical point of view as well as determine its relationship to the water coming to the surface; (3) determine hydrologic character of spoils at active mine sites in Montana; (4) characterize the chemical features of the mined sites.
APPROACH: The proposed work is a key effort in the EPA program to assess the surface and ground water problems associated with western coal. Three sites are being studied comprehensively. Each site is just commencing to have impact. Base line data were obtained before impacts began. In addition to the site-specific work, some data are being collected at two active mining sites in Montana to provide additional data for the analyses.
RESULTS: Characterization of several parameters that would support assessing possible impacts of coal mining development on surface and ground water systems of the surrounding area.
PROJECT MILESTONES: (1) 5/75 Funding Package Submitted. (2) 6/75 Award Funds for Project. (3) 7/76 Funding Increment. (4) 7/77 Funding Increment. (5) 6/78 Final Report Received.
KEYWORDS: COAL MINING;SURFACE MINING;ENVIRONMENTAL IMPACTS;SURFACE WATERS;GROUND WATER;MONTANA;NORTH DAKOTA;WYOMING;HYDROLOGY;OVERBURDEN

<070719>
TITLE: Vegetative Stabilization of Spent Oil Shale
PROJECT NUMBER: B-623-B-358
PRINCIPAL INVESTIGATOR: Berg, W.A.
ADDRESS: Colorado State University Dept. of Agronomy, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Agronomy
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Harris, Eugene F.
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Grant No.-R804719-01
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (50%);CONSERVATION/General (50%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT

PROJECT DESCRIPTION: To investigate surface stability and salt movement in spent oil shales and soil-covered spent shales after a cover of native vegetation has been established by intensive treatments and then left under natural precipitation conditions.
PROACH: The study is being carried out on two different spent oil shales. ''Soil'' treatments are plant establishment on: (1) directly on leached and fertilized spent shales; (2) six inches of soil over leached spent shale; (3) one foot of soil over unleached spent shale; (4) soil. Plots have been established on 25 percent north and south slopes at altitudes of 5700 and 7200 feet in or near the Piceance Basin of Northwestern Colorado. Each plot (28 per site) is bordered with wood to form individual runoff plots 11 feet wide and 22 feet long. Sediment and runoff catchments have yet to be installed. One site (5700') has been instrumented for soil salinity and soil moisture measurements. A cover of native plant species has been established on the lower altitude site and will be established on the higher site.
RESULTS: Measurements on vegetation including frequency, density and vegetative ground cover.
PROJECT MILESTONES: (1) 8/76 Funding package submitted. (2) 9/76 Award funds for project. (3) 9/77 Amendment. (4) Final report received.
KEYWORDS: COLORADO;WATER QUALITY;OIL SHALE MINING;ENVIRONMENTAL EFFECTS;OIL SHALES;WASTE WATER;WATER POLLUTION;SURFACE WATERS;GROUND WATER;LAND RECLAMATION;REVEGETATION;PLANTS;BIOMASS;ENVIRONMENTAL TRANSPORT

<070720>
TITLE: Vegetative Stabilization of Paraho Spent Oil Shale
PROJECT NUMBER: B-623-B-359
PRINCIPAL INVESTIGATOR: Berg, W.A.
ADDRESS: Colorado State University, Dept. of Agronomy, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Agronomy
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Harris, Eugene F.
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Grant No.-R803788-03
77 FUNDING: Environmental Protection Agency FY77:$24,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (50%);CONSERVATION/General (50%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this research project is to study surface stability and water movement in and through the Paraho spent oil shales. In addition to the vegetative stabilization studies, the distributions of water and salts in the plots will be monitored with the objective of quantifying the potential salt pollution from shale residues.
APPROACH: It is not possible to experimentally model the actual prototype disposal. For this reason, data from plot studies will be used to develop and verify a mathematical model of salt and water transport.
RESULTS: This model will be used to estimate the long term water quality aspects of large scale disposal of spent shale residues.
PROJECT MILESTONES: (1) 3/75 Funding package submitted. (2) 7/75 Award funds for project. (3) 7/76 Annual report. (4) 9/76 Continuation awarded. (5) 12/76 Amendment. (6) 8/77 Final report received.
KEYWORDS: COLORADO;WATER QUALITY;OIL SHALE MINING;ENVIRONMENTAL EFFECTS;OIL SHALES;WASTE WATER;WATER POLLUTION;LAND RECLAMATION;REVEGETATION;MATHEMATICAL MODELS;ENVIRONMENTAL TRANSPORT;SURFACE WATERS;GROUND WATER;SPOIL BANKS

<070721>
TITLE: Water-Quality Hydrology of Surface-Mined Watersheds
PROJECT NUMBER: B-623-B-419
PRINCIPAL INVESTIGATOR: McWhorter, D.B.
ADDRESS: Colorado State University, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Agricultural Engineering
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wilmoth, R.C.
TYPE OF FUNDING: Grant No.-R804673-02
77 FUNDING: Environmental Protection Agency FY77:$39,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (33%);TRANSPORTATION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the project is to develop a manual of procedures for quantitatively assessing the impact of individual surface mining projects on the water resources in the affected watershed.
APPROACH: One approach is to gather all pertinent data that are available and determine the required parameters by fitting the model to the data. The second approach is to use a watershed model to generate ''field'' data for a wide variety of hypothetical situations and determine the required parameters for the simpler model. A correlation between the parameters and conditions simulated by the watershed model will be made.
RESULTS: The core of the manual will be a water quality hydrology model developed in a previous project. This model has been tested successfully on four watersheds previously and will be further tested using data now being collected at many locations in the Rocky Mountain region. Detailed procedures for translating basic watershed observations into the appropriate model parameters will be given.
PROJECT MILESTONES: (1) 9/76 Funding Package Submitted. (2) 10/76 Award Funds for Project. (3) 10/77 Continuation. (4) 9/78 Final Report Received.
KEYWORDS: SURFACE MINING;ENVIRONMENTAL EFFECTS;WATER QUALITY;COMPUTER CALCULATIONS;WATER RESOURCES;REGIONAL ANALYSIS;HYDROLOGY;COMPUTER CALCULATIONS;WATERSHEDS;ROCKY MOUNTAINS;MANUALS

<070722>
TITLE: Corehole Spacing Models Defining Potential Toxic Rock Bodies in Coal Surface Mining
PROJECT NUMBER: B623B-503
PRINCIPAL INVESTIGATOR: Horne, J.C.
ADDRESS: University of South Carolina, Columbia, SC 29208
AFFILIATION: South Carolina Univ., Columbia (USA). Dept. of Geology
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Newport, T.G.
TYPE OF FUNDING: Grant No.-R805101-01
77 FUNDING: Environmental Protection Agency FY77:$109,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop a corehole spacing program that will allow defining the potentially toxic soil materials in advance of surface mining.
APPROACH: By associating 28 standard rock types with their geochemical and weathering characteristics, the toxicity potential of each lithology is appraised and potential problem rock types are isolated. Using these results as a base, it is proposed to determine the shape, thickness, and lateral extent of the potentially toxic rock types with the view that, if dimensions of some of these rock bodies are known, core hole spacing required to delineate the dimensions of other similar bodies can be determined. Knowledge of this type will aid in the planning for hydraulic manipulations and segregation and burial of potentially toxic materials during overburden handling in surface mines.
RESULTS: Models will be developed to evaluate the ideal core hole spacing in advance of mining that is necessary to delineate potentially toxic lithologies.
PROJECT MILESTONES: (1) 1/77 Funding Package Submitted. (2) 2/77 Award Funds for Project. (3) 10/78 Final Draft Report. (4) 2/79 Final Report. (5) 3/79 Final Report Received.
KEYWORDS: COAL MINES;SURFACE MINING;BOREHOLES;LITHOLOGY;ROCKS;TOXIC MATERIALS

<070723>
TITLE: Audiovisual Program for Surface Coal Mining and the Environment
PROJECT NUMBER: B-623-B-504
PRINCIPAL INVESTIGATOR: Bowling, K.C.
ADDRESS: P.O. Box 11751, Lexington, KY 40511
AFFILIATION: Interstate Mining Compact Commission, Lexington, Ky. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, John P.
TYPE OF FUNDING: Grant No.-R804972-01
77 FUNDING: Environmental Protection Agency FY77:$88,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: The Interstate Mining Compact Commission proposes to develop a comprehensive informational program in audiovisual format on the topic of ''Surface Coal Mining and the Environment.''
APPROACH: The program will consist of up to fourteen (14) individual twenty to forty (20-40) minute audiovisual presentations on the various environmental topics and a technical manual keyed to the presentation.
RESULTS: The target audience for the information to be developed will be mine inspectors, environmental technicians, mine foremen, and mine operators.
PROJECT MILESTONES: (1) 11/76 Funding Package Submitted. (2) 1/77 Award Funds for Project. (3) 10/77 Draft Interim. (4) 11/77 Award Second Phase. (5) 9/78 Final Program Received.
KEYWORDS: COAL MINING;SURFACE MINING;ENVIRONMENTAL EFFECTS;EDUCATION

<070724>
TITLE: Design and Performance of Head-of-Hollow Fills--A Surface Mining and Reclamation Method
PROJECT NUMBER: B-623B-505
PRINCIPAL INVESTIGATOR: Laughlin, G.R.
ADDRESS: 2611 West End Ave., Knoxville, TN 37902
AFFILIATION: Tennessee Dept. of Conservation, Knoxville (USA). Div. of Surface Mining
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wilmoth, Roger C.
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Grant No.-R 805272-01
77 FUNDING: Environmental Protection Agency FY77:$67,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (60%);WASTE MANAGEMENT (40%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to design and construct head-of-hollow fills using economic engineering criteria and to determine the effects of this mining/reclamation method on the environment.
APPROACH: The study involves monitoring environmental parameters prior to distribution, during disturbance, and after completion of construction.
RESULTS: The program will involve hill-top removal and valley fills, each of varying design. Cost analyses will be conducted for each fill design. Soils engineering parameters including settlement and stability

will be determined and analyzed during and after construction.
PROJECT MILESTONES: (1) 6/77 Funding package submitted. (2) 7/77 Award funds for project. (3) 7/78 Award continuation. (4) 7/79 Award continuation. (5) 7/80 Final report received.
KEYWORDS: COAL MINES;SURFACE MINING;LAND RECLAMATION;SPOIL BANKS;SOIL MECHANICS;CONSTRUCTION;PERFORMANCE;COST BENEFIT ANALYSIS

<070725>
TITLE: Use of Vegetative Filter Zone to Control Fine-grained Sediments From Surface Mines
PROJECT NUMBER: B-623B-506
PRINCIPAL INVESTIGATOR: Nickel, R.E.
ADDRESS: 5th Floor Capital Plaza Tower, Frankfort, KY 40601
AFFILIATION: Hittman Associates, Inc., Frankfort, Ky. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Bates, E
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Grant No.-S805632
77 FUNDING: Environmental Protection Agency FY77:$119,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Primary objective of the project is to demonstrate the technical, the economic and environmental feasibility of using a vegetative filter zone to assist in controlling fine-grained sediments originating from surface mining activities. Specific objectives include: (1) Examine sediment trapping efficiency of the filter zone, (2) Examine suitability of various types of vegetation to use in the filter zone, (3) Evaluate the filter's usefulness in improving water quality, and (4) Determine the cost feasibility of using the filter on surface mines in eastern Kentucky.
APPROACH: Basically, the project will entail the diversion of surface runoff water, which has been collected at a particular point on the mining site, down a riprap lined channel and through a vegetative filter zone approximately 20 feet wide and 200 feet long. In order to assure that runoff is accurately monitored, a berm will be constructed around the project site. A flow distribution area and a level spreader will be installed below the riprap lined channel and above the filter zone. The project will include four tasks: (1) Planning and Feasibility Study, (2) Sediment and Water Quality Monitoring, (3) Construction and Demonstration, and (4) Project Management.
RESULTS: Prove the feasibility of using a vegetative filter zone to assist in controlling fine-grained sediments.
PROJECT MILESTONES: (1) 8/77 Funding package submitted. (2) 9/77 Award funds for project. (3) 1/78 Planning and feasibility study. (4) 4/79 Construction and data collection. (5) 5/79 Final report.
KEYWORDS: RUNOFF;COAL MINING;SURFACE MINING;REVEGETATION;SEDIMENTS;FEASIBILITY STUDIES;ECONOMICS;TECHNOLOGY ASSESSMENT;LAND RECLAMATION;WATER QUALITY

<070726>
TITLE: Determine the Effectiveness of Regulations and Practices for Handling Toxic Strip Mine Spoils to Prevent Acid Mine Drainage
PROJECT NUMBER: B-623B-508
PRINCIPAL INVESTIGATOR: Thompson, D.R.
ADDRESS: P.O. Box 2063, Harrisburg, PA 17120
AFFILIATION: Pennsylvania Div. of Mine Drainage Control and Reclamation, Harrisburg (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Kennedy, James L.
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Grant No.-R805598-01
77 FUNDING: Environmental Protection Agency FY77:$112,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Theoretical (20%);DEVELOPMENT/Pilot plant (40%);ANALYTICAL (40%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: The objective of the proposed research project is to determine if modern regulations and practices governing handling of toxic strip mine spoil materials have been effective in controlling acid mine drainage after mining and reclamation have been completed.
APPROACH: The project will include the evaluation of sixteen strip mines in the Commonwealth of Pennsylvania. These mines will have been reclaimed following laws and regulations which required that toxic spoil materials be segregated during mining and that the toxic material be backfilled in accordance with specifications designed to prevent residual acid mine drainage. Spoil samples will be obtained from a test boring program. The potential toxicity of the spoil samples will be determined by laboratory analysis. Statistical methods will be used to determine the relation between acid mine drainage production and the presence of toxic strip mine spoils, their configuration within the reclaimed strip mine, and the location of ground water with respect to the toxic materials.
RESULTS: Prove the adequacy of or identify the deficiencies of regulations and practices for controlling acid mine drainage.
PROJECT MILESTONES: (1) 8/77 Funding package submitted. (2) 9/77 Award funds for project. (3) 9/78 Award continuation. (4) 3/79 Final report received.
KEYWORDS: COAL MINES;ACID MINE DRAINAGE;POLLUTION REGULATIONS;LAND RECLAMATION;PENNSYLVANIA;SPOIL BANKS;EVALUATION;TOXINS

<070727>
TITLE: Rotating Disc Biological Treatment of Acid Mine Drainage (AMD)
PROJECT NUMBER: B-623B-514
PRINCIPAL INVESTIGATOR: Unz, R.F.
ADDRESS: Institute for Research on Land and Water Resources, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA). Inst. for Research on Land and Water Resources
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wilmoth, Roger C.
TYPE OF FUNDING: Grant No.-R805132-01
77 FUNDING: Environmental Protection Agency FY77:$63,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The project is concerned with evaluating the ferrous (FeII) iron oxidizing capacity of the rotating biological contactor in the treatment of acid mine drainage. The process is dependent upon the lithotrophic capacity of iron-oxidizing bacteria which colonize the available surface area of rotating discs immersed in acid mine water flowing through the RBC unit. The oxidation of the ferrous iron to the ferric state reduces the pollution potential of the drainage. The specific objectives of the project are to determine the treatment of mine drainages of differing chemical nature and the requirements for treatment of certain specific drainages by the unit to accomplish desired effluent quality.
APPROACH: A full size RBC treatment unit, with 2 meter diameter discs, will be specially modified for demonstration purposes and operated at three ferrous iron-containing acid mine drainage locations. These locations are in Pennsylvania and West Virginia and include one active and two abandoned coal mines.
RESULTS: Pertinent water quality parameters will be analyzed to determine the effectiveness of the unit. Particular attention will be paid to the population dynamics of the iron oxidizing organisms at various stages of treatment. Analytical data will be utilized to aid in the design of other units and the assessment of capital and operating costs. Economics of the unit will be compared to those of other iron oxidizing processes in use or planned.
PROJECT MILESTONES: (1) 3/77 Funding package submitted. (2) 4/77 Award funds for project. (3) 4/78 Final report received.
KEYWORDS: ACID MINE DRAINAGE;COAL MINES;BIODEGRADATION;LEACHING;WATER QUALITY;PENNSYLVANIA;WEST VIRGINIA;ECONOMICS

<070728>
TITLE: Importance and Functions of Alluvial Valley Floors
PROJECT NUMBER: B623B-517
PRINCIPAL INVESTIGATOR: Rechard, P.A.
ADDRESS: University of Wyoming, Laramie, WY 82071
AFFILIATION: Wyoming Univ., Laramie (USA). Water Resources Research Inst.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, John F.
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Grant No.-R805185-01
77 FUNDING: Environmental Protection Agency FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Non-point source (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) To define the mechanisms involved in the hydrology of the alluvial system. (2) To investigate the stratigraphic relationship of the stream deposits. (3) To identify the soil types represented. (4) To determine productivity of the native plant community. (5) To provide information relevant for state and federal regulatory agencies.
APPROACH: After an extensive literature review, three sites in Montana and Wyoming will be selected for field study.
RESULTS: It is intended that this study delineate the problems, mineability, treatability, etc. of potential alluvial valley mine sites and to define the critically important physical features of alluvial valleys which have major impacts to the hydrologic cycle.
PROJECT MILESTONES: (1) 6/77 Funding Package Submitted. (2) 7/77 Award Funds for Project. (3) 3/78 Award Continuation. (4) 2/80 Final Report Received.
KEYWORDS: VALLEYS;HYDROLOGY;ALLUVIAL DEPOSITS;COAL MINING;STRATIGRAPHY;SOILS;PLANTS;MONTANA;WYOMING

<070729>
TITLE: Transport Water Contamination in Coal-Slurry Pipelines
PROJECT NUMBER: B623B-525
PRINCIPAL INVESTIGATOR: Peavy, H.S.
ADDRESS: Montana State University, Bozeman, MT 59715
AFFILIATION: Montana State Univ., Bozeman (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Kennedy, James L.
TELEPHONE: F923-7496
TYPE OF FUNDING: Grant No.-R805176-01
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)

REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
OJECT DESCRIPTION: The objective of this research project will be to qualify and quantify any contamination of water used as a transport media in coal-slurry pipelines.
APPROACH: A slurry of water and coal will be pumped continuously for several days around a 2,400 foot, closed loop pipeline. Samples will be drawn off periodically and analysis will be performed on the water phase for various dissolved and suspended materials. Test parameters will be determined by prior analysis of the coal and water used to make up the slurry. It is anticipated that these parameters will include several metals as well as several organic carbon compounds. Both fresh water and saline water will be used as a transport media. Some organic analysis of water which has contracted coal has already been done at M.S.U. This work indicates that dissolved organic carbon of up to 100 ppM can result under some conditions.
RESULTS: Determination of the type and degree of contamination to water used for coal-slurry transport.
PROJECT MILESTONES: (1) 3/77 Funding Package Submitted. (2) 4/77 Award Funds for Project. (3) 8/77 Complete First Pump Tests. (4) 4/78 Final Report Received.
KEYWORDS: COAL;SLURRY PIPELINES;WATER POLLUTION;QUANTITATIVE CHEMICAL ANALYSIS;WATER

<070730>
TITLE: Predicting Acid Pollution Potential from Coal Strip Mines
PROJECT NUMBER: B623-606
PRINCIPAL INVESTIGATOR: Caruccio, F.T.
ADDRESS: University of South Carolina, Columbia, SC 29208
AFFILIATION: South Carolina Univ., Columbia (USA). Dept. of Geology
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Newport, T.G.
TYPE OF FUNDING: Grant No.-R805116-01
77 FUNDING: Environmental Protection Agency FY77:$86,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (40%);TRANSPORTATION (20%);WASTE MANAGEMENT (40%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: If an acidity index can be developed with a reasonable degree of precision, the information will be very valuable to mining operators and regulatory officials in that they will have a tool which can be used to accurately predict the amount of acid pollution to be expected from a site proposed for surface mining. This will be useful in determining whether a mine permit should be issued and in reviewing the proposed mining operation to see if proper reclamation practices are employed.
APPROACH: Six proposed strip mines underlain by different geologies in the bituminous coal field of western Pennsylvania will be core drilled to provide fresh rock samples, detailed geology and ground water sampling points. The rocks will be related to their acid-alkalinity production potentials through laboratory simulated weathering conditions and petrographic analyses. The leachates will be analyzed for specific ionic species indicative of particular chemical reactions. A regional aqueous geochemical survey will be completed to evaluate the natural system's neutralizing and buffering capacities. During the backfilling phase of mining operation, water collectors will be buried in the backfill and mine drainage characteristics monitored. The chemical characteristics of the mine drainage will then be related to those of the leachates to ascertain the chemical reactions taking place. Further identification with the petrographic analyses and pyrite types of the rocks occupying the mine site and noted to produce particular acid-alkaline loads, permits the extension of this pollution predictive technique to other areas.
PROJECT MILESTONES: (1) 4/77 Funding Package Submitted. (2) 5/77 Award Funds for Project. (3) 2/79 Final Report.
KEYWORDS: COAL MINING;SURFACE MINING;ACID MINE DRAINAGE;FORECASTING;PENNSYLVANIA;LAND RECLAMATION

<070731>
TITLE: Multiagency Project for Oil Spill Equipment, Phase I
PROJECT NUMBER: B623C-612
PRINCIPAL INVESTIGATOR: Ackerman, R.
ADDRESS: P.O. Box 117, Leonardo, NJ 07737
AFFILIATION: Mason and Hanger-Silas Mason Co., Inc., Leonardo, N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Parlow, J.S.
TYPE OF FUNDING: Contract No.-68-03-0490
77 FUNDING: Environmental Protection Agency FY77:$38,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (33%);TRANSPORTATION (33%);STORAGE (34%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oils and floating hazardous material (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Other hydrographic areas Navigable waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Performance evaluation of commercially available spill cleanup equipment. Performance testing of actual equipment at OHMSETT.
APPROACH: Four oil skimmers have been selected and their throughput efficiency, oil recovery efficiency and oil recovery rate will be determined for two oil types under a variety of current and wave conditions.
RESULTS: A final report will be prepared.
PROJECT MILESTONES: (1) 6/77 Funding Package Submitted. (2) 6/77 Award Funds for Project. (3) 10/77 Final Report Received.
KEYWORDS: OIL SPILLS;SKIMMERS;DESIGN;PERFORMANCE TESTING;COMPARATIVE EVALUATIONS;WATER POLLUTION CONTROL

<070732>
TITLE: Monitoring of Trace Components from the Hanna IV In-Situ Coal Gasification Test
PROJECT NUMBER: B623A-619
PRINCIPAL INVESTIGATOR: Fischer, D.
ADDRESS: P.O. Box 3395 University Station, Laramie, WY 82071
AFFILIATION: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Huffman, George L.
TYPE OF FUNDING: Interagency agreement-IAG-D7-01185
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The Linked Vertical Well in-situ coal gasification process is being developed by ERDA Laramie Energy Research Center at Hanna, Wyoming. The objective of this research work is to characterize gaseous emissions for this process.
APPROACH: The approach consists of monitoring the low BTU gas during the full lifetime of the Hanna IV in-situ coal gasification test to determine the concentrations of specific trace components and their variation as a function of time.
RESULTS: Current plans are to conduct investigations beginning September 1, 1977 and concluding on February 28, 1978.
PROJECT MILESTONES: (1) 7/77 Funding Package Submitted. (2) 7/77 Award Funds for Project. (3) 7/78 Final Report Received.
KEYWORDS: COAL GASIFICATION;IN-SITU GASIFICATION;GASEOUS WASTES;MONITORING;TRACE AMOUNTS;LOW BTU GAS;WYOMING

<070733>
TITLE: Optimization of Land Cultivation Parameters
PROJECT NUMBER: B623C-621
PRINCIPAL INVESTIGATOR: Brown, K.
ADDRESS: Texas A and M University, College Station, TX 77840
AFFILIATION: Texas A and M Univ., College Station (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Farlow, J.S.
TYPE OF FUNDING: Grant No.-R805474
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Research is to be conducted on the land disposal of tank bottom and API separator wastes.
APPROACH: The investigation will utilize three diverse wastes, and tests will be conducted on several soils representing a range of characteristics. The investigation will begin with characterization of the wastes. This data will be used to decide on the application rates to be used in the studies. Measurements will be made of the deccmposition rate of the wastes, the influence of applications on plant survival and growth, and the concentrations of potential pollutants in runoff and leachate water. The fate and mobility of the wastes in the soil will be investigated in the laboratory, in greenhouse tests, and, ultimately, in field tests.
RESULTS: The research should provide insight into the feasibility of land disposal of this class of waste, and the results will be used to develop criteria to be used in the design, management, and monitoring of oily waste disposal operations.
PROJECT MILESTONES: (1) 7/77 Funding Package Submitted. (2) 8/77 Award Funds for Project. (3) 6/78 Final Report Received.
KEYWORDS: PETROLEUM REFINERIES;WASTE DISPOSAL;LAND POLLUTION;BIODEGRADATION;ENVIRONMENTAL TRANSPORT;WASTE OILS;WASTE WATER;PLANTS

<070734>
TITLE: Predicting Response of a Natural System to Uranium Extraction, Oakville Aquifer System, Texas
PROJECT NUMBER: B-623-B-638
PRINCIPAL INVESTIGATOR: Galloway, W.E.
ADDRESS: Box X, Austin, TX 78712
AFFILIATION: Texas Univ., Austin (USA). Bureau of Economic Geology
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrail Environmental Research Laboratory
MONITOR: Hubbard, J.
TELEPHONE: C(513)684-4417
TYPE OF FUNDING: Grant No.-R805357-01
77 FUNDING: Environmental Protection Agency FY77:$105,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: EXTRACTION (33%);STORAGE (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The principal objective of this project is to determine and document for one uranium-bearing aquifer system the interrelationships between aquifer geometry, hydrology, hydrochemistry, mineralogy, and uranium mineralization and to determine how this natural system will respond to local chemical or physical stresses induced by uranium mining.

RESULTS: The implications of project results for the design of monitoring systems will be evaluated.
PROJECT MILESTONES: (1) 7/77 Funding Package Submitted. (2) 9/77 Award Funds for Project. (3) Final Report Received.
KWORDS: URANIUM MINES;ENVIRONMENTAL EFFECTS;AQUIFERS;HYDROLOGY;REGIONAL ANALYSIS;URANIUM;MINING;GROUND WATER;CHEMICAL COMPOSITION;STRESSES;MINERALIZATION;GROUND SUBSIDENCE

<070735>
TITLE: Process Evaluation: Multi-Waste gasification
PROJECT NUMBER: B624B-T11
PRINCIPAL INVESTIGATOR: Hedley, W.H.
ADDRESS: 1515 Nicholas Road, Dayton, OH 45407
AFFILIATION: Monsanto Research Corp., Dayton, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Liberick, Walter W., Jr.
TYPE OF FUNDING: Contract No.-68-03-2550(Task 1001)
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this effort is to do a complete environmental, economic, and technical feasibility of a multi-waste gasification system. It is envisioned that such a system would be adjacent to an existing gas, liquid, or solid fuel user and would market its gas product to such a user. Acceptable waste types include: municipal solid waste, sewage sludges, industrial (hazardous, sludges, etc.) and agricultural wastes.
APPROACH: The contractors' approach shall be to utilize his experience, the literature, and existing data from gasification process developers to complete this assessment (i.e., Union Carbide, ERCO, Princeton University, etc.).
RESULTS: Report on results.
PROJECT MILESTONES: (1) 7/77 Funding package submitted. (2) 9/77 Award funds for project. (3) 11/77 Draft final report. (4) 12/77 Final report received.
KEYWORDS: SOLID WASTES;GASIFICATION;FUEL GAS;SYNTHESIS;TECHNOLOGY ASSESSMENT;ENVIRONMENTAL EFFECTS;ECONOMICS;FEASIBILITY STUDIES;MUNICIPAL WASTES;SEWAGE SLUDGE;INDUSTRIAL WASTES;AGRICULTURAL WASTES

<070736>
TITLE: Environmental Assessment of Advanced Energy Conversion Technologies
PROJECT NUMBER: B-624-B-379
PRINCIPAL INVESTIGATOR: Shaw, H.
ADDRESS: Government Research Laboratories, P.O.Box 8, London, NJ 07036
AFFILIATION: Exxon Research and Engineering Co., Linden, N.J. (USA). Government Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Cain, William C.
TYPE OF FUNDING: Contract No.-68-02-2146
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);HEAT, THERMAL (10%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The potential environmental impact of advanced energy conversion technologies will be assessed in a 3 phase program over a 30 month period in order to avoid the need for retrofitting control equipment when these plants are a commercial reality. The advanced cycles to be considered in this program include: open and closed cycle magnetohydrodynamics (MHD), open and closed cycle high temperature gas turbines, liquid metal topping cycles, supercritical C0/sub 2/ cycles (feher), thermionics, fuel cells, advanced steam cycles (Field), and bottoming cycles.
APPROACH: The Phase I effort will consolidate the available information on the potential pollutants as well as the current state of development of advanced conversion technologies. The objective of Phase II will be to develop realistic and practical analytical models in order to estimate effluents, pollutants, and waste energy. These models will be employed to provide parametric analyses of emission levels related to cycle characteristics and efficiency. The cost/effectiveness of existing pollution control technologies for each cycle will then be determined. Phase III of the program will use all the information and data generated in the program to identify the critical R and D needed to make these technologies environmentally acceptable. The impact of pollution control on energy conversion efficiency will be stressed in the recommendation. This planning effort will include alternate R and D strategies and priorities based on anticipated ranges of available funding.
PROJECT MILESTONES: (1) 3/75 Funding package submitted. (2) 4/76 Award funds for project. (3) 2/78 Preliminary analysis report. (4) 3/79 Final report received.
KEYWORDS: INSTRUMENTATION;ADVANCED ENERGY CYCLES FROM COAL;MULTI MEDIA POLLUTANTS;ENVIRONMENTAL CONTROL REQUIREMENTS;POWER PLANTS;TOPPING CYCLES;BOTTOMING CYCLES;MHD GENERATORS;GAS TURBINES;LIQUID METALS;THERMODYNAMIC CYCLES;THERMIONIC CONVERTERS;FUEL CELLS;STEAM TURBINES;RANKINE CYCLE;POLLUTION;CHEMICAL EFFLUENTS;GASEOUS WASTES;LIQUID WASTES;THERMAL EFFLUENTS;ENVIRONMENTAL IMPACTS;POLLUTION;POLLUTION CONTROL;MATHEMATICAL MODELS;POLLUTION CONTROL EQUIPMENT;EFFICIENCY;ECOSYSTEMS;TECHNOLOGY ASSESSMENT

<070737>
TITLE: Evaluation of Ames' Waste Process--An Energy Recovery System
PROJECT NUMBER: B-624B-391
PRINCIPAL INVESTIGATOR: Chantland, A.O.
ADDRESS: Public Works Director, Ames, IA 50010
AFFILIATION: City of Ames, Iowa (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wiles, C.;Olexsey, R.
TYPE OF FUNDING: Grant No.-R-803903
77 FUNDING: Environmental Protection Agency FY77:$470,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);CONSERVATION/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The study will assess the effects of using municipal solid waste (MSW) as a supplementary fuel.
APPROACH: Co-firing of MSW with coal in stoker and tangentially-fired boilers will be conducted and since one boiler is the same as at St. Louis, studies will permit confirmation, and comparison of selected St. Louis results.
RESULTS: Assessments will be made of the technical and environmental aspects of these co-firing techniques. In addition, technical and economic tests and evaluations will be conducted on the second generation MSW processing facility associated with supplying the refuse derived fuel.
PROJECT MILESTONES: (1) 4/77 Funding package submitted. (2) 5/77 Award funds for project. (3) 1/77 Funding Increment. (4) 4/77 Grant Amendment (5) 2/78 Final report received.
KEYWORDS: SOLID WASTES;COMBUSTION;FOSSIL-FUEL POWER PLANTS;BOILER FUEL;MUNICIPAL WASTES;ENVIRONMENTAL EFFECTS;ECONOMICS;AIR POLLUTION

<070738>
TITLE: Pilot Scale Pyrolytic Conversion of Mixed Waste to Fuel
PROJECT NUMBER: B624B-399
PRINCIPAL INVESTIGATOR: Stephens, R.H.
ADDRESS: 185 Alewife Brook Parkway, Cambridge, MA 02138
AFFILIATION: Energy Resources Co., Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Liberick, Walter W., Jr.
TYPE OF FUNDING: Contract No.-68-03-2340
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (20%);PARTICULATES (40%);ORGANICS (40%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop models relating fraction of fuel products (gas, liquid, solid) produced in pyrolysis of various types of solid wastes as function of pyrolyzed conditions. Solid wastes include mixed municipal, agricultural, and industrial wastes. An investigation of chemical conversions including steam gasification, partial oxidiation, and catalytic effects of bed materials, as well as detailed analysis and characterization of pyrolysis products including char and oil, will be conducted.
APPROACH: Experimental study using small batch pyrolyzer and pilot size (200 kg/hr) fluidized bed pyrolyzer to produce data for model development and verification. Statistical and semi-empirical models will be examined for the normal fluidized bed pyrolytic reaction as well as for steam gasification and partial oxidation. Several char and oil samples will be analyzed in detail to evaluate the acceptability of fuel products.
RESULTS: Status: Fabrication of the test units is completed. Test runs are underway to accumulate data for model verification.
PROJECT MILESTONES: (1) 3/75 Funding package submitted. (2) 6/75 Award funds for project. (3) 12/76 Grant modification No. 1. (4) 4/77 Grant modification No. 2. (5) 12/77 Final report received.
KEYWORDS: SOLID WASTES;PYROLYSIS;FUEL GAS;FUEL OILS;CHARS;SYNTHESIS;PARTIAL OXIDATION PROCESSES;GASIFICATION;CATALYSTS;CHEMICAL ANALYSIS;FLUIDIZED BED;MUNICIPAL WASTES;AGRICULTURAL WASTES;INDUSTRIAL WASTES;FLUE GAS

<070739>
TITLE: Co-firing of Solid Waste with Coal in a Cement Kiln
PROJECT NUMBER: B-624B-626
PRINCIPAL INVESTIGATOR: Willey, C.R.
ADDRESS: 60 West St., Annapolis, MD 21401
AFFILIATION: Maryland Environmental Service, Annapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Olexsey, R.
TYPE OF FUNDING: Grant No.-R805613-01
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);CONSERVATION/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this project is to investigate the technical and economic feasibility of co-firing solid waste with coal in an existing full-scale cement kiln. This project will address both the resource recovery aspects of using waste as a supplementary fuel and the industrial conservation aspects of preserving conventional (high-priced, high-sulfur) fossil fuels.
APPROACH: Approximately 3000 tons of refuse-derived fuel will be co-fired in the direct-fired kiln. During

these co-combustion tests, environmental analyses of process effluents will be carried out.
PROJECT MILESTONES: (1) 8/77 Funding package submitted. (2) 9/77 Award funds for project. (3) 12/78 Final report.
KEYWORDS: SOLID WASTES;COMBUSTION;INDUSTRY;ENERGY SOURCES;MATERIALS RECOVERY;ENVIRONMENTAL EFFECTS;AIR POLLUTION;FLUE GAS;REFUSE DERIVED FUELS;SULFUR COMPOUNDS

<070740>
TITLE: Chemical Reclamation of Scrap Rubber
PROJECT NUMBER: B-624B-401
PRINCIPAL INVESTIGATOR: Larsen, J.W.
ADDRESS: University of Tennessee, Buehler Hall, Knoxville, TN 37916
AFFILIATION: Tennessee Univ., Knoxville (USA). Dept. of Chemistry
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Liberick, Walter W., Jr.
TYPE OF FUNDING: Grant No.-R804321-01
77 FUNDING: Environmental Protection Agency FY77:$88,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The environmental problems caused by 200 million tires discarded annually in the United States are well documented. At present there is no good way of disposing of scrap tires or of recovering the valuable carbon materials which they contain. The chief objective of this project is to complete bench scale engineering research on a process which converts scrap rubber to a mixture of hydrocarbon gases, a low sulfur oil, and carbon black.
APPROACH: This will involve identification and solution of technical problems--for example, separation of the catalyst and carbon black. It will include a complete economic evaluation of the process. Quantities of the products will be produced for evaluation by potential customers.
RESULTS: The data necessary for the design of a pilot plant will be obtained.
PROJECT MILESTONES: (1) 10/76 Funding package submitted. (2) 1/77 Award funds for project. (3) 12/77 Draft final report. (4) 3/78 Final report received.
KEYWORDS: TIRES;PYROLYSIS;FUEL GAS;FUEL OILS;CARBON BLACK;SYNTHESIS;ECONOMICS;BENCH-SCALE EXPERIMENTS;SOLID WASTES;SYNTHETIC FUELS;SULFUR COMPOUNDS

<070741>
TITLE: St. Louis Waste Co-firing with Coal Project: Equipment, Facilities and Environmental Evaluation of Meramac Power Plant
PROJECT NUMBER: B-624B-390
PRINCIPAL INVESTIGATOR: Gorman, P.G.
ADDRESS: 425 Volker Boulevard, Kansas City, MO 64110
AFFILIATION: Midwest Research Inst., Kansas City, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Wiles, C.
TYPE OF FUNDING: Contract No.-68-02-1871
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);CONSERVATION/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This project provides for tests to determine the effects of firing refuse and coal on gases and particles emitted from a 120 MW tangentially fired utility boiler.
APPROACH: Tests will be made to investigate the mechanisms which cause a loss in ESP performance. Water pollution tests will be conducted and the emission of potentially hazardous pollutants will be investigated. Testing and engineering analyses will be performed to technically and economically evaluate the refuse preparation and firing processes.
RESULTS: Requirements for design of emission control devices will be established and process or equipment modifications necessary to reduce process cost and to increase energy or material recovery will be determined.
PROJECT MILESTONES: (1) Funding package submitted. (2) Award funds for project. (3) 5/77 Final report received.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;BOILER FUEL;SOLID WASTES;COMBUSTION;MUNICIPAL WASTES;AIR POLLUTION;MONITORING;EQUIPMENT;WATER POLLUTION;POLLUTION CONTROL EQUIPMENT

<070742>
TITLE: Workshop on Waste-to-Energy Technology
PROJECT NUMBER: B-624B-625
PRINCIPAL INVESTIGATOR: Smithson, G.R. Jr.
ADDRESS: 505 King Ave., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Freeman, Harry
TYPE OF FUNDING: Grant No.-R805561-01
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT

PROJECT DESCRIPTION: The objective of the proposed project is to develop and conduct a workshop which will provide a forum for reviewing the state of the art of waste-to-energy technology, for assessing problem areas, and for suggesting approaches for the continued development of this technology. Participants in th workshop will include representatives from both the technological and user communities.
APPROACH: Specific details regarding the format, scheduling, and location of the workshop as well as the preparation of a list of potential participants will be developed by a workshop committee composed of representatives of U.S. EPA, Battelle, and others. This committee will be selected and begin its work immediately upon the execution of this grant.
RESULTS: A brief report in which the findings and recommendations of the workshop participants will be prepared at the conclusion of the project.
PROJECT MILESTONES: (1) 8/77 Funding package submitted. (2) 8/77 Award funds for project. (3) 11/77 Conference. (4) 3/78 Summary report. (5) Final report received.
KEYWORDS: WASTE PRODUCT UTILIZATION;TECHNOLOGY ASSESSMENT;ENERGY SOURCE DEVELOPMENT;MEETINGS

<070743>
TITLE: Refuse Derived Fuel Sources and Utilization
PROJECT NUMBER: B-624-B-T-61
PRINCIPAL INVESTIGATOR: McElroy, A.D.
ADDRESS: 425 Volker Road, Kansas City, MO 64110
AFFILIATION: Midwest Research Inst., Kansas City, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Liberick, Walter W., Jr.
TYPE OF FUNDING: Contract No.-68-03-2563
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this study is to identify sources of feedstocks (wastes) compatible with existing waste-as-fuel processes and ''product'' fuel users.
APPROACH: This effort calls for a national identification of waste sources (municipal, industrial, agricultural/quantities and locations by counties) and current fuel users (residential, utility boilers, etc. and locations by counties).
RESULTS: It is envisioned that the results of this effort will be displayed in a tabular form according to geographic areas as well as displayed on one or a series of maps.
PROJECT MILESTONES: (1) 8/77 Funding Package Submitted. (2) 10/77 Award Funds for Project, Draft Final Report. (3) 11/77 Final Report Received.
KEYWORDS: REFUSE DERIVED FUELS;SOLID WASTES;INVENTORIES;AGRICULTURAL WASTES;MUNICIPAL WASTES;INDUSTRIAL WASTES

<070744>
TITLE: Effects of Burning Densified Forms of Municipal Solid Waste Derived Fuels in Industrial, Utility, and Institutional Stoker-Fired Boilers
PROJECT NUMBER: B-624-B-395
PRINCIPAL INVESTIGATOR: Rigo, H.G.
ADDRESS: 245 North Valley Road, Xenia, OH 45385
AFFILIATION: Systems Technology Corp., Xenia, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wiles, C.;Olexsey, R.
TYPE OF FUNDING: Contract No.-68-03-2426
77 FUNDING: Environmental Protection Agency FY77:$119,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);CONSERVATION/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (60%);WASTE MANAGEMENT (40%)
POLLUTANTS: METALS/Heavy (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this program is to demonstrate the use of densified Refuse Derived Fuel (d-RDF) as a coal supplement in stoker-equipped boilers and to assess the environmental impact of widespread implementation of the concept.
APPROACH: The questions are to be answered by burning pelletized, cubetted and briquetted d-RDF and coal in spreader stoker-equipped boilers. The coal: d-RDF ratio will be varied to establish the impact of substitution ratio on boiler performance and the environment. After initial testing is complete, a demonstration burn will occur to assess the impact of sustained firing. Each fuel-boiler combination will be approached in a three step sequence: (1) a field trial will establish the processability of the fuel by the boiler and the maximum substitution ratios usable without boiler problems; (2) a field test will quantify environmental, energy and boiler impacts of the fuel system over a range of boiler conditions; (3) a demonstration will be performed.
RESULTS: Demonstration of feasibility and acquisition of parametric data.
PROJECT MILESTONES: (1) 10/76 Funding Package Submitted. (2) 11/76 Award Funds for Project. (3) 3/77 Preliminary Performance Evaluation of Short Burns. (4) 6/77 Final Report Received.
KEYWORDS: INSTRUMENTATION;REFUSE DERIVED FUELS;COMBUSTION;FOSSIL-FUEL POWER PLANTS;BOILER FUEL;FEASIBILITY STUDIES;ENVIRONMENTAL EFFECTS;CORROSIVE EFFECTS

<070745>
TITLE: Pyrolysis of Agricultural Residues and Feedlot Wastes in a Reactive Steam Atmosphere
PROJECT NUMBER: B-624-B-538
PRINCIPAL INVESTIGATOR: Antal, M.J. Jr.
ADDRESS: Princeton University, Engineering Quadrangle, Princeton, NJ 08540
AFFILIATION: Princeton Univ., N.J. (USA). Dept. of Aerospace and Mechanical Sciences
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Liberick, Walter W., Jr.
TYPE OF FUNDING: Grant No.-R804836-01

77 FUNDING: Environmental Protection Agency FY77:$86,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
.UTANTS: NOXIOUS GAS/H2;NOXIOUS GAS/CO;NOXIOUS GAS/CO2 (50%);METALS (15%);PARTICULATES (15%);ORGANICS (20%)
!ACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: A program to investigate the pyrolysis of agricultural residues and feedlot wastes in a steam atmosphere is to be done. The program is motivated by the evident need to upgrade the energy value of organic wastes for them to become a nationally significant fuel resource. Hydrogen produced from solid wastes by steam pyrolysis could be used to meet a portion of the Nation's natural gas demand. Experimental work on the kinetics of steam pyrolysis is needed to design a practical reactor system and to establish the regimes where minimum levels of environmental pollutants are produced.
APPROACH: The research program outlined in this effort will investigate at the bench the effects of diverse parameters, e.g., heating rate and ultimate temperature, particle size, reactor residence time and pressure on steam pyrolysis. In addition, catalysis of the pyrolysis reactions and effects of trace constituents of the waste on catalysis will also be studied. Mathematical models based on differential equations describing the rate processes will be developed when appropriate. The research program is aimed at determining the optimal conditions for the production of a synthesis gas (composed primarily of H2, CO, and CO2) from organic wastes by steam pyrolysis. In order to achieve this goal, yields of char and liquid products will be minimized. Ultimate pyrolysis temperatures will also be kept as low as possible, but other conditions will be treated as true variables in the optimization process.
RESULTS: Results from this research will facilitate the design of a continuous, small-scale chemical reactor primarily for waste gasification, though some waste liquefaction information will also result.
PROJECT MILESTONES: (1) 11/76 Funding Package Submitted. (2) 2/77 Award Funds for Project. (3) 12/77 Interim Report. (4) 1/78 Award Continuation. (5) 11/78 Draft Final Report. (6) 1/79 Final Report.
KEYWORDS: INSTRUMENTATION;AGRICULTURAL WASTES;MANURES;PYROLYSIS;STEAM;HYDROGEN PRODUCTION;FUEL GAS;SYNTHESIS;AIR POLLUTION;LAND POLLUTION;BENCH-SCALE EXPERIMENTS;CHEMICAL REACTION KINETICS;MATHEMATICAL MODELS;SYNTHESIS GAS;STEAM-IRON PROCESS

<0707#6>
TITLE: Environmental and Technological Analysis of the Use of Surplus Wood as an Industrial Fuel
PROJECT NUMBER: B-624-B-546
PRINCIPAL INVESTIGATOR: Hall, E.H.
ADDRESS: 505 King Ave., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Freeman, H.M.
TYPE OF FUNDING: Grant No.-R-805050-01
77 FUNDING: Environmental Protection Agency FY77:$57,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: TRANSPORTATION (33%);PROCESSING, CONVERSION (34%);WASTE MANAGEMENT (33%)
POLLUTANTS: NOXIOUS GAS/Sulphur oxides (50%);PARTICULATES (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To analyze the potential availability of surplus wood by region and compare that availability with potential regional demand for wood fuel. (2) To assess the current state of the technology for the procurement and utilization of surplus wood fuel, to project potential consumption of wood fuel on the basis of existing technology, and to identify any technology-related research and development needs. (3) To assess the environmental/ecological impacts with respect to SO2 emissions and with respect to potential long-range impacts on our forests.
PROJECT MILESTONES: (1) 7/77 Funding Package Submitted. (2) 8/77 Award Funds for Project. (3) 5/78 Final Report.
KEYWORDS: WOOD;COMBUSTION;AVAILABILITY;INFORMATION NEEDS;SULFUR DIOXIDE;ENVIRONMENTAL EFFECTS

<070747>
TITLE: Environmental Effect of Utilizing Solid Waste as a Supplementary Power-Plant Fuel
PROJECT NUMBER: B-624-B-392
PRINCIPAL INVESTIGATOR: Vaughan, D.A.
ADDRESS: 505 King Ave., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Grant No.-R804008-02
77 FUNDING: Environmental Protection Agency FY77:$97,500
TECHNOLOGY: FOSSIL FUEL/Coal (50%);CONSERVATION/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (40%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (30%)
POLLUTANTS: METALS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this project is to investigate the benefits to the environment resulting from the utilization of solid waste as a supplementary fuel in existing coal-fired power plants.
APPROACH: The approach is to evaluate the gaseous and particulate emission plus the corrosiveness of combustion products as a function of refuse-coal ratio and as a function of sulfur content of the coal. Experiments will be conducted in an operating power station through cooperation of the City of Columbus, Ohio, and at the Harrisburg (Pa.) Waterwall Co. Incineration Plant. Furnace and stack gas and particulate samples will be collected throughout the periods that corrosion probes are inserted at several locaticns in the heat-recovery passes. These probes will be examined for corrosion attack and deposit

composition for various gas and metal temperatures.
RESULTS: Provide guidance in future utilization of solid waste as a supplementary fuel.
PROJECT MILESTONES: (1) 8/77 Funding Supplement. (2) 10/78 Final Report.
KEYWORDS: INSTRUMENTATION;SOLID WASTES;COMBUSTION;FOSSIL-FUEL POWER PLANTS;BOILER FUEL;ENVIRONMENTAL EFFECTS;FLUE GAS;CORROSIVE EFFECTS

<070748>
TITLE: Assessment of Combustion of Refuse Derived Fuels
PROJECT NUMBER: B-624-B-542
PRINCIPAL INVESTIGATOR: Hartman, C.
ADDRESS: 485 Clyde Ave., Mountain View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Freeman, Harry M.
TYPE OF FUNDING: Contract No.-68-02-1885
77 FUNDING: Environmental Protection Agency FY77:$163,000
TECHNOLOGY: CONSERVATION/General (100%)
POLLUTANTS: NOXIOUS GAS (33%);METALS (33%);PARTICULATES (34%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to assess pollutant formation during the combustion of refuse-derived fuels (RDF) as a function of combustion parameters (such as air-to-fuel ratio, solid particle residence time, combustion temperature, etc.). Pollutant control within the combustion chamber will also be assessed.
APPROACH: The approach will be to utilize an already existing, Government-owned, small-scale (pilot) test furnace for the combustion experiments. The RDF fuel system will be capable of firing about 100 pounds of RDF per hour.
RESULTS: Data on pollution formation during combustion of refuse-derived fuels.
PROJECT MILESTONES: (1) 4/77 Funding Package Submitted. (2) 8/77 Award Funds for Project. (3) 9/78 Final Report. (4) 4/79 Final Report Received.
KEYWORDS: REFUSE DERIVED FUELS;COMBUSTION;SOLID WASTES;COMBUSTION PRODUCTS;AIR POLLUTION;POLLUTION CONTROL

<070749>
TITLE: Remote Control Hovercraft or Vehicle to Plug Hazardous Leaks
PROJECT NUMBER: B610A-212
PRINCIPAL INVESTIGATOR: Gustafson, H.A.
ADDRESS: 305 West Third St., Oxnard, CA 93030
AFFILIATION: City of Oxnard, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brugger, John E.
TYPE OF FUNDING: Grant No.-R-805365-01
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (20%);ORGANICS (40%);SPECIFIED OTHER POLLUTANTS/Oil and hazardous materials (40%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (20%);FULL SCALE DEMONSTRATION (80%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The grantee has proposed a two-phase effort to design, develop, test, and evaluate a remotely piloted, centrifugal fan thrust propelled, jet skirt nozzle forward/side motion controlled, moderate weight, hovercraft-type of vehicle for moving into a hazardous spill contaminated area over rough terrain and pipe runs (as well as over flat land) to carry an on-board TV camera and one or more remotely operated devices for plugging leaks, crimping pipes, turning valves, etc. close to the site or origin of the spill and thereby to reduce the risk to response personnel in acquiring factual data on the spill or in undertaking control measures.
APPROACH: In Phase A (Design and Pilot Model), a thorough evaluation of the propulsion options and capability trade-offs will be undertaken, followed by the fabrication and testing of either a pilot model or a stripped-down full-scale system. In Phase B (Engineering Prototype Construction and Evaluation), a full-scale system--equipped not only with a TV camera but with one or more control devices (plug, crimper)--will be constructed, evaluated, demonstrated, and delivered.
PROJECT MILESTONES: (1) 6/77 FUNDING PACKAGE SUBMITTED. (2) 7/77 AWARD FUNDS FOR PROJECT. (3) 10/77 APPLY INCREMENTAL FUNDS FOR PHASE A. (4) 5/78 COMPLETE PHASE A. (5) 5/78 INITIATE AND INCREMENTALLY FUND PHASE B. (6) 10/78 INCREMENTALLY FUND PHASE B. (7) 11/79 COMPLETE PHASE B. (8) 6/80 FINAL REPORT RECEIVED.
KEYWORDS: AIR CUSHION VEHICLES;DESIGN;PERFORMANCE TESTING;REMOTE SENSING;REMOTE CONTROL;TELEVISION;CAMERAS;PROPULSION;LEAKS;HAZARDOUS MATERIALS;OIL SPILLS

<070750>
TITLE: Protection and Restoration of Shorelines from Oil Spills
PROJECT NUMBER: B623C-287
PRINCIPAL INVESTIGATOR: Castle, R.
ADDRESS: 155 Bovet Road, San Mateo, CA 94402
AFFILIATION: URS Research Co., San Mateo, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McCarthy, L.
TYPE OF FUNDING: Contract No.-68-03-2160
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: TRANSPORTATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oil and hazardous materials (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this project are to provide from efficient action to minimize damage o shorelines from oil and hazardous substance discharges including containment, dispersal and removal. PA headquarters has specifically expressed the need for, and given the highest priority to, Manuals of Practice (MOP) to meet the operational needs of field personnel during spill response actions to protect and restore threatened and contaminated shore areas. The projects associated with the milestone will satisfy the need by supplying Manuals of Practice which will be utilized by on-the-scene field personnel.
APPROACH: For the accomplishment of this milestone, the approach or methodology is to evaluate and select from the currently practiced state-of-the-art those field relevant methods and techniques for reduction to concise descriptive handbook format on-the-scene use by field personnel. The manuals will emphasize the decision process through which the field personnel must progress in order to arrive at the proper recommendation. For example, in protecting a marsh area, some questions that should be answered may include the type of marsh grasses, the inhabitants of the marsh, the time of year, expected weather conditions and the ecological, recreational, commercial and aesthetic value of the marsh.
RESULTS: Field procedures will be appended for utilizing products, equipment and supplies. These procedures will outline in concise descriptive format the step-by-step approach for implementation by the on-the-scene field personnel.
PROJECT MILESTONES: (1) 11/74 FUNDING PACKAGE SUBMITTED. (2) 12/74 AWARD FUNDS FOR PROJECT. (3) 3/74 FINAL REPORT RECEIVED.
KEYWORDS: COASTAL REGIONS;OIL SPILLS;LAND POLLUTION ABATEMENT;LAND RECLAMATION;BASELINE ECOLOGY;WATER POLLUTION CONTROL;DIFFUSION;REMOVAL;CLEANING;MARSHES;WATER POLLUTION ABATEMENT;PLANNING;MANUALS;DECISION MAKING;GRASS;HAZARDOUS MATERIALS;PETROLEUM INDUSTRY;ENVIRONMENTAL IMPACTS;PETROLEUM INDUSTRY;SHORES

<070751>
TITLE: Environmental Guidelines for Onshore Impact of Offshore Petroleum Development
PROJECT NUMBER: B-623C-300
PRINCIPAL INVESTIGATOR: Doyel, W.W. (Marcus)
ADDRESS: U.S. Geological Survey (MS 750), Reston, VA 22092
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Farlow, John S.
TYPE OF FUNDING: Interagency agreement-EPA-IAG-D6-0008
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (33%);TRANSPORTATION (34%);PROCESSING, CONVERSION (33%)
POLLUTANTS: METALS (20%);PARTICULATES (20%);ORGANICS (20%);VISUAL AESTHETICS (20%);SPECIFIED OTHER POLLUTANTS/Oil (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To carry out a series of workshops for State and local planning officials to provide them with methodologies and information pertaining to the identification of the onshore impact of outer continental shelf petroleum development and the siting of facilities associated with that development.
APPROACH: Retain the American Society of Planning Officials (ASPO) to set up the meetings, arrange for curricula and facility, prepare preprints and proceedings, and present a final report both on the content and on the success of this means of rapid dissemination of information. Use the results of USGC-funded ($450K) New England River Basins Commission (NERBC) methodology and development for the New England OCS frontier as a basis for the first series of workshops (held in 5 locations around the coastal U.S.). Involve State and local planners from the region where each workshop is held to the maximum extent possible in preparation and in execution to enrich the total content, to ensure useful feedback to NERBC, and to guarantee a nationally useful body of information and methods.
RESULTS: IAG with USGS signed; ASPO contract signed; Federal and regional advisory committees being formed; first workshops tentatively scheduled for January 1977.
PROJECT MILESTONES: (1) 2/76 FUNDING PACKAGE SUBMITTED. (2) 3/76 AWARD FUNDS FOR PROJECT. (3) 7/76 FUNDING INCREMENT. (4) 3/77 FUNDING INCREMENT. (5) 3/79 FINAL REPORT RECEIVED.
KEYWORDS: PETROLEUM INDUSTRY;ENVIRONMENTAL IMPACTS;OFFSHORE SITES;WATER POLLUTION;PETROLEUM;NATURAL GAS;TERRESTRIAL ECOSYSTEMS;PLANNING;EDUCATION;INFORMATION NEEDS;ENVIRONMENT;REGULATIONS;MEETINGS;STATE GOVERNMENT;OIL SPILLS;COASTAL REGIONS;DECISION MAKING

<070752>
TITLE: Evaluation/Development of Foams for Mitigating Air Pollution from Hazardous Spills
PROJECT NUMBER: B-L04A-234
PRINCIPAL INVESTIGATOR: Hiltz, R.H.
ADDRESS: Division of Mine Safety Appliances Co., Evans City, PA 16033
AFFILIATION: MSA Research Corp., Evans City, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brugger, John E.
TYPE OF FUNDING: Contract No.-68-03-2478
77 FUNDING: Environmental Protection Agency FY77:$130,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: TRANSPORTATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
JECT DESCRIPTION: The objectives of this project are (1) to undertake a state-of-the-art survey of the use of foams on hazardous spills and to present the results in the form of a preliminary matrix of spilled material vs suitable foam; (2) through laboratory and field testing to fully define the capability of the foam systems commercially available in mitigating the hazards from spilled chemicals, revising the first-cut matrix to make it more complete and of wider use to spill response teams; and (3) develop advanced foam technology directed to more effective and versatile foam systems specifically suited to the mitigation of the hazard from spilled volatile chemicals that are not readily controlled with existing foams and equipment.

PROJECT MILESTONES: (1) 10/76 FUNDING PACKAGE SUBMITTED. (2) 11/76 AWARD FUNDS FOR PROJECT. (3) 10/78 FINAL REPORT RECEIVED.
KEYWORDS: HAZARDOUS MATERIALS;ACCIDENTS;SULFUR;NITROGEN;CHLORINE;AIR POLLUTION CONTROL;FOAMS;REMOVAL;CLEANING;EVALUATION;SORPTIVE PROPERTIES;VOLATILITY;FEASIBILITY STUDIES;TECHNOLOGY ASSESSMENT

<070753>
TITLE: Technical Awareness in the Nonferrous Metals Industry--Pilot Study (TANMIPS)
PROJECT NUMBER: B604C-560
PRINCIPAL INVESTIGATOR: Bartlett, E.S.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Craig, A.B. Jr.
TYPE OF FUNDING: Grant No.-R805095-01
77 FUNDING: Environmental Protection Agency FY77:$42,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective is to pilot a simple, inexpensive system to provide, maintain, and communicate to IERL/Cincinnati an up-to-date awareness and assessment of technological developments in the nonferrous metals industries that are believed to have significant environmental impact.
APPROACH: Information will be gathered by review of the periodical literature, special reports, and limited travel visits, and interviews.
RESULTS: The product of this proposed program will be six bimonthly Awareness Bulletins which will be given limited distribution within IERL-Cincinnati. The output will be arranged in a physical manner and format so as to permit rapid methodical storage and retrieval of the information.
PROJECT MILESTONES: (1) 2/77 FUNDING PACKAGE SUBMITTED. (2) 3/77 AWARD FUNDS FOR PROJECT. (3) 11/77 FINAL REPORT RECEIVED.
KEYWORDS: NON-FERROUS METALS;TECHNOLOGY ASSESSMENT;METAL INDUSTRY;ENVIRONMENTAL IMPACTS;REVIEWS;AIR POLLUTION CONTROL;WATER POLLUTION CONTROL;LAND POLLUTION CONTROL;DATA COMPILATION;INFORMATION SYSTEMS

<070754>
TITLE: Hazardous Material Spill Ultimate Disposal: Assessing of Material/Methods Matrix
PROJECT NUMBER: B-610A-581
PRINCIPAL INVESTIGATOR: Mercer, B.W.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brugger, John E.
TYPE OF FUNDING: Contract No.-68-03-2494
77 FUNDING: Environmental Protection Agency FY77:$16,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: TRANSPORTATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (50%);ORGANICS/Pesticides (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: The primary objectives of this program are to evaluate existing technology for the treatment and disposal of wastes generated from hazardous material spill cleanup and to identify novel treatment and disposal techniques that show the greatest potential for substantial improvement over present technology.
APPROACH: Spill incidences occurring in recent years will be investigated to gain better knowledge of waste disposal needs and a literature search will be conducted to review present practices for the disposal of these wastes and to identify novel techniques. In addition, responsible parties within Federal and State agencies and industrial organizations will be contacted to supplement the information obtained from the open literature.
RESULTS: Hazardous materials identified in the proposed hazardous material designation regulations (Federal Register, Volume 40, No. 250, December 20, 1975), the materials cited in the U.S. Coast Guard's ''CHRIS'' list (CG-446-2), pesticides produced in large quantities, and various other materials (paint, ink, processing sludges, off-spec products) will be grouped according to their physical-chemical properties to facilitate evaluation of treatment and disposal options. An annotated matrix will be prepared, which will include a brief description of the preferred disposal options in priority order for each material or class of materials. The annotation will characterize the options according to strengths and limitations, as well as to applicability to types of spill situations. Special consideration will be given to spills of small quantities of highly toxic and hazardous materials. An amended matrix of hazardous materials and disposal options will also be prepared by taking into consideration the potential use of novel processes that are being developed under other current projects. Wherever possible, additional novel techniques will be identified.
PROJECT MILESTONES: (1) 2/76 FUNDING PACKAGE SUBMITTED. (2) 11/76 AWARD FUNDS FOR PROJECT. (3) 2/77 FUNDING INCREMENT AWARDED. (4) 11/77 FINAL REPORT RECEIVED.
KEYWORDS: HAZARDOUS MATERIALS;WASTE PROCESSING;WASTE DISPOSAL;ACCIDENTS;CARCINOGENS;PESTICIDES;MUTAGENS;ENVIRONMENTAL TRANSPORT;HEALTH HAZARDS

<070755>
TITLE: HM Spill Ultimate Disposal: Lab/Pilot Demo Sodium Fluxing and Classification
PROJECT NUMBER: B-610A-579
PRINCIPAL INVESTIGATOR: Hiltz, R.H.
ADDRESS: Division of Mine Safety Appliances Co., Evans City, PA 16033
AFFILIATION: MSA Research Corp., Evans City, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brugger, John
TYPE OF FUNDING: Contract No.-68-03-2492
77 FUNDING: Environmental Protection Agency FY77:$34,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (50%);ORGANICS/Pesticides (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The disposal of collected spilled hazardous materials can pose significant difficulty in assuring that such disposal is complete and that the material cannot enter the ecosystem in its hazardous form. This program will assess two techniques to provide ultimate disposal of those chemicals that are not generally amenable to existing disposal techniques such as incineration, landfill, etc.
APPROACH: The first task will evaluate the ability of a liquid alkali metal to degrade organic compounds to elements or simple innocuous compounds (hydrogen, nitrogen, carbon, NaCI) or to compounds which can be treated by conventional techniques (Na2, Na2S, C2H2). The liquid metal system will be designed along lines of current heat transfer equipment and will use technology derived from inert gas cleaning units. The second task will evaluate glass encapsulation of essentially nonvolatile materials. In this technique, the material to be disposed of will be blended with glass-forming materials. In-situ glass formation will be effected using either external heating or pyrochemical reaction within the mass. Accelerated leaching tests will be run to determine the stability of the resulting glasses. Careful attention will be paid to the control of reaction-generated vapors.
RESULTS: Rather than restricting the project to work on only pure chemicals, both techniques will be developed for processing spilled hazardous materials contaminated with typical spilled debris (earth, sand, flora, water, etc.). A full analysis will be made of the fate of the reacted materials after disposal to the environment. Pilot scale units will be built and operated for those processes that are successful on a laboratory scale.
PROJECT MILESTONES: (1) 2/76 FUNDING PACKAGE SUBMITTED. (2) 11/76 AWARD FUNDS FOR PROJECT. (3) 2/77 FUNDING INCREMENT. (4) 6/79 FINAL REPORT RECEIVED.
KEYWORDS: HAZARDOUS MATERIALS;ENVIRONMENTAL TRANSPORT;WASTE DISPOSAL;LIQUID METALS;WASTE PROCESSING;VITRIFICATION;PESTICIDES;CARCINOGENS;CHEMICAL REACTIONS;HYDROCARBONS

<070756>
TITLE: Demonstration of Connector Wells
PROJECT NUMBER: B-623-B-342
PRINCIPAL INVESTIGATOR: Demchalk, J.
ADDRESS: P.O. Box 1467, Dept. of Environmental Resources, Harrisburg, PA 17120
AFFILIATION: Pennsylvania Dept. of Environmental Resources, Harrisburg (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hubbard, S.J.
TYPE OF FUNDING: Grant No.-S803191-01
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To study the feasibility and effectiveness of using gravity connector wells to improve stream quality by reducing drainage from abandoned deep coal mines.
APPROACH: Select the best site for demonstrating the effectiveness of gravity connector wells for reducing drainage from abandoned deep coal mines. Determine optimum number and location of gravity drainage wells and estimate the quantity of drainage that will be abated.
RESULTS: Current plans are for conducting Feasibility Study of an optimum demonstration site and develop plans and specifications for a full scale field demonstration of the technique. The site will be studied to determine its hydrogeologic and mining conditions affecting gravity drainage of related aquifers that will significantly reduce deep mine drainage. The study will capitalize on available data, but also include limited drilling and testing to determine aquifer flow characteristics. Following evaluation of the demonstration site, continuous monitoring of quantity and quality of deep mine discharges will commence. Detailed design plans for the gravity drainage wells will be determined based on the hydrogeology and aquifer flow characteristics of the site. The optimum location of the wells will be determined by studying fracture trace patterns as related to aquifer flow characteristics and hydrogeology. Based on the above, a determination will be made of the number and locations for constructing the required gravity drainage wells. As many as four connector wells will be constructed to study the mine drainage reduction possible from this technique.
PROJECT MILESTONES: (1) 5/74 Funding package submitted. (2) 6/74 Award funds for Project. (3) 5/77 Amendment to grant. (4) 11/79 Final report received.
KEYWORDS: COAL MINES;ACID MINE DRAINAGE;INHIBITION;BOREHOLE LINKING;WATER POLLUTION CONTROL;FEASIBILITY STUDIES;SULFUR COMPOUNDS

<070757>
TITLE: Potential Impacts to Ground-Water and Surface Water Quality and Quantity from Proposed Energy Development on the Northern Cheyenne Reservation--Montana
PROJECT NUMBER: B-623B-356
PRINCIPAL INVESTIGATOR: Monteau, R.
ADDRESS: Northern Cheyenne Tribe, Lame Deer, MT 59043
AFFILIATION: Northern Cheyenne Research Project, Lame Deer, Mont. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, John F.
TYPE OF FUNDING: Grant No.-R803566-03
77 FUNDING: Environmental Protection Agency FY77:$192,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The Northern Cheyenne Tribe, via the Northern Cheyenne Research Project, desires to develop an in-depth knowledge of the chemical and physical character of the reservation water resources, and the interrelation of water to other resources, so that the tribe can make formal choices in planning coal development. A three-year study plan has begun to: (1) gather and interpret baseline data concerning the water resources and the interrelationships of these data to land, biocommunity, supply needs, and energy resources of the reservation; (2) ascertain potential adverse chemical, physical, and economic impacts to reservation water resources from coal development; and (3) develop a comprehensive water resources management plan that will aid present and future planning for resources exploitation.
APPROACH: Standard field and laboratory methodology are being employed in assessing the geology, surface water, and ground water of reservation lands. Baseline discharge and water quality data collection has begun for six reservation streams. Well inventories, a basic ground water monitoring program, and collection of ground water quality data has begun.
RESULTS: Stratigraphic correlation of the regional and local geology is completed and potential development priority areas have been selected. During the third budget period a description of potential impacts to the surface and ground water resources from mining and a reservation water resource management plan will be prepared.
PROJECT MILESTONES: (1) 5/75 FUNDING PACKAGE SUBMITTED. (2) 6/75 AWARD FUNDS FOR PROJECT. (3) 4/76 FUNDING INCREMENT. (4) 3/77 FUNDING INCREMENT. (5) 9/78 FINAL REPORT RECEIVED.
KEYWORDS: GROUND WATER;SURFACE WATERS;WATER QUALITY;ABUNDANCE;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL IMPACTS;MONTANA;WATER RESOURCES;COAL INDUSTRY;LAND USE;COAL MINING

<070758>
TITLE: Preparation of Plans and Specifications for MERL/IERL T and E Facility
PROJECT NUMBER: B-623-A-577
ADDRESS: 6161 Buch Blvd., Columbus, OH 43229
AFFILIATION: Pirmie (Malcom), Inc., Columbus, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Jelen, V.F.
TYPE OF FUNDING: Contract No.-68-03-1241
77 FUNDING: Environmental Protection Agency FY77:$58,000
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: Develop plans and specifications for a municipal and industrial test and evaluation facility.
PROJECT MILESTONES: (1) 3/77 Award Contract. (2) 8/77 Complete Plans and Specs Provided.
KEYWORDS: AIR POLLUTION;TEST FACILITIES;INDUSTRY;RESIDENTIAL SECTOR;PLANNING;SPECIFICATIONS;EARTH ATMOSPHERE

<070759>
TITLE: New Amine Carbamate Gelation Techniques for Use in Oil Spill Recovery Operations
PROJECT NUMBER: B-623-C-602
PRINCIPAL INVESTIGATOR: Bannister, W.W.
ADDRESS: Lowell, MA 01854
AFFILIATION: Lowell Univ., Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Frank, U.W.E.
TYPE OF FUNDING: Grant No.-R-804628-01
77 FUNDING: Environmental Protection Agency FY77:$29,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The main objective of this research is to develop for ''real World'' situations an amine carbamate gelation technique to facilitate the removal of petroleum derived oil spilled on ocean or inland waters. The specific objectives are: (a) determination of physical properties of a selected gelling agent (dehydroabietyl amine), including solubility and detergency determinations of the agent in water/oil matrices; (b) development of carbamating agents other than carbon dioxide; (3) determine the feasibility of oil and agent recovery by centrifugation; (d) pilot studies of gelation technique in large laboratory wave tanks; (e) field tests of gelation techniques at EPA test facilities; (f) preliminary evaluation of agent for gelling non-petroleum hazardous materials; (g) preliminary evaluation of the gelation

technique's utility in the prophylactic treatment of beach fronts.
PROJECT MILESTONES: (1) 3/77 Funding package submitted. (2) 5/77 Award funds for project. (3) 3/78 Draft Final Report. (4) 5/78 Final Report received.
KEYWORDS: EFFLUENTS;OIL SPILLS;REMOVAL;CARBAMATES;AMINES;PERFORMANCE TESTING;CHEMICAL PREPARATION;GELS;WATER POLLUTION;ECOSYSTEMS

<070760>
TITLE: Full-Scale Demonstration of Hyperfiltration for Closed-Cycle Operation in Textile Dying and Finishing Plant
PROJECT NUMBER: B-624-B-374
PRINCIPAL INVESTIGATOR: Brandon, C.A.
ADDRESS: La France Division, La France, SC 29656
AFFILIATION: Riegel Textile Corp., La France, S.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Mournighan, R.
TELEPHONE: C(513)684-4318
TYPE OF FUNDING: Grant No.-S805182-01
77 FUNDING: Environmental Protection Agency FY77:$190,000
TECHNOLOGY: CONSERVATION/End use (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this project are to demonstrate the economic and technical advantages to a full scale reverse osmosis (hyperfiltration) system for closed cycle operation of a textile dying and finishing plant.
APPROACH: Involved is the design, installation, and twelve-month operation of a reverse osmosis treatment system for the hot wastewater from either a continuous dye range or a group of ten atmospheric dye becks. The two types of equipment are typical of the two broad categories of textile processing: continuous and batch. A conceptual design will be developed for each process and the one appearing to he the most economically viable will be demonstrated.
RESULTS: Outputs from this program consist of: a detailed design for textile wastewater treatment by reverse osmosis, detailed operations and capital costs, documentation of energy savings of the reverse osmosis system compared to conventional waste treatment methods and evaluation of chemical (dyes, salt) recycle in the dying process.
PROJECT MILESTONES: (1) 5/77 Funding Package Submitted. (2) 9/77 Award Funds for Project. (3) 9/79 Complete Construction and Begin Operation. (4) 9/80 Operation Complete. (5) 12/80 Draft Report. (6) 4/81 Final Report Received.
KEYWORDS: TEXTILE INDUSTRY;WATER POLLUTION CONTROL;ENERGY CONSERVATION;WASTE WATER;WASTE PROCESSING;ECONOMICS;DEMONSTRATION PROGRAMS;FILTRATION;OSMOSIS;DYES;SALTS;MATERIALS RECOVERY;RECYCLING;CAPITAL;COST

<070761>
TITLE: Survey of Geothermal Environmental Regulations and Control Technology
PROJECT NUMBER: B-624-B-380
PRINCIPAL INVESTIGATOR: Boles, D.
ADDRESS: 6300 Wisconsin Avenue, Washington, DC 20015
AFFILIATION: Wapora, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hartley, Robert
TELEPHONE: C(513)684-4334
TYPE OF FUNDING: Contract No.-68-03-2371
77 FUNDING: Environmental Protection Agency FY77:$14,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple pollutants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: One of the project objectives (Phase I) is to summarize and analyze the adequacy of federal, state and local environmental laws applicable to geothermal energy development. Another objective (Phase II) is to examine the characteristics and potential uses of the known Geothermal Resource Areas, potential pollution problems, control technologies, and pollution control research needs.
APPROACH: The approach has been to examine and analyze existing information from many sources.
RESULTS: The output is two reports, Phase I (regulations) and Phase II (geothermal resource area characteristics and potential problems). These two documents should be useful to those engaged in preparing impact statements, to regulators, to legislative bodies, and to geothermal area decision-makers.
PROJECT MILESTONES: (1) 11/75 FUNDING PACKAGE SUBMITTED. (2) 11/75 AWARD FUNDS FOR PROJECT. (3) 4/76 INTERIM DRAFT REPORT ON REGULATIONS. (4) 3/77 DRAFT FINAL REPORT. (5) 6/77 FINAL REPORT RECEIVED.
KEYWORDS: GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS;REGULATIONS;LOCAL GOVERNMENT;STATE GOVERNMENT;LAWS;ENERGY SOURCE DEVELOPMENT;KGRA;GEOTHERMAL SYSTEMS;POLLUTION REGULATIONS;POLLUTION LAWS;POLLUTION CONTROL

<070762>
TITLE: Preliminary Environmental Assessment of Solar Energy Systems
PROJECT NUMBER: B-624B-383
PRINCIPAL INVESTIGATOR: Sears, D.R.
ADDRESS: P.O. Box 1103, Huntsville, AL 35807
AFFILIATION: Lockheed Missiles and Space Co., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hartley, Robert
TELEPHONE: C(513)684-4334

TYPE OF FUNDING: Contract No.-68-02-1331
77 FUNDING: Environmental Protection Agency FY77:$3,000
TECHNOLOGY: SOLAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple pollutants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective was to provide a preliminary environmental assessment of solar energy power generation systems and flat plate collectors for heating, and define areas requiring pollution control research.
APPROACH: The approach was to evaluate existing information and solar development programs.
RESULTS: The output is a report in line with the objectives. Solar systems are environmentally superior to their conventional alternatives. Land area requirements for central station power plants will be large but not so destructive as coal stripping. Visual effects can be extensive. Indirect effects of producing large quantities of solar cell materials could be environmentally harmful. EPA should encourage solar technologies as environmentally preferable to conventional technologies.
PROJECT MILESTONES: (1) 12/75 FUNDING PACKAGE SUBMITTED. (2) 1/76 AWARD FUNDS FOR PROJECT. (3) 4/76 DRAFT FINAL REPORT. (4) 1/77 FUNDING INCREMENT FOR FINAL REPORT. (5) 2/77 FINAL REPORT RECEIVED.
KEYWORDS: FLAT PLATE COLLECTORS;SOLAR POWER PLANTS;ENVIRONMENTAL IMPACTS;EVALUATION;POLLUTION CONTROL

<070763>
TITLE: Environmental Impact Statement for a Solar Power Station
PROJECT NUMBER: B-624B-384
PRINCIPAL INVESTIGATOR: Sears, D.R.
ADDRESS: P.O. Box 1103, Huntsville, AL 35807
AFFILIATION: Lockheed Missiles and Space Co., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hartley, Robert
TYPE OF FUNDING: Contract No.-68-02-1331
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: SOLAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple pollutants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project was to produce an example environmental impact statement for a hypothetical solar electric power generating plant.
APPROACH: The approach was to select a site where appropriate data were available and to impose the hypothetical situation upon it.
RESULTS: The output is a report simulating the environmental impact of a hypothetical 1000 MWe solar-electric plant in the desert of southeastern Nevada. Results indicate the principal impacts would be the destruction of soil and vegetation on 52 square km of desert terrain and the displacement of the animal population. There would be no effects on ground water, no thermal pollution, no surface water pollution, and nc noise pollution. The visual impact would be extensive.
PROJECT MILESTONES: (1) 3/76 FUNDING PACKAGE SUBMITTED. (2) 4/76 AWARD FUNDS FOR PROJECT. (3) 8/76 DRAFT FINAL REPORT. (4) 1/77 FUNDING INCREMENT FOR FINAL REPORT. (5) 2/77 FINAL REPORT RECEIVED.
KEYWORDS: SOLAR POWER PLANTS;ENVIRONMENTAL IMPACT STATEMENTS;SITE SELECTION;NEVADA;LAND POLLUTION;SOILS;PLANTS;ECOSYSTEMS;GROUND SUBSIDENCE;EROSION;WILD ANIMALS;METEOROLOGY

<070764>
TITLE: Environmental Assessment of Waste-to-Energy
PROJECT NUMBER: B-624-B-388
PRINCIPAL INVESTIGATOR: Schrag, M.P.
ADDRESS: 425 Volker Boulevard, Kansas City, MO
AFFILIATION: Midwest Research Inst., Kansas City, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Freeman, H.M.
TYPE OF FUNDING: Contract No.-68-02-2166
77 FUNDING: Environmental Protection Agency FY77:$330,000
TECHNOLOGY: FOSSIL FUEL/General (30%);FOSSIL FUEL/Biomass - pyrolysis (20%);CONSERVATION/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is to characterize the liquid, gaseous, and solid emission from various waste to energy systems.
APPROACH: The characterization will be based on actual data obtained from on-site sampling operations. The first report from this project was distributed in July '77; it represented a collection of previously obtained data and was called a "Source Assessment Document for Waste-As-Fuel Processes."
RESULTS: A co-firing of wood waste with coal process has been characterized for environmental emissions, as has a waste pre-processing (shredder/air classification) plant in Houston, Texas. Characterization of several waste pyrolysis plants is envisioned, in addition to that of waterwall incineration plants.
PROJECT MILESTONES: (1) 7/77 Funding Package Submitted. (2) 8/77 Award Funds for Project. (3) 1/77 Define Gaps in Literature. (4) 2/77 Recommend Preliminary Std. S and A Techs. (5) 3/77 Environmental Characterization of One Major Process. (6) 3/77 Final Report Received.
KEYWORDS: SOLID WASTES;COMBUSTION;PYROLYSIS;ENVIRONMENTAL EFFECTS;WOOD WASTES;MUNICIPAL WASTES;WASTE PROCESSING PLANTS;AIR POLLUTION

<070765>
TITLE: Conversion of Solid Waste to Polymer Gasoline
PROJECT NUMBER: B-624-B-402
NCIPAL INVESTIGATOR: Benhem, C.B.
ADDRESS: Naval Weapons Center, China Lake, CA 93555
AFFILIATION: Naval Weapons Center, China Lake, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Liberick, Walter
TYPE OF FUNDING: Interagency agreement-EPA-IAG-D5-0781
77 FUNDING: Environmental Protection Agency FY77:$171,000
TECHNOLOGY: FOSSIL FUEL/General (30%);FOSSIL FUEL/Biomass - pyrolysis (20%);CONSERVATION/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To determine the feasibility, both technical and economic, of pyrolyzing the organic fraction of municipal solid waste to sufficient quantity of hydrocarbon gases (ethylene, ethane, etc.) to produce chemical intermediates. Phase I of subsequent studies are directed towards the polymerization of hydrocarbon fraction to liquid fuel (polymer gasoline) suitable for internal combustion engine operation.
APPROACH: (1) An existing pyrolysis unit will be operated under various conditions to maximize the production of unsaturated hydrocarbons. (2) A polymerization unit will be designed, fabricated and added to the pyrolysis unit. (3) Data will be obtained over a wide variety of conditions using the combined pyrolysis and polymerization units. Compositional analysis of pyrolysis and polymerization products will be performed for each test condition. (4) Preliminary design of a scaled-up pilot plant will be developed.
RESULTS: Studies have been conducted with the pyrolyis unit to optimize the unsaturated hydrocarbons in the off-gases. Separate studies have been made on a gas cleaning system and a thermal polymerization unit. Polymer gasoline has been produced from the polymerization unit using a combination of bottle gases simulating the gas mixture from the pyrolysis unit. Future tests involve using gases from the pyrolysis unit in the gas cleaning system and the polymerization unit and again optimize operating parameters.
PROJECT MILESTONES: (1) 4/75 Funding Package Submitted. (2) 6/75 Award Funds for Project. (3) 12/77 Project Testing Completed. (4) 12/77 Final Report Received.
KEYWORDS: SOLID WASTES;PYROLYSIS;GASOLINE;SYNTHESIS;FEASIBILITY STUDIES;ECONOMICS;MUNICIPAL WASTES

<070766>
TITLE: Waste Heat Recovery Potential for Environmental Benefits in Selected Industries
PROJECT NUMBER: B-624-B-530
PRINCIPAL INVESTIGATOR: Latour, S.R.
ADDRESS: 7483 N.W. 4th St., Ft. Lauderdale, FL 33317
AFFILIATION: DSS Engineers, Inc., Fort Lauderdale, Fla. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lee, C.C.
TELEPHONE: C(513)684-4334
TYPE OF FUNDING: Contract No.-68-01-4454
77 FUNDING: Environmental Protection Agency FY77:$6,500
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this task is to identify the points, quantity, and quality of heat discharged from: (1) established industrial technologies now discharging substantial amounts of waste heat to the environment and (2) emerging technologies for energy development, conversion and utilization.
APPROACH: In order to accomplish this objective the following sub-task will be performed: (1) identification of waste heat discharging industries and technologies; (2) determination of the main processes in use; (3) establishment of industrial or technological sub-categories; (4) preparation of heat flow charts and diagrams; (5) determination of annual waste heat discharge of each sub-category; (6) categorize types of waste heat discharged according to quality, quantity, and potential of utilization; (7) present total waste heat discharged of each waste heat category; (a) as a percentage of the total industrial consumption of energy, (b) as a percentage of each SIC group, (c) according to geographical distribution; (8) identify further R and D needs.
RESULTS: The purpose of this study is to present detailed data on heat and water discharged from industries and emerging technologies for energy development, which are discharging substantial quantities of waste heat to the environment, in such a manner that it may be effectively used to: (1) assess the relative economic and environmental effects of utilizing waste heat and (2) assure the development of environmentally compatible control technology necessary for efficient waste heat utilization.
PROJECT MILESTONES: (1) 7/75 Funding Package Submitted. (2) 3/77 Award Funds for Project. (3) 1/78 Interim Report Received. (4) 8/79 Final Report.
KEYWORDS: INDUSTRY;WASTE HEAT;RECOVERY;TECHNOLOGY ASSESSMENT;WASTE HEAT UTILIZATION;ENERGY EFFICIENCY;ECONOMICS;ENVIRONMENTAL EFFECTS

<070767>
TITLE: Technology Assessment of Energy Development in Appalachia
PROJECT NUMBER: B-624-C-594
PRINCIPAL INVESTIGATOR: Cobb, R.W.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
ITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Jelen, Victor F.
TYPE OF FUNDING: Contract No.-68-63-2531
77 FUNDING: Environmental Protection Agency FY77:$400,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)

POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple pollutants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The purpose of this program is to provide EPA and other decision makers with information necessary (1) to foresee the effects of regulatory policies upon future energy development in Appalachia and (2) to determine areas requiring research emphasis in preparation for monitoring and controlling the impacts of new or expanded energy technologies. This regional study of energy development in Appalachia will focus on environmental, social, and economic impacts, both beneficial and adverse, associated with alternative energy policies and practices. Although the emphasis will be on the development of Appalachian coal resources, other energy resources will also be examined.
APPROACH: The first year technology assessment will begin by reviewing existing literature on Appalachian energy development. Energy development scenarios will be formulated based on (1) national energy policy as it relates to Appalachia and (2) existing energy production technology that is expected to be used to 1985 (near-term development) as well as existing and new technology which can be expected to be available for use between 1985 and 2000 (mid-term development). Next the direct and higher order impacts from the implementation of this technology will be examined. Concurrently, policy options available for controlling the impacts will be investigated along with issues that impacts raise. Emphasis will be placed on investigating the impacts from current plans for energy development under existing or proposed environmental protection policies. The second phase will expand upon and refine the work of the first year technology assessment. Emphasis will be placed upon identifying and analyzing alternative strategies for managing the rate and pattern of energy development in Appalachia.
PROJECT MILESTONES: (1) 3/77 Funding Package Submitted. (2) 6/77 Contract Awarded. (3) 8/78 Report of First Phase I. (4) 11/78 Work Plan for Phase II. (5) 7/80 Final Report Received.
KEYWORDS: EFFLUENTS;EMISSIONS;MULTIPLE POLLUTANTS;ENVIRONMENTAL IMPACT ASSESSMENTS;ENERGY SOURCE DEVELOPMENT;TECHNOLOGY ASSESSMENT;APPALACHIA;COAL;ENVIRONMENTAL IMPACTS;AIR;ECONOMICS;ECOSYSTEMS;MINING;SOILS;WASTES;WATER

<070768>
TITLE: Evaluation of Toxic Components and Their Concentrations in Kraft and Sulfite Mill Effluents
PROJECT NUMBER: B-610B-411
PRINCIPAL INVESTIGATOR: Leach, J.M.
ADDRESS: 3650 Westbrook Crescent, Vancouver, British Columbia, Canada, XX
AFFILIATION: British Columbia Research Council, Vancouver (Canada)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Dallons, Victor
TELEPHONE: F420-4701
TYPE OF FUNDING: Grant No.-R-804977-01
77 FUNDING: Environmental Protection Agency FY77:$61,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Toxics (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop a chemical analysis procedure for rapid measurement of toxic materials concentration in bleached and unbleached kraft whole mill effluents, groundwood effluents and sulfite mill effluents; and relate the chemical assay results to effluent toxicity measured in bioassays using rainbow trout.
APPROACH: The experimental work will be carried out in two phases: development of the analytical procedure and demonstration of a relationship between analytical results and effluent toxicity. Also, toxic loadings in effluents from various types of pulp mills.
RESULTS: A final report will be issued detailing findings obtained from this effort.
PROJECT MILESTONES: (1) 7/76 Funding package submitted. (2) 8/76 Award funds for project. (3) 10/76 Funding increment. (4) 10/78 Final report received.
KEYWORDS: HAZARDOUS MATERIALS;PAPER INDUSTRY;FISHES;BIOASSAY;TOXICITY;ENVIRONMENTAL IMPACTS;CHEMICAL EFFLUENTS;METABOLISM;MONITORING;POLLUTION CONTROL EQUIPMENT;HEALTH HAZARDS;WATER QUALITY

<070769>
TITLE: Neutralization/Precipitation Manual of Practice
PROJECT NUMBER: B610C-628
PRINCIPAL INVESTIGATOR: Ellerbusch, F.
AFFILIATION: Mitre Corp., McLean, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Weesner, G.F.
77 FUNDING: Environmental Protection Agency FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The primary emphasis of this manual will be one of removal of heavy metals from wastewater commonly associated with electroplating/metal finishing industries. Since data will be collected from all corners of the inorganic and metals industry, it is felt that the MOP will be widely applicable to these areas as well.
RESULTS: MITRE's approach will be one of unit operation/unit process optimization of design criteria, selection, and operations-maintenance for use under real world conditions. General areas to be covered include: theory, design and upgrading, operation and equipment, costing and economics, case histories and applications, and bibliography.
PROJECT MILESTONES: 08/77 Funding package submitted. 09/77 Award funds for project. 09/79 Final report received.
KEYWORDS: METAL INDUSTRY;CHEMICAL EFFLUENTS;LIQUID WASTES;WATERSHEDS;WATER POLLUTION CONTROL;METALS;WATER POLLUTION

<070770>
TITLE: Activities Associated with Energy Resource Extraction
PROJECT NUMBER: B623-622
CIPAL INVESTIGATOR: Braun, H.
FFILIATION: Department of Agriculture, Washington, D.C. (USA)
TORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hill, R.D.
77 FUNDING: Environmental Protection Agency FY77:$973,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: This program is to develop assessment and guideline reports for coal mining in both the humid eastern states and the arid and semi-arid western states.
APPROACH: The work is divided into four tasks undertaken by Forest Service personnel in Kentucky, Logan, Utah, and Albuquerque, N.M. The tasks are as follows: (1) develop guidelines and criteria for overburden drilling, analysis, and placement as related to growth supporting media; (2) prepare technical handbook on revegetation methods for mined lands in eastern U.S., including recommendations for new research; (3) develop guidelines and criteria for the use of non-mine wastes as soil amendments on coal and oil shale spoils; (4) develop recommendations, guidelines, and criteria, based on new research, for revegetation following coal and oil shale mining.
PROJECT MILESTONES: 01/75 Funding package submitted and funds awarded. 12/77 Technical handbook on eastern U.S. revegetation. 06/78 Guidelines on overburden drilling. 06/80 Final report on revegetation guidelines--semi-arid. 06/80 Final report on revegetation guidelines--arid. 06/80 Report: effects transportation systems. 06/79 Report: effects quality water in strip mines. 06/79 Report: assess technologies for redepositing and stabilizing. 06/80 Report: criteria use nonmine waste.
KEYWORDS: COAL MINES;KENTUCKY;UTAH;NEW MEXICO;SURFACE MINING;REVEGETATION;OIL SHALE MINING;SPOIL BANKS;LAND RECLAMATION;BACKFILLING

<070771>
TITLE: Removal of Toxic Material From Mine Drainage
PROJECT NUMBER: B623B-T71
PRINCIPAL INVESTIGATOR: Zeitoun, M.A.
AFFILIATION: Dow Chemical Co., Midland, Mich. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wilmoth, R.C.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of the project is to study removal of toxic materials from acid mine drainage by three processes: reverse osmosis, ion exchange, and lime neutralization.
APPROACH: The anticipated approach is to inject specified toxic materials from a bulk solution into an AMD process stream at the EPA Crown Field Site near Morgantown, West Virginia. The toxic materials to be used for the study are arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, phosphorus, selenium, and zinc.
PROJECT MILESTONES: (1) 08/77 Funding package submitted; (2) 08/77 award funds for project; (3) 08/77 begin on site investigation; (4) 10/77 complete on site work; (5) 01/78 draft final report; (6) 01/78 executive summary; (7) 02/78 revise report; (8) 03/78 final report received.
KEYWORDS: COAL MINES;ENVIRONMENTAL EFFECTS;ACID MINE DRAINAGE;ENVIRONMENTAL TRANSPORT;WASTE WATER;WATER POLLUTION ABATEMENT;CHEMICAL
EFFLUENTS;TESTING;ARSENIC;BORON;CADMIUM;CHROMIUM;COPPER;LEAD;MERCURY;NICKEL;PHOSPHORUS;SELENIUM;ZINC;REMOV
L

<070772>
TITLE: Effects of Surface Configuration in Water Pollution Control on Semi-Arid Mined Lands
PROJECT NUMBER: B623B-353
PRINCIPAL INVESTIGATOR: Hodder, J.F.;Jensen, L.B.;Dollhopf, D.;Halk, D.;Olson, J.;VanVoast, W.
AFFILIATION: Montana State Univ., Bozeman (USA); Montana Bureau of Mines and Geology, Billings (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, J.F.
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Objectives of this study are to demonstrate the effectiveness of several surface configurations in controlling erosion, runoff, sedimentation and pollution of adjacent drainages; quickly producing a desirable stabilizing vegetative cover; creating an equilibrium between precipitation absorbed and soil moisture evaporated and transpired so that ground water pollution will remain minimal; producing an overall desirable reclamation design providing effective drainage, esthetics productiveness and use. Demonstration areas approximately 16 hectares in size were located on reshaped spoils of strip mined coal mines near Colstrip, MT; Savage, MT; Beulah, ND; Hanna, WY; and Glenrock, WY. Five treatments evaluated include deep chiseling in topsoil, deep chiseling no topsoil, gouging in topsoil, gouging no topsoil and dozer basins in topsoil. Five 0.21 hectare microwatersheds have been constructed at each area to aid in intensively evaluating each treatment. Treatment evaluation at each area include meteorological monitoring, surface runoff water quality, soil moisture, evapotranspiration rate, water aquifer levels. Implementation of the five areas has been completed and data is being collected and processed. The first report will be published during 1977. Treatment evaluations are scheduled through September 12, 1978.
PROJECT MILESTONES: (1) 00/74 Funding package submitted; (2) 00/74 award funds; (3) 11/78 final report received.
KEYWORDS: WATERSHEDS;COAL MINES;WATER POLLUTION;WATER POLLUTION CONTROL;SURFACE MINING;LAND RECLAMATION;SPOIL BANKS;MONTANA;NORTH DAKOTA;WYOMING;BACKFILLING;REVEGETATION;WATER REQUIREMENTS;WATER QUALITY;SOILS;MOISTURE;EVAPORATION;TRANSPIRATION;ARID LANDS

<070773>
TITLE: Environmental Monitoring and Assessment of Coal Strip Mining and Reclamation in The Four Corner Area
PROJECT NUMBER: B623B-418
PRINCIPAL INVESTIGATOR: Fogel, M.M.;Thames, J.L.;Verma, T.R.;Hekman, L.H.;Duckstein, L.
AFFILIATION: Arizona Univ., Tucson (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, J.F.
77 FUNDING: Environmental Protection Agency FY77:$145,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: The overall objective of the project is to develop criteria for the optimal management of land that has been distributed by coal strip mining activities.
APPROACH: The criteria will be based on minimizing air and water pollution. Specifically, the second phase of the project will be devoted principally to monitoring (1) two selected groundwater basins, (2) three surface water sites and (3) three air quality sites to determine the effects of strip mining on the environment. Several holes will be drilled, cased and monitored for each of the shallow groundwater basins.
RESULTS: Infiltration studies will be used to ascertain the mobility of pollutants from the land surface to groundwater. The surface water sites will involve both mined and undisturbed areas as well as revegetated areas which are either irrigated or rainfed. High volume air samplers will be used to monitor particulate concentrations before, during and after mining development.
PROJECT MILESTONES: (1) 08/77 Funding package submitted; (2) 09/77 award funded; (3) 09/78 award continuation; (4) 10/79 final report received.
KEYWORDS: COAL MINING;SURFACE MINING;AIR POLLUTION CONTROL;WATER POLLUTION CONTROL;GROUND WATER;AQUIFERS;SURFACE WATERS;AIR QUALITY;MONITORING;ENVIRONMENTAL EFFECTS;REVEGETATION;SPOIL BANKS;IRRIGATION;ATMOSPHERIC PRECIPITATIONS

<070774>
TITLE: Trace and Potentially Toxic Elements Associated with Uranium Deposits in South Texas
PROJECT NUMBER: B623B-523
PRINCIPAL INVESTIGATOR: Henry, C.D.;Groat, C.C.
AFFILIATION: Texas Univ., Austin (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hubbard, S.J.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: The objective of this study is to evaluate potential problems of toxic elements associated with uranium mineralization and mining in South Texas.
APPROACH: Sampling of soils and vegetation in (1) areas that are within or immediately adjacent to mining areas or have had ore stored on them; (2) areas underlain by identified uranium mineralization but which have not been mined; and (3) areas of similar substrate and soils away from any known mineralization or previous mining will accomplish this objective.
RESULTS: The third locality will establish background levels: the first two would indicate the extent of man-caused or ''natural'' contamination. Sampling will begin early in 1977.
PROJECT MILESTONES: (1) 04/77 Funding package submitted; (2) 05/77 award funds; (3) 07/78 final report received.
KEYWORDS: TEXAS;REGIONAL ANALYSIS;SOILS;SAMPLING;CHEMICAL COMPOSITION;URANIUM DEPOSITS;URANIUM MINES;PLANTS;ELEMENTS;TRACE AMOUNTS;TOXICITY;URANIUM MINERALS

<070775>
TITLE: Evaluation of 3 Permeable Limestone Seals Via Construction of 3 Earthen Dams
PROJECT NUMBER: B623B-574
PRINCIPAL INVESTIGATOR: Scott, R.B.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Scott, R.B.
77 FUNDING: Environmental Protection Agency FY77:$19,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this project is to demonstrate mine sealing by pneumatically injecting limestone (1/2'' x 5'') into abandoned drift mine portals.
APPROACH: The limestone (CaCO3) in the seal will react with the acid water to neutralize acidity and precipitate ferric and aluminum hydroxides that will tend to plug the voids between the stones and prevent water flow from the mine.
RESULTS: The current phase of the project involves evaluation of the mine seals by external flooding. Extensive monitoring is being conducted to determine the extent of flooding inside the mine area, and the volume of water percolating through the limestone seals.
PROJECT MILESTONES: (1) 11/76 Funding package submitted; (2) 11/76 award funds; (3) 11/80 final report received.
KEYWORDS: MINES;SEALS;SEALING MATERIALS;PERFORMANCE TESTING;LIMESTONE;CHEMICAL REACTIONS;ACID MINE DRAINAGE;FLUID FLOW

<070776>
TITLE: Geochemistry of Cadmium and Other Selected Heavy Metals as Related to Coal Strip Mining
PROJECT NUMBER: B623B-633
PRINCIPAL INVESTIGATOR: Hood, W.;Robinson, P.
AFFILIATION: Southern Illinois Univ., Carbondale (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wilmoth, R.C.
77 FUNDING: Environmental Protection Agency FY77:$27,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: This investigation is concerned with the potential release of cadmium and other toxic heavy elements (arsenic, antimony, nickel, cobalt, zinc, and chromium) to southern Illinois streams as a result of the strip mining of coal. Preliminary data indicate that significant amounts of toxic heavy elements can be leached by acid mine water but the fate of these elements after they enter the aquatic

environment is not known. However, preliminary information indicates that dangerous concentrations of these elements may possibly be transported downstream as part of the bedload, perhaps to be again released when favorable conditions arise. Our study site will be a six-county area in southern Illinois, one of the ost extensively strip-mined areas in the world.
OACH: Our proposed study will be divided into three separate parts: (1) regional and stratigraphic aistribution of the elements in mine overburden materials, (2) leaching studies on the removal of the elements from overburden rocks and (3) distribution of the elements in selected streams and stream sediments in the area.
RESULTS: Our results will establish the extent of cadmium and other heavy element pollution resulting from southern Illinois coal strip mining operations, establish the causes, and provide the information needed for its prevention.
PROJECT MILESTONES: (1) 08/77 Funding package submitted; (2) 09/77 award funds; (3) 12/77 review sampling and analysis plan; (4) 01/78 award continuation; (5) 09/79 final report received.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;ILLINOIS;REGIONAL ANALYSIS;STREAMS;COAL MINES;SURFACE MINING;ACID MINE DRAINAGE;LEACHING;CADMIUM;ARSENIC;ANTIMONY;NICKEL;COBALT;ZINC;CHROMIUM;ENVIRONMENTAL TRANSPORT;TOXICITY;ENVIRONMENTAL EFFECTS;SEDIMENTS

<070777>
TITLE: Major Inorganic Manufacturing Industrial Segments
PROJECT NUMBER: B604B-030
PRINCIPAL INVESTIGATOR: Sawyer, C.
AFFILIATION: PEDCO-Environmental Specialists, Inc., Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Stinson, M.
77 FUNDING: Environmental Protection Agency FY77:$17,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of the project is to assess the major inorganic manufacturing industry segments.
APPROACH: The project will be approached by the following phases: Phase I: An in-depth source assessment studying the qualitative and quantitative aspects of all pollutant emissions, as well as available technology and pollutant effects of major manufacturing industrial segments. This source assessment will provide the information necessary to determine the immediate impact of emissions. Phase II: A comprehensive study to assess and prioritorize the multimedia pollution problems of the major inorganic manufacturing industrial segments. This study will prioritorize the multimedia pollution problems to establish a direction for technology, development and demonstration efforts.
RESULTS: The data obtained from this project will be computerized to form a data base for the inorganic chemicals industry.
PROJECT MILESTONES: (1) 01/76 Funding package submitted; (2) 12/76 award funds for project; (3) 12/76 funding increment; (4) 10/77 final report received.
KEYWORDS: CHEMICAL INDUSTRY;CHEMICAL EFFLUENTS;AIR POLLUTION;LAND POLLUTION;WATER POLLUTION;ENVIRONMENTAL EFFECTS;INORGANIC COMPOUNDS;WASTE MANAGEMENT;ENVIRONMENTAL TRANSPORT

<070778>
TITLE: Inorganic Chemicals Producers Data Base
PROJECT NUMBER: B604B-462
PRINCIPAL INVESTIGATOR: DeVitt, T.W.
AFFILIATION: PEDCO-Environmental Specialists, Inc., Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Stinson, M.K.
77 FUNDING: Environmental Protection Agency FY77:$13,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The product of this project will be compilation of toxicity and emissions data for the inorganic chemicals industries via computerized reports to facilitate data handling and interpretation.
APPROACH: Data obtained by a comprehensive study to assess and prioritorize the pollution problems of the major inorganic chemicals industries will be used to form a computerized data base.
RESULTS: Plans for the data base is to update it by adding additional industrial inorganic chemicals.
PROJECT MILESTONES: (1) 11/76 Funding package submitted; (2) 11/76 Award funds for project; (3) 01/77 draft final report; (4) 03/77 final report received.
KEYWORDS: CHEMICAL INDUSTRY;CHEMICAL EFFLUENTS;INORGANIC COMPOUNDS;AIR POLLUTION;TOXICITY;DATA COMPILATION;COMPUTER CALCULATIONS;ENVIRONMENTAL EFFECTS;ENVIRONMENTAL TRANSPORT;WASTE MANAGEMENT;LAND POLLUTION;WATER POLLUTION

<070779>
TITLE: Source Assessment, Maleic Anhydride Manufacture
PROJECT NUMBER: B604B-584
PRINCIPAL INVESTIGATOR: Hughes, T.
AFFILIATION: Monsanto Research Corp., St. Louis, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Turner, R.
77 FUNDING: Environmental Protection Agency FY77:$4,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This report will be a summary of data on air emissions from the maleic anhydride industry.
APPROACH: Major processing steps will be described including flow diagrams, process chemistry, material and energy balances.
RESULTS: The study will include emission factors for each species emitted and the environmental hazard potential.
ECT MILESTONES: (1) 12/76 Funding package submitted; (2) 10/77 award funds for project; (3) 01/78 receive draft report; (4) 05/78 Final report received.
KEYWORDS: CHEMICAL INDUSTRY;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;GASEOUS WASTES;MALEIC ACID;ANHYDRIDES;AIR POLLUTION;CHEMICAL PREPARATION

<070780>
TITLE: Protective Equipment for Spill Response Personnel
PROJECT NUMBER: B610A-198
PRINCIPAL INVESTIGATOR: Iacono, V.
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: LaFornara, J.P.
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this project is to develop recommendations for the minimum protective equipment requirements for those individuals who have responsibility for the investigation, inspection and supervision of operations involving the cleanup of spills of a broad range of hazardous materials.
APPROACH: An ensemble of the best available equipment will be assembled and 11 prototypes delivered to EPA for use testing. Included in the ensemble will be a body and head cooling system, a lightweight self-contained breathing apparatus and a chemically resistant suit, gloves and boots.
RESULTS: The output of this work will be a comprehensive categorization of hazardous materials (or classes/groupings of these materials) with corresponding recommendations for minimum protective clothing and breathing apparatus along with respective sources of supply and performance profiles for the equipment.
PROJECT MILESTONES: 03/75 Funding package submitted. 05/75 Award funds for project. 12/75 Funding increment. 02/77 Change in scope submitted. 03/77 Change in scope awarded. 03/78 Final report received.
KEYWORDS: HAZARDOUS MATERIALS;CLEANING;ACCIDENTS;DECONTAMINATION;PERSONNEL;PROTECTIVE CLOTHING;RESPIRATORS;PERFORMANCE TESTING;GLOVES;AIR CONDITIONING;SURFACE CLEANING

<070781>
TITLE: Field Identification Kit for Spilled Hazardous Materials
PROJECT NUMBER: B610A-200
PRINCIPAL INVESTIGATOR: Silvestri, A.
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Resarch Laboratory
MONITOR: Lafornara, J.P.
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this project is to develop a portable field kit for use by EPA and other spill response personnel in identifying spilled hazardous materials.
APPROACH: An evaluation of the performance of the kit will be conducted in the laboratory and in the field under simulated spill conditions. Two prototype kits will be delivered to EPA along with manuals and reagents necessary for their use.
RESULTS: Selected off-the-shelf procedures and probes supplemented by a newly developed field operable thin-layer chromatography procedure will be incorporated into a self-contained kit capable of use to determine the identity or chemical class of a spilled material.
PROJECT MILESTONES: 05/74 Funding package submitted. 06/74 Award funds for project. 05/76 Funding increment. 06/78 Final report received.
KEYWORDS: HAZARDOUS MATERIALS;ACCIDENTS;CHEMICAL COMPOSITION;CHEMICAL ANALYSIS;THIN-LAYER CHROMATOGRAPHY;SURFACE CONTAMINATION;MONITORING

<070782>
TITLE: Pilot Scale Testing of Activated Carbon Treatment of Hazardous MAterials Spills
PROJECT NUMBER: B610A-229
PRINCIPAL INVESTIGATOR: Lafornara, J.P.;Gruenfeld, M.;Freestone, F.J.;Urban, M.
AFFILIATION: Environmental Protection Agency, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lafornara, J.P.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this program is to define the extent to which selected hazardous materials can be removed from water by the activated carbon columns of the Mobile Physical/Chemical Treatment Trailer (Contract No. 68-01-0099).
APPROACH: A pilot scale model of the trailer's columns will be designed, fabricated, and operated at various loading rates to determine which of the chemicals about to be designated as hazardous in response to Section 311 of Public Law 92-500, can be removed by this technique. A performance matrix will be developed so that high priority materials will be tested first. Individual experiments will be designed so as to allow rapid determination of parameters such as minimum carbon contact time, adsorption capability of the carbon, and rate of movement of the adsorption front.
RESULTS: Emergency activation of the pilot plant will be possible for hazardous materials incidents such as spills, etc. which require the rapid generation of carbon treatment data so that an effective can be made.
PROJECT MILESTONES: (1) 10/76 Initiate project. (2) 03/77 Complete pilot plant fabrication. (3) 09/77 Complete pilot plant shakedown. (4) 09/78 Publish data for first year. (5) 09/79 Publish data for second year. (6) 09/80 Publish data for third year.
KEYWORDS: ACTIVATED CARBON;HAZARDOUS MATERIALS;ACCIDENTS;CLEANING;WATER POLLUTION;SORPTIVE PROPERTIES

<070783>
TITLE: 1978 National Conference on Control of Hazardous Material Spills
PROJECT NUMBER: B610A-491
PRINCIPAL INVESTIGATOR: Usher, D.;Shaye, M.
AFFILIATION: Hazardous Materials Control Research Inst., Southfield, Mich. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wilder, I.
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: A conference will be convened in March 1978 on control and prevention of hazardous material spills. The topics to be presented include: legislation and regulations; clean-up systems; international programs; contingency planning; prevention; government policies and programs; personnel safety; spill retrieval data systems; ultimate disposal; detection-monitoring-reporting; response

capabilities; risk analysis; case histories; effects and impacts; spill movement; research and development; and training.
PROJECT MILESTONES: (1) 03/77 Funding package submitted. (2) 03/77 Award funds for project. (3) 04/78 Hold 1978 National Hazardous Spills Conference.
KEYWORDS: HAZARDOUS MATERIALS;ACCIDENTS;CLEANING;GOVERNMENT POLICIES;RESEARCH PROGRAMS;PERSONNEL;SAFETY;INFORMATION SYSTEMS;ENVIRONMENTAL TRANSPORT;MEETINGS;MONITORING;RISK ASSESSMENT;ENVIRONMENTAL EFFECTS;ENVIRONMENTAL IMPACTS;WASTE DISPOSAL;LAWS;POLLUTION REGULATIONS

<070784>
TITLE: Hazardous Material Spill Ultimate Disposal--Lab/Pilot Demonstration Sodium Fluxing and Glassification
PROJECT NUMBER: B610A-579
PRINCIPAL INVESTIGATOR: Hiltz, R.H.;Griwatz, G.H.;Gross, S.
AFFILIATION: Mine Safety Appliances Co., Pittsburgh, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brugger, J.
77 FUNDING: Environmental Protection Agency FY77:$34,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This program will assess two techniques to provide ultimate disposal of those chemicals that are not generally amenable to existing disposal techniques such as incineration, landfill, etc.
APPROACH: The first task will evaluate the ability of a liquid alkali metal to degrade organic compounds to elements or simple innocuous compounds (hydrogen, nitrogen, carbon, NaCl) or to compounds which can be treated by conventional techniques (Na2O, Na2S, C2H2). The liquid metal system will be designed along lines of current heat transfer equipment and will use technology derived from inert gas cleaning units. The second task will evaluate glass encapsulation of essentially nonvolatile materials. In this technique, the material to be disposed of will be blended with glass-forming materials. In-situ glass formation will be effected using either external heating or pyrochemical reaction within the mass. Accelerated leaching tests will be run to determine the stability of the resulting glasses. Careful attention will be paid to the control of reaction-generated vapors.
RESULTS: Rather than restricting the project to work on only pure chemicals, both techniques will be developed for processing spilled hazardous materials contaminated with typical spilled debris (earth, sand, flora, water, etc.). A full analysis will be made of the fate of the reacted materials after disposal to the environment. Pilot scale units will be built and operated for those processes that are successful on a laboratory scale.
PROJECT MILESTONES: 02/76 Funding package submitted. 11/76 Award funds for project. 02/77 Funding increment. 06/79 Final report received.
KEYWORDS: HAZARDOUS MATERIALS;ACCIDENTS;SURFACE CONTAMINATION;DECONTAMINATION;CLEANING;WASTE DISPOSAL;ORGANIC COMPOUNDS;DECOMPOSITION;VOLATILITY;VITRIFICATION

<070785>
TITLE: Characterization of High Temperature Decomposition Behavior of Pesticides and Other Organic Materials
PROJECT NUMBER: B610B-608
PRINCIPAL INVESTIGATOR: Duvall, D.S.;Rubey, W.A.;Hect, N.L.;Boehman, L.I.;Fox, B.L.
AFFILIATION: Dayton Univ., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Weitzman, L.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The prime objective of the proposed research is to determine the thermal destruction characteristics of a wide assortment of pesticides and other organic hazardous waste materials.
APPROACH: This objective will be accomplished using a specially designed laboratory test system capable of determining destruction-temperature/residence time data for a multitude of organic samples, while simultaneously analyzing the complete spectrum of evolved decomposition products.
KEYWORDS: HAZARDOUS MATERIALS;ORGANIC COMPOUNDS;PESTICIDES;WASTE DISPOSAL;DECOMPOSITION;HEAT TREATMENTS;THERMAL DEGRADATION;WASTE PROCESSING

<070786>
TITLE: Measurement of Volatile Chemical Emissions from Wastewater Basins
PROJECT NUMBER: B610B-618
PRINCIPAL INVESTIGATOR: Thibodeaux, L.J.;Parker, D.G.
AFFILIATION: Arkansas Univ., Fayetteville (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Dallons, V.
77 FUNDING: Environmental Protection Agency FY77:$94,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this study is to determine the magnitude of both sulfur and organic compounds that escape into the air from wastewater treatment facilities at pulp and paper mills. The results of this study will help to establish whether wastewater treatment facilities are a significant secondary emission source of sulfur and organic compounds. The results can also be used to establish baseline quantities and to suggest possible control methods, if required.
APPROACH: Both laboratory and field investigations will be conducted. The laboratory study will be designed primarily to perfect appropriate water and air sampling techniques. This phase will consist of running a laboratory scale biological reactor and samling both the liquid and air phases. The methods developed during this study will then be used to conduct field investigations. Both phases of this project will take approximately one year to complete. The field sampling will consist of both water and air sampling at actual wastewater treatment facilities. Liquid samples will be collected at the influent and effluent locations of the treatment reactors as well as in the reactors themselves. Air samples will be collected at strategic points upwind and downwind from the biological reactors and possibly above the reactors themselves. Air samples will be collected at different elevations so that the vertical distribution of pollutants can be established.

RESULTS: The results will be published in EPA Technical Report Series.
PROJECT MILESTONES: 08/77 Funding package submitted. 10/77 Award funds for project. 08/79 Final draft report. 10/79 Final report received.
KEYWORDS: PAPER INDUSTRY;ENVIRONMENTAL EFFECTS;AIR POLLUTION;SULFUR;ORGANIC COMPOUNDS;LIQUID WASTES;WASTE PROCESSING;WATER POLLUTION;AIR POLLUTION;SAMPLING

<070787>
TITLE: Sulfide Precipitation of Heavy Metals
PROJECT NUMBER: B610C-567
PRINCIPAL INVESTIGATOR: Robinson, S.;Terhune, C.
AFFILIATION: Boeing Co., Seattle, Wash. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wilson, D.
77 FUNDING: Environmental Protection Agency FY77:$97,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To compare the sulfide and hydroxide precipitation processes for the removal of heavy metals, including copper, chromium, zinc, iron, cadmium and nickel, from industrial wastewater streams. The comparison will include: the completeness of removal, the full scale installation and operating costs, and a 12-month exposure study of the leaching characteristics of the sludges, both raw and admixed with binding materials.
APPROACH: Pilot scale plants will process up to 190 liter (50 gallon) samples of wastewaters in the sulfide, hydroxide, and combined sulfide--hydroxide processes. Samples of sludge will be collected from the pilot scale plants, and from industrial treatment plants using the processes. The sludge samples will be exposed in small roof-pack lysimeters, and in 0-76 cubic meter (1 cubic year) landfill-type lysimeters. Heavy metal concentrations will be determined in the pilot scale plant streams and in the sludge leachates principally by flameless atomic absorption spectroscopy.
PROJECT MILESTONES: 06/77 Funding package submitted. 09/77 Award funds for project. 09/78 Draft final report. 11/78 Final report received.
KEYWORDS: CHEMICAL EFFLUENTS;LIQUID WASTES;COPPER;CHROMIUM;ZINC;IRON;CADMIUM;NICKEL;WASTE PROCESSING;PRECIPITATION;HYDROXIDE MODERATORS;SULFIDES;CHEMICAL REACTIONS;PILOT PLANTS;PROCESS DEVELOPMENT UNITS;SLUDGES;LEACHING;ABSORPTION SPECTROSCOPY;CHEMICAL ANALYSIS

<070788>
TITLE: Methods Manual for Oil Spill Source Identification
PROJECT NUMBER: B623C-275
PRINCIPAL INVESTIGATOR: Gruenfeld, M.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Gruenfeld, M.
77 FUNDING: Environmental Protection Agency FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The objective of this project is to develop a comprehensive manual of proven analytical methods for the quantitation, characterization, and source identification of petroleum oils that are spilled into the environment.
APPROACH: A manual of reliable analytical methods will be prepared in order to monitor oil pollution in the vicinity of oil spills, oil production platforms, tanker routes, industrial and municipal outfalls, et al. Although methods for analyzing oils in water, sediments, and biological tissues are currently proliferating, they generally lack sensitivity, specificity and adequate validation. This project will review the available methods, and consolidate the most appropriate ones within the context of a state-of-the-art EPA oil spill methods manual.
PROJECT MILESTONES: 01/76 Initiate project. 04/76 Complete literature review. 09/77 Complete methods evaluation. 12/77 Draft manual. 03/78 Final manual.
KEYWORDS: OIL SPILLS;AQUATIC ECOSYSTEMS;LOCALITY;MONITORING;PETROLEUM PRODUCTS;CHEMICAL ANALYSIS;SPATIAL DISTRIBUTION;WATER POLLUTION

<070789>
TITLE: Method of Quantitation for Petroleum Oils in Water
PROJECT NUMBER: B623C-276
PRINCIPAL INVESTIGATOR: Gruenfeld, M.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Gruenfeld, M.
77 FUNDING: Environmental Protection Agency FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The objective of this project is to develop a method for quantitating petroleum oils that are dispersed in water, or that have separated from water dispersion following sample collection.
APPROACH: The method will be specific for petroleum oils, i.e., it should accurately quantitate petroleum even in the presence of non-petroleum organics. Application to the minimum concentration 1 microgram per liter (ppb) is desired. The methodology to be used will include procedures such as solvent extraction, adsorption, gas and liquid chromatography, spectroscopy, et al.
PROJECT MILESTONES: 06/75 Initiate project. 09/75 Report test results of adsorption procedures. 12/76 Report on utility of IR. 12/77 Report on utility of GC. 12/78 Report on utility of fluorescence spectroscopy. 06/79 Final report.
KEYWORDS: PETROLEUM PRODUCTS;WATER POLLUTION;MICROANALYSIS;QUANTITATIVE CHEMICAL ANALYSIS;WATER;SEPARATION PROCESSES

<070790>
TITLE: System Concept Evaluation--Densified Refuse--Derived Fuels
PROJECT NUMBER: B624B-T72
PRINCIPAL INVESTIGATOR: Zeitoun, M.
AFFILIATION: Dow Chemical Co., Midland, Mich. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Olexsey, R.A.
77 FUNDING: Environmental Protection Agency FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This task calls for an economic and technical feasibility study of the concept of central station production of densified refuse derived fuel (DRDF), marketing, and delivery of the fuel product to industrial, institutional, and utility boilers within the local vicinity of the central station plant.
APPROACH: Costs and the feasibility of the DRDF system concept will be compared/contrasted with those of the more conventional concept of the production of ''fluff'' refuse derived fuel (RDF) for sale to an adjacent utility. The contractor will use his experience, the literature, and existing data supplied by system developers and EPA through contractors and grantees working on the subject area.
PROJECT MILESTONES: 04/78 Final report.
KEYWORDS: REFUSE DERIVED FUELS;FABRICATION;FEASIBILITY STUDIES;COMBUSTION;BOILER FUEL;COST;COMPARATIVE EVALUATIONS;TECHNOLOGY ASSESSMENT;ECONOMICS;FOSSIL-FUEL POWER PLANTS

<070791>
TITLE: Energy Consumption from Present Pollution Control Technology
PROJECT NUMBER: B624B-386
PRINCIPAL INVESTIGATOR: Hockett, R.S.
AFFILIATION: Monsanto Research Corp., St. Louis, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lee, C.C.
77 FUNDING: Environmental Protection Agency FY77:$5,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of this task are: (1) to assess the existence of and accuracy of pollution control energy cost estimates, and (2) to assess, in the light of shortages and increasing cost of energy, the need for modification of present approaches to pollution control. Within the time constraints of the project, the object is to obtain as broad a perspective as possible on the problem area for EPA program planning purposes.
APPROACH: The two objectives for this project will be met by the following two subtasks: Subtask 1--Survey the open literature and make personal contacts to identify previous efforts and success in determining the energy costs of pollution control. Interest is in industrial and utility stationary point sources and in the related air, water, and solids pollution control throughout the U.S. economy. Analyze the deficiences and assumptions in previous work. Suggest alternative approaches to obtaining better cost data (125 manhours); Subtask 2--Identify the relative energy uses of various pollution control strategies now in use to determine the most important areas for reducing energy consumption. The basis should be present industry production capacity, but with anticipated pollution control assumed to be installed to satisfy present regulations. It may be appropriate to consider categories of pollutants, i.e., NOx, SO2, hydrocarbons, BOD, COD, trace organics in water, etc., rather than industry categories, in making comparisons. Alternatives to pollution control that are less energy intensive should be identified and prioritized. Emphasis should be placed on modifications of existing processes rather than on totally new approaches (375 manhours).
PROJECT MILESTONES: (1) 07/75 Funding package submitted. (2) 04/76 Award funds for project. (3) 01/78 Final report received.
KEYWORDS: ENERGY SOURCES;POLLUTION CONTROL EQUIPMENT;COST BENEFIT ANALYSIS;POLLUTION REGULATIONS

<070792>
TITLE: Evaluation of Waste-to-Energy Processes
PROJECT NUMBER: B624B-389
PRINCIPAL INVESTIGATOR: Wilson, E.M.
AFFILIATION: Parsons (Ralph M.) Co., Pasadena, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Freeman, H.M.
77 FUNDING: Environmental Protection Agency FY77:$54,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The objective of this project is to provide an objective third-party engineering evaluation of emerging waste-to-energy processes.
APPROACH: The evaluation included cost figures and potential technical problems for the most prominent of the current and developing processes.
RESULTS: Seven leading processes were evaluated technically and economically.
PROJECT MILESTONES: (1) 02/75 Funding package submitted. (2) 05/75 Award funds for project. (3) 12/76 Draft final report. (4) 06/77 Final report received.
KEYWORDS: SOLID WASTES;MUNICIPAL WASTES;WASTE PROCESSING PLANTS;TECHNOLOGY ASSESSMENT;ECONOMICS;WASTE PROCESSING;ENERGY SOURCES

<070793>
TITLE: Program Briefings on Energy Conserving Industrial Process Changes
PROJECT NUMBER: B624B-529
PRINCIPAL INVESTIGATOR: Haley, H.
AFFILIATION: Little (Arthur D.), Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Skovronek, H.S.
77 FUNDING: Environmental Protection Agency FY77:$74,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The objectives of this program are to provide briefings in Washington, Research Triangle Park and Cincinnati on the results of the energy/environment study conducted by Arthur D. Little, Inc. under EPA contract 68-03-2198. Also included in the program is the publication of information obtained in

this study and categorized by pollutant rather than by industrial segment.
PROJECT MILESTONES: (1) 10/76 Funding package submitted. (2) 11/76 Award funds for project. (3) 10/77 Draft final report received. (4) 02/78 Final report received.
KEYWORDS: INDUSTRY;ENERGY MANAGEMENT;ENERGY CONSERVATION;INDUSTRIAL PLANTS;ENVIRONMENT;POLLUTION;DATA COMPILATION

<070794>
TITLE: Environmental, Economic, and Conservation Aspects of Integrated Energy Use Applications
PROJECT NUMBER: B624B-531
PRINCIPAL INVESTIGATOR: Zimmer, R.P.
AFFILIATION: Georgia Inst. of Tech., Atlanta (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lee, C.C.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The purpose of this project is to provide up-to-date analyses of the environmental, economic and technical feasibility of alternatives for supplying total energy needs, to assess various integrated energy system concepts for supplying multipurpose energy for utility and industrial needs, to identify the technical feasibility of matching industrial processes to thermal outputs of power plants, to analyze extensively several final concepts selected for their potential for future environmentally sound developments, and to make recommendations about future environmental research and development activities based on the project results.
APPROACH: This research study will follow a phase-oriented program to achieve its objectives. Five phases have been identified and are listed below: Phase 1: Project management, Phase 2: Environmental, economic and technological overview and preliminary concept identification, Phase 3: Methodology development and final concept selection, Phase 4: Concept analysis and evaluation, Phase 5: Conclusion and recommendation.
PROJECT MILESTONES: (1) 07/75 Funding package submitted. (2) 03/76 Award funds for project. (3) 01/78 Final report received.
KEYWORDS: ENERGY SOURCES;ENERGY DEMAND;INDUSTRY;THERMAL POWER PLANTS;ENVIRONMENTAL EFFECTS;RESEARCH PROGRAMS;RECOMMENDATIONS;ECONOMICS

<070795>
TITLE: Development of Sampling Plan for Geothermal Manifestations
PROJECT NUMBER: B624B-532
PRINCIPAL INVESTIGATOR: Leavitt, C.
AFFILIATION: Thompson Ramo Wooldridge, Inc., Inglewood, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hartley, R.P.
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: GEOTHERMAL/General (100%)
PROJECT DESCRIPTION: The objective of this project is to devise a plant for sampling geothermal fluids at various sites, prioritized on the basis of adequacy of existing date, stage of development of the resource area, significance of potential pollution and sampling costs.
APPROACH: The plan will be designed to encompass the range of resource characteristics. The approach is to examine the existing data base and field developments and evaluate needs therefrom.
RESULTS: The output will be a plan to support and justify a geothermal fluid data-gathering effort, as a base for further refining pollution control technology needs.
PROJECT MILESTONES: (1) 04/77 Funding package submitted. (2) 04/77 Award funds for project. (3) 10/77 Final report.
KEYWORDS: GEOTHERMAL ENERGY;GEOTHERMAL FLUIDS;POLLUTION;MONITORING;COST BENEFIT ANALYSIS

<070796>
TITLE: Assessment of Large-Scale Photovoltaic Materials Production
PROJECT NUMBER: B624B-536
PRINCIPAL INVESTIGATOR: Sears, D.R.
AFFILIATION: Lockheed Missiles and Space Co., Palo Alto, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hartley, R.
77 FUNDING: Environmental Protection Agency FY77:$5,000
TECHNOLOGY: SOLAR/General (100%)
PROJECT DESCRIPTION: The objectives of this study were to assess the environmental impact of large increases in the production of solar cell materials assuming that photovoltaics would provide 1 percent of the national electrical energy requirement.
APPROACH: Three types of cell production--silicon, cadmium sulfide, and gallium arsenide--were examined. The approach was to investigate the existing and developing production methods and to calculate potential pollution discharge and emission loadings.
RESULTS: The final report is complete. For silicon production, the necessary power consumption produces indirect air emissions over half as large as the coal-burning plants that the silicon cells might replace. For the others, atmospheric cadmium releases and potential cadmium and arsenic spills are the major potential problem areas.
PROJECT MILESTONES: (1) 11/76 Funding package submitted. (2) 11/76 Award funds for project. (3) 11/76 Draft final report. (4) 04/77 Final report received.
KEYWORDS: SOLAR CELLS;PRODUCTION;ENERGY DEMAND;SILICON SOLAR CELLS;AIR POLLUTION;CADMIUM;ARSENIC;ENVIRONMENTAL EFFECTS

<070797>
TITLE: Control Technology Survey of Paraho Retort
PROJECT NUMBER: B623A-T51
PRINCIPAL INVESTIGATOR: Cotter, J.
AFFILIATION: Thompson Ramo Wooldridge, Inc., Inglewood, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Powers, T.J.
77 FUNDING: Environmental Protection Agency FY77:$31,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: A total environmental characterization of air emissions, liquid effluents and solid wastes is the objective sought for the Paraho surface retort at Anvil Points, Colorado. There are two 2-week periods of survey which will occur in August 1977 and September 1977. The work will be performed at the site at the same time other EPA, ERDA, and DOD environmental process sampling and analysis work is in progress. The sampling and analysis will include''on-site'' gas chromatography to measure inorganic and light-end hydrocarbons in recycle gas streams as well as all previous ''on-site'' analyses.
PROJECT MILESTONES: (1) 07/77 Funding package submitted. (2) 07/77 Award funds for project. (3) 08/77 Sampling and analysis. (4) 11/77 Final report received.
KEYWORDS: OIL SHALE PROCESSING PLANTS;ENVIRONMENTAL IMPACTS;POLLUTION CONTROL EQUIPMENT;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;PERFORMANCE;STANDARDS;COMPARATIVE EVALUATIONS;TECHNOLOGY ASSESSMENT

<070798>
TITLE: Environmental Assessment of Oil Shale Processes
PROJECT NUMBER: B623A-365
PRINCIPAL INVESTIGATOR: Cotter, J.;Prien, C.
AFFILIATION: Thompson Ramo Wooldridge, Inc., Inglewood, Calif. (USA); Denver Univ., Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Powers, T.J.
77 FUNDING: Environmental Protection Agency FY77:$413,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
PROJECT DESCRIPTION: The major objectives of this project include the acquisition of the necessary background data on the principal industrial shale recovery processes and U.S. shale resource, a comparative assessment of their environmental acceptability and an evaluation of technologies available for the control of air, water, and solid waste emissions.
APPROACH: Shale oil production requires cheap, large-scale materials handling methods at all stages of mining, retorting, and retorted shale disposal; maximum heat economy in retorting and upgrading; and minimum water and power consumption. A number of processing sequences are available, each with its own accompanying environmental impacts. The evaluation and assessment program involves six tasks: (1) Project Management; (2) Oil Shale and Recovery Process Characterization; (3) Engineering Analysis and Problem Definition; (4) Field Testing and Laboratory Analysis; (5) Environmental Evaluation; (6) Evaluation of Existing Environmental Control Technology.
RESULTS: This project will provide a basis for the establishment of rational design, management, and monitoring procedures to mitigate unavoidable adverse environmental impacts. The type and magnitude of these impacts should be determined prior to the development of a full-scale oil shale industry.
PROJECT MILESTONES: (1) 01/75 Funding package submitted. (2) 01/76 Award funds for project. (3) 10/76 Funding increment. (4) 12/76 Funding increment. (5) 05/78 Final report received.
KEYWORDS: PARAHO PROCESS;RETORTS;MONITORING;OIL SHALES;RETORTING;AIR POLLUTION;LAND POLLUTION;LIQUID WASTES;SOLID WASTES;SAMPLING;CHEMICAL ANALYSIS

<070901>
TITLE: Evaluation of Existing Leaching Tests
PROJECT NUMBER: C618A-7013
PRINCIPAL INVESTIGATOR: Lowenbach, B.;Abelson, H.
AFFILIATION: Mitre Corp., McLean, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Sanning, D.E.
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: The Mitre Corporation shall evaluate existing leachate tests as indicated in Chapter IV of the report entitled ''Environmental Assessment of Fluidized-Bed Combustion Technology, Contract No. 68-02-1859, Task Order No. 7, for their weaknesses and advantages as predictors of leaching potential and as duplicators of the natural leachate process. Mitre shall also recommend those elements of the evaluated leaching tests which may be of special benefit to the development of the SLT and provide at least three candidate ISLT's which will be further tested as a part of a separate grant to the University of Wisconsin.
PROJECT MILESTONES: 09/77 Final report.
KEYWORDS: LEACHING;FLUIDIZED-BED COMBUSTION;TECHNOLOGY ASSESSMENT;ENVIRONMENTAL IMPACTS;STANDARDIZATION;QUALITY CONTROL;SAMPLING;WASTE MANAGEMENT;QUANTITATIVE CHEMICAL ANALYSIS;EVALUATION

<070902>
TITLE: Analysis of Llangollen Landfill Leachate Samples
PROJECT NUMBER: C618A-7014
PRINCIPAL INVESTIGATOR: Dewalle, F.B.
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Sanning, D.E.
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Dr. Edward S.K. Chian, University of Illinois, will analyze 16 leachate samples from the Llangollen Landfill in New Castel County, Delaware.
APPROACH: These analyses will consist of a GC/MS scan, wherein, all organic components present in the acid and base extraction fractions will be qualitatively identified. Volatile organic analyses will also be

performed.
PROJECT MILESTONES: 06/77 Project completed.
KEYWORDS: SANITARY LANDFILLS;DELAWARE;LEACHING;SAMPLING;MONITORING;TESTING;QUALITY CONTROL;INSPECTION;ORGANIC COMPOUNDS;QUALITATIVE CHEMICAL ANALYSIS;ENVIRONMENTAL IMPACTS;GAS CHROMATOGRAPHY;MASS SPECTROMETERS;VOLATILE MATTER

<070903>
TITLE: Environmental Effects and Control of Various Flue Gas Cleaning (FGC) Sludge Disposal Options
PROJECT NUMBER: C618A-7207
PRINCIPAL INVESTIGATOR: Schmidt, C.J.;Weaver, D.E.;Woodyard, H.P.;Nishel, H.L.;Pifer, H.W.;Chen, K.Y.
AFFILIATION: Stearns, Conrad, and Schmidt Consulting Engineers, Inc., Long Beach, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Sanning, D.E.
77 FUNDING: Environmental Protection Agency FY77:$99,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The primary objectives of this project are: (1) to develop a better understanding of the thermodynamics and kinetics of chemical speciation in FGC sludge and sludge liquors; (2) to assess the economic impact of various FGC sludge disposal regulatory approaches on the utility industry.
APPROACH: The project is to be performed in two separate phases. Phase I involves the preparation and implementation of a thermodynamic and kinetic model of chemical speciation in FGC sludge and sludge liquors. This subject, identified as an area of needed research in previous studies, is important when assessing the impact of sludge leachate on the ecosystem. Constituents of particular interest to this study are mercury, fluoride, selenium, arsenic, and sulfite ion. Data developed using this model will define what chemical species exist in sludge liquors or leachate for a given set of sludge characteristics. Phase II of the project will involve the development of a detailed economic impact document. In addition to updating the FGC sludge treatment disposal cost data base, the study will review performance of the treatment/disposal alternatives to determine what level of pollutant control is technologically feasible.
RESULTS: A family of cost curves will be developed relating disposal cost to the ''goal'' of the ultimate disposal operation (e.g., reduced permeability, increased load bearing strength, etc.). These costs will be exemplified through the designation of several model power plants and a subsequent analysis of regulatory impact of FGC sludge disposal operations.
PROJECT MILESTONES: 02/79 Final report available.
KEYWORDS: FLUE GAS;CLEANING;SLUDGES;SLURRIES;THERMODYNAMICS;CHEMICAL REACTION KINETICS;ECONOMIC IMPACT;WASTE DISPOSAL;CHEMICAL EFFLUENTS;ENVIRONMENTAL IMPACTS;LEACHING;MERCURY;FLUORIDES;SELENIUM;ARSENIC;SULFITES;SULFUR;FOSSIL-FUEL POWER PLANTS;WASTE MANAGEMENT;FLUORINE;ENVIRONMENTAL TRANSPORT;TERRESTRIAL ECOSYSTEMS;MATHEMATICAL MODELS

<070904>
TITLE: Evaluation of Fixation of Arsenic Bearing Wastes
PROJECT NUMBER: C618A-7208
PRINCIPAL INVESTIGATOR: Johnson, J.;Pojasek, R.;Greene, S.;Gallant, R.
AFFILIATION: JBF Scientific Corp., Burlington, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Sanning, D.E.
77 FUNDING: Environmental Protection Agency FY77:$11,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This study will evaluate the effectiveness of a number of proprietary and generic processes for the fixation of arsenic in arsenic bearing wastes. These wastes are presently being stored as they are generated, because of their potential hazard to the environment. Among the major generators of such wastes are copper smelters and pesticide manufacturers. The principal objectives are to identify those fixation methods which most severely restrict the leaching potential of arsenic, and to identify potential markets for the wastes.
APPROACH: The work will consist primarily of the following tasks: (1) fixing wastes, using generic methods in the laboratory and arranging for proprietory processes by vendors; (2) leaching studies, including column and elutriate tests, to establish effectiveness of fixation; (3) market studies for both raw and treated wastes.
PROJECT MILESTONES: 03/79 Final report available.
KEYWORDS: ARSENIC;WASTE PROCESSING;SOLIDIFICATION;SMELTING;PESTICIDES;INDUSTRY;LEACHING;OPTIMIZATION

<070905>
TITLE: Role of Aquatic Communities in Evaluating Strategies, Establishing Standards and Monitoring Programs for Water Quality Management
PROJECT NUMBER: C619A-7116
PRINCIPAL INVESTIGATOR: Brigham, W.U.
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Oppelt, E.T.
77 FUNDING: Environmental Protection Agency FY77:$160,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The purposes of this investigation are to investigate the role of aquatic communities in evaluating strategies for water quality management; to define the term fishable in light of non-steady-state environmental effects; to explore and recommend appropriate standards which account for these effects, and; to design and test a responsive monitoring program.
APPROACH: The project will be conducted in three phases: Phase I will elucidate the interrelationship among abiotic and biotic factors. Phase II will demonstrate the use of these interrelationships as guidelines for the establishment of standards, using existing chemical, physical and biological community data from the DuPage (Illinois) and Enoree (N. Carolina) River basins in conjunction with water quality modelling. Phase III will consider the nature of the monitoring program necessary to develop the phase-II standards (using the DuPage River as an example case.)
RESULTS: In pursuing these objectives, the relationship between aquatic biological communities and their physical and chemical environment will be explored. The survival or demise of communities will be related to spatial and temporal patterns of physical and chemical events. If possible, survival will be related to such statistical measures as expected magnitude, duration, and recurrence of critical chemical

characteristics and will be related to natural and man-induced effects so that, in the end, causes and effects of management control can be assessed.
---JECT MILESTONES: (1) 10/77 Project begins; (2) 05/78 complete Phase I concepts and procedures; (3) 10/78 omplete Phase II standards; (4) 10/79 complete Phase III monitoring; and (5) 04/80 final report.
ORDS: AMMONIA;TOXICITY;FISHES;TOLERANCE;BIOASSAY;TROUT;DAILY VARIATIONS;WASTE WATER;WATER TREATMENT PLANTS;ENVIRONMENTAL IMPACTS;CHEMICAL EFFLUENTS;TEMPERATURE EFFECTS;OXYGEN

<070906>
TITLE: Ammonia Toxicity to Fishes
PROJECT NUMBER: C619A-7117
PRINCIPAL INVESTIGATOR: Thurston, R.V.;Russo, R.
AFFILIATION: Montana State Univ., Bozeman (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Brunas, W.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this research is to determine the effect on fish of exposures to fluctuating concentrations of ammonia above the proposed EPA criterion level of 0.02 mg/liter NH3 but below acute toxicity levels.
APPROACH: This will be accomplished through a series of laboratory flow-through bioassays in which rainbow trout and fathead minnows will be exposed to fluctuating concentrations of ammonia. Two different fluctuation regimes will be studied: (1) diurnal fluctuations typical of those which might be caused by wastewater treatment plant discharges, and (2) intermittent fluctuations as might be caused by ''slug'' discharges. Experiments to investigate the effect of fluctuations under stressful conditions of temperature and dissolved oxygen will also be examined in an exploratory fashion.
PROJECT MILESTONES: (1) 10/77 Project start; (2) 09/78 project completion; and (3) 03/79 final report.
KEYWORDS: DUPAGE RIVER;AQUATIC ORGANISMS;BIOLOGICAL INDICATORS;STANDARDS;MONITORING;WATER QUALITY;MANAGEMENT;WATER RESOURCES;POPULATION DYNAMICS;FISHES;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;DESIGN;WATER POLLUTION;RECOMMENDATIONS;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;BIOLOGICAL MODELS;NORTH CAROLINA;ILLINOIS;HEALTH HAZARDS

<070907>
TITLE: Laboratory and Field Evaluation of Chemically Stabilized Sludges
PROJECT NUMBER: C624A-7017
PRINCIPAL INVESTIGATOR: Mahloch, J.L.
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Landreth, R.E.
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To assess on a laboratory scale the pollution potential of selected hazardous raw solid/liquid waste streams and sludges, residues resulting from air-pollution-abatement devices, and sludges and residues that have been chemically/physically fixed to eliminate or substantially reduce their pollution potential. To validate by field studies the information obtained from the laboratory study.
APPROACH: WES has obtained selected sludges and residues from hazardous waste streams and selected power plants. After having these residues chemically stabilized by different processors, an extensive leachability and durability evaluation is being carried out. The leaching rate and pollutant leachability from raw and fixed sludges using two leach solutions are being determined. The stability and weatherability of the sludges are being determined under the durability testing phase of the project. A field evaluation using surface plots and lysimeters will extend the laboratory study to conditions that might be expected in the field environment.
RESULTS: Test results show that fixing can cause significant changes in the properties of sludge, that fixed sludges are similar to soil, soil-cement, or low-strength concrete, and that properties are process-dependent.
PROJECT MILESTONES: (1) 06/74 IAG award; (2) 01/75 interim report-lab design for sludge analysis; (3) 09/76 interim report-leachability and durability studies; (4) 09/77 interim report-engineering properties; (5) 10/77 final report-leachability and durability; (6) 02/78 final report-site evaluation; (7) 01/81 project completed; and (8) 06/81 final report.
KEYWORDS: SLUDGES;STABILIZATION;CHEMICAL ANALYSIS;LEACHING;STABILITY;ENVIRONMENTAL ENGINEERING;SITE SELECTION;WASTE WATER;RIVERS;SOLID WASTES;ENVIRONMENTAL IMPACTS;QUALITY CONTROL;HAZARDOUS MATERIALS;POWER PLANTS;WEATHERING;SOILS;CEMENTS;CONCRETES;WATER POLLUTION ABATEMENT;WASTE MANAGEMENT;LIQUID WASTES

<070908>
TITLE: Assessment of Cover Materials for Solid and Hazardous Waste Landfills
PROJECT NUMBER: C624A-7019
PRINCIPAL INVESTIGATOR: Lutton, R.
AFFILIATION: Department of the Army, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Landreth, R.E.
77 FUNDING: Environmental Protection Agency FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To determine the ability of soils to meet solid and hazardous waste landfill cover material performance criteria.
APPROACH: The work is progressing in two phases. In Phase I, WES is reviewing the literature and is making on-site inspections of solid and hazardous waste disposal sites in order to develop a document for planners, designers, and permit writers which would allow them to better select cover materials for disposal operations. In Phase II, reseach will be conducted to fill data gaps identified in Phase I, and to perform selected field verification studies. Current Plans: Phase I has begun. Interim reports are expected in 3/79 and 9/79. Project completion is scheduled for 9/80 with the final report published by 12/80.

PROJECT MILESTONES: (1) 09/77 IAG awarded; (2) 03/79 interim report; (3) 09/79 interim report; (4) 09/80 project completed; and (5) 12/80 final report.
KEYWORDS: SANITARY LANDFILLS;HAZARDOUS MATERIALS;WASTE MANAGEMENT;ENVIRONMENTAL IMPACTS;SOILS;SOIL MECHANICS;SOLID WASTES;PERFORMANCE;DATA COMPILATION;WASTE DISPOSAL;EVALUATION;PLANNING;ENVIRONMENTAL ENGINEERING;POLLUTION REGULATIONS;BACKFILLING;REFUSE DERIVED FUELS

<070909>
TITLE: Capturing the Sun Through Bioconversion
PROJECT NUMBER: C624B-7201
PRINCIPAL INVESTIGATOR: Schauffler, P.;Clemons, C.A.
AFFILIATION: Executive Office of the President, Washington, D.C. (USA). Energy Policy and Planning
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Clemons, C.A.
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: SOLAR/Biomass (100%)
PROJECT DESCRIPTION: To provide coordination for a conference on bioconversion, with a review of how biomass is converted into natural gas, alcohols, oils, solid fuels, animal feeds, human foods, fertilizers, and industrial chemicals. Production, collection, and conversion costs, both economic and environmental, and how bioconversion fits into the world's search for supplements to fossil and nuclear fuels will be considered.
APPROACH: Organization of a conference to be held in Washington, D.C., March 10-12, 1976. Conference was held and proceedings have been published.
PROJECT MILESTONES: 03/76 Conference.
KEYWORDS: ANAEROBIC DIGESTION;BIOCONVERSION;BIOCHEMISTRY;BIOMASS;MEETINGS;FOSSIL FUELS;NATURAL GAS;ALCOHOLS;PETROLEUM;SOLID FUELS;ANIMALS;HUMAN POPULATIONS;FOOD;FERTILIZERS;ELEMENTS;ECONOMICS;COST;ENERGY CONVERSION;TECHNOLOGY ASSESSMENT;ENVIRONMENTAL IMPACTS;BIOSYNTHESIS

<070910>
TITLE: Beneficial Use of Sludge as a Fertilizer and Soil Conditioner on Agricultural Land
PROJECT NUMBER: C611B-7059
PRINCIPAL INVESTIGATOR: Larson, W.E.;Dowdy, R.H.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Dotson, G.K.
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The objective is to identify safe, efficient, practical methods of applying sewage sludge to land in harmony with agricultural usage while controlling pollution of surface and groundwater by a program of soil and water management.
APPROACH: A 40 acre watershed has been prepared with terraces, underdrains, and other conservation practices. Subwatersheds with various management systems are being compared to identify land management appropriate for sludge application sites. Corn silage grown on sludge-treatment fields will be fed to milk goats and lambs. Milk from the goats and tissues from the lambs will be analyzed to determine changes in concentrations of metals, etc., caused by using sludge on land. The health and efficiency of the animals will also be determined.
PROJECT MILESTONES: (1) 06/78 Interim funding, (2) 03/80 project completion, and (3) 07/80 final report.
KEYWORDS: SLUDGES;WASTE PRODUCT UTILIZATION;FERTILIZERS;SOIL MECHANICS;SOILS;LAND USE;AGRICULTURE;ENVIRONMENTAL IMPACTS;GOATS;FOOD CHAINS;TOXIC MATERIALS;MINERAL CYCLING;ENVIRONMENTAL TRANSPORT;METALS;MILK;MAIZE;TRACE AMOUNTS;SOIL CONSERVATION;SHEEP;TISSUE DISTRIBUTION

<070911>
TITLE: Demonstrate and Evaluate Reclamation, Stabilization and Erosion Control of Strip Mined Land for Agricultural Use Using Municipal Sewage Sludge
PROJECT NUMBER: C611B-7060
PRINCIPAL INVESTIGATOR: Sopper, W.
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Dotson, G.K.
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: (1) To determine the feasibility of using municipal sewage sludge to reclaim and vegetate land disturbed by mining activities; (2) to evaluate methods for the processing, transportation, spreading and incorporation of the sludge into the land; (3) to demonstrate application rates that will maximize benefits to soils, improve water quality, and make lands agriculturally productive; (4) to evaluate the effect of varied sludge applications on vegetation establishment and growth (grass, legume and tree species), including foliar analysis to determine nutrient uptake and potential heavy metal toxicity; (5) to evaluate the effect of the sludge applications on the chemical quality of percolating recharge water; (6) to determine the degree of site amelioration resulting from the sludge application by monitoring physical and chemical changes of the surface spoil or refuse material; and (7) to evaluate the effect of the sludge application on the quality of the groundwater and/or the quality of the nearest receiving stream and/or surface water runoff by a monitoring program. The proposed project contains three phases. Phase I is concerned with the processing of sewage sludge at the sewage treatment plant an its transport to and delivery at the strip mine sites. Phase II concerns the application of the sludge to the land and the revegetation measures necessary to return the land to productive use. Phase III is project evaluation.
PROJECT MILESTONES: (1) 07/76 Project start and (2) 11/79 Final report published.
KEYWORDS: LAND RECLAMATION;SURFACE MINING;SOIL CONSERVATION;EROSION;STABILITY;MUNICIPAL WASTES;WASTE PRODUCT UTILIZATION;SEWAGE SLUDGE;WASTE MANAGEMENT;AGRICULTURE;WATER POLLUTION ABATEMENT;REVEGETATION;PLANT GROWTH;CULTIVATION TECHNIQUES;LAND POLLUTION ABATEMENT;SOIL CHEMISTRY;SPOIL BANKS;ENVIRONMENTAL IMPACTS;GROUND WATER;SURFACE WATERS;MONITORING

<070912>
TITLE: Studies of Existing Land Application Systems
ECT NUMBER: C611B-7067
CIPAL INVESTIGATOR: Ryan, J.A.;Dotson, G.K.
FFILIATION: Municipal Environmental Research Lab., Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Ryan, J.A.
77 FUNDING: Environmental Protection Agency FY77:$19,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: Documentation of the impact of existing land application practices on the metals content of the soils and the quality of the crop produced.
APPROACH: Samples of the current sewage sludge, sewage sludge amended soils, control soils, and crops produced on the systems have been sampled and are being analyzed.
RESULTS: Information on the length of time the site has been used, amount of sludge applied/unit time, kinds of records kept, methods of application has been accumulated. At selected sites field plots will be established on control and sewage amended soils.
PROJECT MILESTONES: (1) 09/74 Project start; (2) 12/76 interim report; (3) 09/78 project complete; and (4) 03/79 final report.
KEYWORDS: LAND USE;METALS;QUALITY CONTROL;CROPS;SEWAGE SLUDGE;SOIL CONSERVATION;WASTE PRODUCT UTILIZATION;SOIL CHEMISTRY;SOIL MECHANICS;AGRICULTURE;CHEMICAL ANALYSIS;ENVIRONMENTAL IMPACTS;SOILS;FERTILIZATION;MINERAL CYCLING;WASTE WATER;TECHNOLOGY ASSESSMENT;WASTE DISPOSAL

<070913>
TITLE: Effect of Soil Properties and Previous Metal Additions on the Solubility of Metals
PROJECT NUMBER: C611B-7068
PRINCIPAL INVESTIGATOR: Ryan, J.A.;Dotson, G.K.
AFFILIATION: Municipal Environmental Research Lab., Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Ryan, J.A.
77 FUNDING: Environmental Protection Agency FY77:$19,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: Determine the effect of soil properties on the solubility (plant availability) of selected heavy metals (Cd, Cu, Zn, Ni, Pb). Determine the effect of previous metal additions upon the solubility of current metal additions.
APPROACH: Matched pairs of soil samples from control and sludge amended soils are being collected.
RESULTS: The samples will be utilized in metal fractionation and greenhouse experiments.
PROJECT MILESTONES: (1) 01/75 Project start; (2) 06/77 interim report; (3) 09/78 project complete; and (4) 03/79 final report.
KEYWORDS: SOIL CHEMISTRY;SOIL MECHANICS;METALS;ADDITIVES;SOLUBILITY;NUTRIENTS;PLANTS;CADMIUM;COPPER;ZINC;NICKEL;LEAD;SEWAGE SLUDGE;SOIL CONSERVATION;AGRICULTURE;WASTE PRODUCT UTILIZATION;ENVIRONMENTAL IMPACTS;GREENHOUSES;CHEMICAL ANALYSIS;UPTAKE;ENVIRONMENTAL TRANSPORT;MINERAL CYCLING;TECHNOLOGY ASSESSMENT

<070914>
TITLE: User Acceptance of Wastewater Sludge Compost
PROJECT NUMBER: C611B-7077
PRINCIPAL INVESTIGATOR: Ettlich, W.F.;Lewis, A.E.
AFFILIATION: Culp, Wesner, and Culp, El Dorado Hills, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Stern, G.
77 FUNDING: Environmental Protection Agency FY77:$2,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: This study had the overall objective of determining user acceptance of wastewater sludge compost.
RESULTS: The task is completed and the final manuscript is in the process of being published.
PROJECT MILESTONES: (1) 08/75 Starting date. (2) 07/77 Estimated completion date--report in publication.
KEYWORDS: WASTE WATER;WASTE PROCESSING;SLUDGES;COMPOSTING;ECONOMICS;DESIGN;PERFORMANCE

<070915>
TITLE: High Energy Electron Irradiation of Wastewater Liquid Residuals
PROJECT NUMBER: C611B-7078
PRINCIPAL INVESTIGATOR: Trump, J.G.
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Stern, G.
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: A technical and economic feasibility of disinfecting liquid municipal wastewater residuals with high energy electrons is being evaluated at the Deer Island Wastewater Plant of the Metropolitan District Commission (Boston). The objectives of the overall research program at Deer Island with supporting laboratory studies at MIT is not only the evaluation of the technical and economic feasibility of disinfecting liquid waste residuals but also the investigation of high energy electrons for modifying dewaterability and oxidation state of metals in the liquid waste residuals. The specific research supported by EPA is the chemical studies involving the influence of high energy electron irradiation treatment of sludges for: (1) sedimentation and dewatering effects, (2) effect on metals and (3) inactivation of toxic materials.
JECT MILESTONES: (1) 01/77 Project start. (2) 03/78 Project completed. (3) 07/78 Final report published.
KEYWORDS: WASTE WATER;FEASIBILITY STUDIES;MUNICIPAL WASTES;DISINFECTANTS;RADIOSTERILIZATION;ELECTRONS;IRRADIATION;SLUDGES;SLURRIES;SEDIMENTS;WATER REMOVAL;METALS;TOXIC MATERIALS;PHYSICAL RADIATION EFFECTS;BIOLOGICAL RADIATION EFFECTS

<070916>
TITLE: Analyses for Sludges for Helminth Ova (Ascaris)
PROJECT NUMBER: C611B-7079
PRINCIPAL INVESTIGATOR: Kaneshiro, E.
AFFILIATION: Cincinnati Univ., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Stern, G.
77 FUNDING: Environmental Protection Agency FY77:$11,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The basic purpose of this contract is to engage the University of Cincinnati as a service laboratory for analyzing sludges (submitted by the EPA project officer) for Ascaris. However, because of the nature of sludge, the work (through the efforts of the Principal Investigator and her laboratory) also includes developing an improved method for determining the quantity and viability of Ascaris in the sludge samples.
PROJECT MILESTONES: (1) 06/76 Starting date. (2) 10/77 Completion date.
KEYWORDS: SLUDGES;HEALTH HAZARDS;HELMINTHS;OVA;POPULATION DYNAMICS;BIOASSAY;CHEMICAL ANALYSIS

<070917>
TITLE: Microbiological Study of Sludge Composting in Southern California
PROJECT NUMBER: C611B-7080
PRINCIPAL INVESTIGATOR: Selna, M.;Miele, R.P.;Smith, D.L.
AFFILIATION: Los Angeles County Sanitation District, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Stern, G.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: This study is a task under Contract 14-12-150 with the Country Sanitation Districts of Los Angeles County. Dr. Irvin Kugelman is Project Officer for the contract. The first part of the study was the evaluation of windrow sludge composting of anaerobically digested sludge cake after solid bowl centrifugation. The objective of the study was to determine the following: (1) decrease in pathogen organisms after composting, (2) decrease in moisture content after composting, (3) additional stabilization of the sludge cake and (4) the turning frequency needed to achieve the most optimum effect for (1), (2), and (3). In February 1977, second stage basket-type centrifuges were put on stream to further centrifuge (increase total solids capture) the centrate from the solid bowl centrifuge. The study was expanded to include the effect of the 2-stage centrifuge sludge cake on windrow sludge composting efficiency.
PROJECT MILESTONES: (1) 03/76 Project start. (2) 03/78 Project completed. (3) 07/78 Final report published.
KEYWORDS: SLUDGES;COMPOSTING;MICROORGANISMS;ANAEROBIC DIGESTION;BIODEGRADATION;STABILIZATION;SOLID WASTES;ENVIRONMENTAL EFFECTS;OPTIMIZATION

<070918>
TITLE: Thermoradiation Treatment of Sewage Sludge Using Reactor Waste Fission Products (Updated NRP)
PROJECT NUMBER: C611B-7081
PRINCIPAL INVESTIGATOR: Sivinski, H.D.
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Stern, G.
77 FUNDING: Environmental Protection Agency FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/Fission (50%)
PROJECT DESCRIPTION: The objective of the research program is to constructively couple two environmental problems, disinfection and treatment of sewage sludge and disposal of nuclear waste materials. Successful coupling could lead to a mutually beneficial solution, the utilization of nuclear waste products in the disinfection and treatment of digested municipal sewage sludge, sludge cake and sludge compost.
APPROACH: Experimental studies are being conducted on a 160 ml batch basis with Co60 and Cs137 and also on a 1 to 2 liter dynamic system (heat and radiation pulse in a single flow-thru system) on thermoradiation and irradiation disinfection of liquid digested sludge.
RESULTS: The end result of this phase of study will be the design of a 40,000 gpd pilot unit. Preliminary cost studies show that the cost of gamma irradiation significantly decreases as the solid content of the sludge increases. Thus, batch type studies are being conducted on gamma irradiation of sludge cake and sludge compost. A pilot unit for gamma irradiation of sludge cake and sludge compost is currently being constructed.
PROJECT MILESTONES: (1) 03/75 Project start. (2) 12/76 Continuation funding. (3) 12/77 Continuation funding. (4) 02/78 Completion of study.
KEYWORDS: FISSION PRODUCTS;SEWAGE SLUDGE;IRRADIATION;RADIOSTERILIZATION;WASTE PRODUCT UTILIZATION;ENVIRONMENTAL EFFECTS;MICROORGANISMS;COBALT 60;MUNICIPAL WASTES;DISINFECTANTS;CESIUM 137;WASTE DISPOSAL;GAMMA RADIATION;BIOLOGICAL RADIATION EFFECTS;PILOT PLANTS

<070919>
TITLE: Removal of Organics Using Oxidants
PROJECT NUMBER: C614-7141
PRINCIPAL INVESTIGATOR: Carswell, J.K.;Love, O.T.
AFFILIATION: Municipal Environmental Research Lab., Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Carswell, J.K.
77 FUNDING: Environmental Protection Agency FY77:$39,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this project is to study the use of oxidants (principally ozone and chlorine dioxide) to remove or reduce the concentrations of general organic parameters and specific organic compounds in drinking water and to identify the oxidation products resulting from the use of such oxidants.
APPROACH: Both bench and pilot-scale research are being used to achieve the project's objectives.
RESULTS: To date, the ability of both ozone and chlorine dioxide to removal trihalomethanes and/or their precursors has been studied and reported. Current efforts involve the use of ozone in combination with a

granular-activated carbon filter to promote increased bed life for the removal of total organic carbon and trihalomethane formation potential from drinking water.
PROJECT MILESTONES: (1) 12/72 Start study of the effectiveness of ozone for organics removal. (2) 07/74 Publish report on Alron Ozonator for NSF. (3) 11/76 Interim report published.
KEYWORDS: OZONE;CHLORINE OXIDES;REMOVAL;DRINKING WATER;ORGANIC HALOGEN COMPOUNDS;DISINFECTANTS;PURIFICATION;CLEANING

<070920>
TITLE: Cost of Water Utility Management
PROJECT NUMBER: C614-7143
PRINCIPAL INVESTIGATOR: Clark, R.M.;Gillean, J.I.;Adams, K.S.
AFFILIATION: ACT Systems, Inc., Winter Park, Fla. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Clark, R.M.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The object of this research is to carefully explore costs associated with water supply and water utility management on a case study basis.
APPROACH: In the first phase of the effort, data were collected from 12 water utilities (at last one in each EPA region) over a period of two years. These data have been analyzed and a report developed. Most of the utilities investigated during the first phase were large water producers (85 mgd). It was decided to specifically investigate costs associated with small water supplies and the project was extended to examine (on the same basis) 30 small water utilities located in EPA regions III, V, and VI. These data are currently being analyzed.
RESULTS: A draft report has been prepared on the first phase of this project.
PROJECT MILESTONES: 11/77 Publish report on the cost of water supply utility management basis.
KEYWORDS: WATER QUALITY;MANAGEMENT;COST;ECONOMICS;WATER REQUIREMENTS;POLLUTION CONTROL AGENCIES

<070921>
TITLE: Chlorination of Aquatic Humic Substances
PROJECT NUMBER: C614-7173
PRINCIPAL INVESTIGATOR: Christman, R.F.
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Stevens, A.A.
77 FUNDING: Environmental Protection Agency FY77:$112,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objectives of this research project are to (a) establish the relative contribution to total trihalomethane production of natural aqueous humic material in waters from different sources, (b) characterize the chemical nature of the reactions that occur between aqueous humic materials and chlorine, and (c) assess the water treatment implications of prechlorination of humic-containing waters with respect to the formation of trihalomethanes and other chlorinated organic species.
APPROACH: The experimental approach includes laboratory studies and GC/MS identification of reaction products with different natural humic waters and various model humic structures. A wide range of model organic compounds representative of natural humic material will be chlorinated over a range of pH, chlorine to carbon ratios, and temperatures representative of conditions in water treatment plant operations. Trihalomethanes and total organic chlorine concentrations will be measured. Humic fractions extracted from raw water supplies will also be chlorinated, in the presence and absence of surfaces and treated in the same manner as the model compounds.
PROJECT MILESTONES: (1) 06/76 Grant awarded; (2) 07/77 interim report; (3) 07/78 interim report; (4) 04/79 project completed; and (5) 10/79 final report published.
KEYWORDS: CHLORINATION;ENVIRONMENTAL IMPACTS;ORGANIC CHLORINE COMPOUNDS;CHLORINATED ALIPHATIC HYDROCARBONS;GAS CHROMATOGRAPHY;MASS SPECTROSCOPY;HUMUS;AQUEOUS SOLUTIONS;WATER;ORGANIC HALOGEN COMPOUNDS;AQUATIC ECOSYSTEMS;CHEMICAL REACTION KINETICS;WATER TREATMENT PLANTS;CHLORINE;ECOLOGICAL CONCENTRATION

<070922>
TITLE: Study Formation of Organic Byproducts of Disinfection
PROJECT NUMBER: C614-7176
PRINCIPAL INVESTIGATOR: Stevens, A.A.
AFFILIATION: Municipal Environmental Research Lab., Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Stevens, A.A.
77 FUNDING: Environmental Protection Agency FY77:$39,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives are to identify potentially hazardous byproducts of disinfection practice in benchscale studies and elucidate possible routes for control of these byproducts during treatment. The study is currently placing heavy emphasis on the formation and control of trihalomethanes during chlorination as well as identification of byproducts of ClO2 application. Studies will continue into an investigation of other chlorinated byproducts of chlorine disinfection plus a future investigation of ozonation byproducts.
PROJECT MILESTONES: (1) 01/75 Start study of trihalomethane formation; (2) 11/75 national organics reconnaisance survey report published; (3) 04/76 start study of ClO2 disinfection byproducts; (4) 04/76 start study of Cl2 disinfection byproducts; (5) 12/76 report published on factors influencing trihalomethane; (6) 04/78 report published on ClO2 byproducts; and (7) 04/78 report published on non-trihalomethane byproducts of Cl2.
KEYWORDS: BENCH-SCALE EXPERIMENTS;DISINFECTANTS;ENVIRONMENTAL IMPACTS;CHLORINATION;ORGANIC HALOGEN COMPOUNDS;ORGANIC CHLORINE COMPOUNDS;CHEMICAL REACTION KINETICS;OZONE;BY-PRODUCTS;CHLORINATED ALIPHATIC HYDROCARBONS;WATER

<070923>
TITLE: Neutralization of Inoperative Waste Disposal Sites
PROJECT NUMBER: C618A-7016
PRINCIPAL INVESTIGATOR: Emrich, G.H.
AFFILIATION: Martin (A.W.) Associates, Inc., King of Prussia, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Sanning, D.A.
77 FUNDING: Environmental Protection Agency FY77:$190,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of the proposed study is to verify the effectiveness of existing technologies to neutralize/deactivate an industrial, hazardous and/or municipal solid waste disposal site. This study, to develop and implement a neutralization system at an inoperative waste disposal site, will be conducted in three phases.
APPROACH: In Phase I, Feasibility Study, Martin will determine the present state-of-the-art for neutralization of waste disposal sites and investigate five candidate sites for neutralization. Three of these sites will be studied in detail. On the basis of the data collected in these studies, one site will be selected for further detailed work and implementation of a neutralization system. A detailed hydrogeologic investigation will be conducted at the selected site during which monitoring wells will be drilled, water samples will be collected and analyzed, and soil samples will be tested. The hydrologic setting of the site will be determined. Based on this information and development of the state-of-the-art for site neutralization, a neutralization technique(s) will be selected. Martin will then design a neutralization system as well as a monitoring network. Monitoring will be conducted at the candidate site to supply data before, during, and after the installation of the neutralization system. In Phase II, a Field Verification Study will be performed involving the implementation of the neutralization and monitoring systems, monitoring for a 28-month period, and evaluation of the results of implementation. In Phase III of this study Martin will prepare a Site Neutralization Guide which will define the strong and weak points of the neutralization operation and extrapolate their potential application to other waste disposal sites.
RESULTS: It is anticipated that this report will provide local municipalities and others with the necessary data to make sound judgements on the selection of viable neutralization procedures. Currently under way on this project is the selection of five candidate sites for initial study and the preliminary collection of data pertaining to the five sites and potential methods of neutralization.
PROJECT MILESTONES: (1) 06/78 Phase I-final report-feasibility study; (2) 03/81 Phase II-final report-verification study; and (3) 05/82 Phase II-final report-guidance manual.
KEYWORDS: NEUTRALIZATION;DISPOSAL SITES;CHEMICAL ENGINEERING;SOLID WASTES;FEASIBILITY STUDIES;TECHNOLOGY ASSESSMENT;INDUSTRIAL WASTES;HAZARDOUS MATERIALS;MUNICIPAL WASTES;WASTE DISPOSAL;SITE SELECTION;PH VALUE;WASTE MANAGEMENT;WATER;MONITORING;SANITARY LANDFILLS;CHEMICAL EFFLUENTS;DECONTAMINATION;ENVIRONMENTAL IMPACTS

<070924>
TITLE: The Development of Laboratory Test Procedures to Determine the Calorific Value of Refuse-Derived Fuels (RDF) by Bomb Calorimetry
PROJECT NUMBER: C618A-7020
PRINCIPAL INVESTIGATOR: Domalski, E.S.
AFFILIATION: Department of Commerce, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Oberacker, D.A.
77 FUNDING: Environmental Protection Agency FY77:$106,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The National Bureau of Stndards (NBS) will conduct a laboratory research program to determine whether a 25 gram capacity bomb calorimeter can provide calorific values which accurately represent a large array of RDF.
APPROACH: The research program will include investigations of refuse size-reduction, processing, testing methods, and data collection from both conventional and larger-sized calorimeters.
RESULTS: A final report, written by NBS, will result from the study.
PROJECT MILESTONES: (1) 05/77 Project start; (2) 09/77 complete small calorimeter tests; (3) 10/77 complete larger (25 gm) unit; (4) 08/79 complete project; (5) 10/79 final draft report submitted; and (6) 03/80 final report published.
KEYWORDS: US NBS;CALIBRATION STANDARDS;STANDARDIZATION;CALORIFIC VALUE;SYNTHETIC FUELS;CALORIMETRY;CALORIMETERS;PERFORMANCE TESTING;BIOCONVERSION;WASTE PRODUCT UTILIZATION;REFUSE DERIVED FUELS

<070925>
TITLE: Effect of Moisture Regimen on Solid Waste Stabilization
PROJECT NUMBER: C618A-7029
PRINCIPAL INVESTIGATOR: Chian, E.S.
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Brunner, D.R.
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The objectives of this study are to determine gas production rates and total quantities from municipal refuse maintained at different steady state moisture conditions, to determine gas production rates and total quantity of gas produced from municipal refuse under transient conditions of moisture content, increase simulating net infiltration at landfill sites, and to determine the quantity of organic matter in leachate draining from the municipal refuse.
APPROACH: A series of modified 55-gallon drums containing shredded municipal refuse serve as the landfill models. Special features include provision for gas and leachate collection, temperature monitoring, uniform water distribution, and self containment for weighing. Four different steady state moisture conditions and three different transient moisture loading rates are to be studied. Additionally, two different ambient temperatures are to be studied. Gas and leachate composition and volumes and refuse temperature are to be monitored.
RESULTS: An interim report describing construction and initial refuse decomposition will be followed by a final report which summarizes the 2 year study. Results will be evaluated to determine the municipal refuse decomposition rates and to quantitatively establish the effect of moisture on the decomposition

rate. This information, although obtained on bench scale, should provide valuable basic data for evaluating the performance of field landfills and for development of a model to predict the potential leachate and gas discharges from municipal refuse.
)JECT MILESTONES: (1) 11/76 Annual report and (2) 12/77 final report.
'WORDS: SOLID WASTES;STABILIZATION;MOISTURE;MUNICIPAL WASTES;GASES;LEACHING;CHEMICAL PROPERTIES;ENVIRONMENTAL IMPACTS;WASTE DISPOSAL;SANITARY LANDFILLS;BIODEGRADATION

<070926>
TITLE: Study of Vegetation Problems Associated With Refuse Landfills
PROJECT NUMBER: C618A-7030
PRINCIPAL INVESTIGATOR: Flower, F.B.
AFFILIATION: Rutgers--the State Univ., New Brunswick, N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Landreth, R.E.
77 FUNDING: Environmental Protection Agency FY77:$39,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To evaluate the cause and effect relationship of refuse landfill gases on surrounding landfill vegetation by performing field and laboratory studies.
APPROACH: The first year's effort included a comprehensive literature survey resulting in findings that minimal data exist on the subject. Also, a mail survey conducted during the first year indicated that most of the problems were identified in the Eastern part of the United States. A comprehensive laboratory and field evaluation program with selected vegetation is planned for the second year.
RESULTS: The results will be combined to develop a design manual for the utilization of appropriate vegetative cover for landfills.
PROJECT MILESTONES: (1) 01/75 Grant awarded; (2) 08/76 interim report; (3) 05/78 project completed; and (4) 09/78 final report.
KEYWORDS: SANITARY LANDFILLS;ENVIRONMENTAL IMPACTS;PLANTS;NUTRIENTS;DATA COMPILATION;REVEGETATION;LAND RECLAMATION;PREFERRED SPECIES

<070927>
TITLE: Use of Simulation for Characterizing Transport in Soils Adjacent to Land Disposal Sites
PROJECT NUMBER: C618A-7031
PRINCIPAL INVESTIGATOR: Pinder, G.F.;Saukin, W.P.
AFFILIATION: Princeton Univ., N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Roulier, M.H.
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Develop and test a simulation technique for predicting the movement of nonconservative solutes in saturated and unsaturated soils.
APPROACH: An existing digital computer, Galerkin-finite element, transient, two-dimensional, cross-sectional, saturated flow, conservative solute model is being modified to describe movement of a single, non-conservative solute in both saturated and unsaturated soils in large, three-dimensional systems. The model will be field tested using contaminant monitoring data from an existing landfill or other land disposal site.
RESULTS: Solute movement problems having exact solutions were solved using a finite difference procedure and a Galerkin finite element procedure to calculate the derivatives of concentration and velocity with respect to distance and a third order correct finite difference procedure to calculate the time derivatives. For the Galerkin finite element procedure the following were tested as basis functions: first and second order continuous Hermitean polynomials and zero order continuous linear, quadratic, and cubic functions. Comparison of the results of these various calculations with the exact solutions showed that the Galerkin finite element procedure using first and second continuous Hermitean polynomials as basis functions provided the most satisfactory combination of accuracy and computational efficiency, particularly for larger values of the time step, node spacing, and dispersion coefficient. Because the first derivatives of Hermitean polynomials are continuous at element boundaries, use of these polynomials allows calculation of a continuous flow field and helps to minimize solute mass balance errors which may occur with other methods. Future work will modify the model to account for adsorption/decay of single, non-conservative solutes and will test the model with data from an existing landfill.
PROJECT MILESTONES: (1) 11/75 Project start and (2) 02/78 project completion.
KEYWORDS: SOILS;MINERAL CYCLING;ENVIRONMENTAL TRANSPORT;BIOLOGICAL MODELS;SANITARY LANDFILLS;WASTE DISPOSAL;TWO-DIMENSIONAL CALCULATIONS;WASTE DISPOSAL;ENVIRONMENTAL IMPACTS;MATHEMATICAL MODELS;SIMULATION;SOLUTIONS;SATURATION

<070928>
TITLE: Hazardous Waste Sampling, Analysis, and Compatibility Study
PROJECT NUMBER: C618A-7037
PRINCIPAL INVESTIGATOR: Stephens, R.D.;Storm, D.L.
AFFILIATION: California Dept. of Health, Berkeley (USA). Air and Industrial Hygiene Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Carnes, R.A.
77 FUNDING: Environmental Protection Agency FY77:$211,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The overall objectives of this research program are to investigate procedures for sampling, classifying, analyzing, and handling hazardous wastes.
APPROACH: A series of procedural field manuals will result from this program that will be primarily directed to persons who are responsible for sampling, handling, and disposing of hazardous wastes.
?SULTS: The information and knowledge generated by this program provide vitally needed guidelines for hazardous waste handlers and establish base-line data for the development and refinement of future state and federal hazardous waste management regulations.
PROJECT MILESTONES: (1) 06/77 Hazardous waste compatibility overview. (2) 12/79 User manuals published.
KEYWORDS: HAZARDOUS MATERIALS;SAMPLING;CHEMICAL ANALYSIS;REVIEWS;CLASSIFICATION;MANUALS

<070929>
TITLE: Detection, Occurrence, Characterization, and Persistence of Microbes in Landfill Leachates
PROJECT NUMBER: C618A-7038
PRINCIPAL INVESTIGATOR: Scarpino, P.V.
AFFILIATION: Cincinnati Univ., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Brunner, D.R.
77 FUNDING: Environmental Protection Agency FY77:$58,000
TECHNOLOGY: FOSSIL FUEL/General (100.%)
PROJECT DESCRIPTION: The objective of this project is to determine the health and environmental significance of the persistence of fecal streptococci found in leachate from landfill municipal refuse. The project will consist of two phases.
APPROACH: The initial phase will verify microbial analytical methods and determine the presence of study organisms in a variety of leachates. Samples of leachate from different sources of landfilled waste representing different stages of waste decomposition (age of landfill) and different operational conditions (batch versus continuous disposal, controlled versus natural moisture infiltration) will be assayed for microbial and chemical content. Microbial assays will include total aerobic and anaerobic plate counts, indicators of fecal pollution, selected bacterial pathogens (e.g., Salmonella, Shigella, Klebsiella, and Mycobacteria) and anaerobes (e.g., Clostridia) and the major fungi of pathogenic significance. Chemical analyses will be used to describe the leachate environment. The second phase will study the relationship between the extent of waste decomposition and the microbial population dynamics. Three experimental landfills (specially constructed 55-gal. drums) containing municipal refuse, municipal refuse and sewage sludge, and hospital waste will be constructed and operated at 16" of net infiltration per year. Leachates will be assayed bi-weekly initially and less frequently as the rate of population changes decreases.
RESULTS: An assessment of the health significance of the continued leaching of fecal streptococci and determination of the presence of pathogens in a variety of leachates will be made in the final report.
PROJECT MILESTONES: 09/79 Final report.
KEYWORDS: MICROORGANISMS;SANITARY LANDFILLS;HEALTH HAZARDS;MONITORING;STREPTOCOCCUS;LEACHING;MUNICIPAL WASTES;BACTERIA;NUTRIENTS;CHEMICAL ANALYSIS;POPULATION DYNAMICS

<070930>
TITLE: Preparation of Appendix H for Areawide Assessment Procedures Manual
PROJECT NUMBER: C619A-7135
PRINCIPAL INVESTIGATOR: Patterson, K.
AFFILIATION: Weston (Roy F.), Inc., West Chester, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Smith, R.
77 FUNDING: Environmental Protection Agency FY77:$22,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: This appendix will contain cost relationships for most of the conventional and advanced treatment processes and treatment systems. These relationships are generalized and are to be used in 208 planning studies. This appendix is essentially completed and will be published within one or two months.
KEYWORDS: MANUALS;PLANNING;ENVIRONMENT;MANAGEMENT;COST;WATER POLLUTION ABATEMENT;AIR POLLUTION ABATEMENT;LAND POLLUTION ABATEMENT;TECHNOLOGY ASSESSMENT

<070931>
TITLE: Evaluation of Ames Solid Wastes Resources--An Energy Recovery System
PROJECT NUMBER: C624-7210
PRINCIPAL INVESTIGATOR: Chantland, A.O.
AFFILIATION: Iowa State Univ. of Science and Technology, Ames (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Wiles, C.C.
77 FUNDING: Environmental Protection Agency FY77:$250,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The study will assess the effects of using municipal solid waste as a supplementary fuel.
APPROACH: Co-firing of MSW with coal in stoker and tangentially fired boilers will be conducted and since one boiler is the same as at St. Louis, studies will permit confirmation, and comparison of selected St. Louis results. Assessments will be made of the technical and environmental aspects of these co-firing techniques. In addition, technical and economic tests and evaluations will be conducted on the second generation MSW processing facility associated with supplying the refuse derived fuel.
PROJECT MILESTONES: (1) 04/77 First annual report (draft) on Ames System; (2) 07/77 report published; (3) 04/78 2nd year report on process studies and environmental impacts; and (4) 02/79 project completed.
KEYWORDS: SOLID WASTES;AMES LABORATORY;TECHNOLOGY ASSESSMENT;MATERIALS RECOVERY;MUNICIPAL WASTES;WASTE PROCESSING;COAL;BOILER FUEL;STOKERS;COMPARATIVE EVALUATIONS;REFUSE DERIVED FUELS;ENVIRONMENTAL IMPACTS;ECONOMICS;BOILERS;COMBUSTION PROPERTIES;COMBUSTION;FURNACES

<070932>
TITLE: Evaluation of Selected Biodegradation Techniques and/or Ultimate Disposal of Organic Materials
PROJECT NUMBER: C618A-7203
PRINCIPAL INVESTIGATOR: Hansen, W.;Schmidt, C.;Lofy, R.;Mang, J.;Newkirk, D.;Laconde, K.;Rishel, H.;Schmidt, M.
AFFILIATION: Stearns, Conrad, and Schmidt Consulting Engineers, Inc., Long Beach, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Municipal Environmental Research Laboratory
MONITOR: Rogers, C.J.
TYPE OF FUNDING: EPA pass-thru funding-68-03-2475
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The primary objective of the proposed work is to prepare a comprehensive report informing industrial and municipal engineers about applications of accelerated biodegradation for treating organic industrial and/or hazardous wastes by methods other than lagooning or land-spreading.
APPROACH: The report will identify innovations which enhance biodegradation and describe how these technologies may be applied to existing plant facilities or utilized in the design of package treatment

plants. Study observations will include analyses of biological-sludge disposal problems, the potential generation of toxic or carcinogenic metabolites, and operational costs. Classes of wastes considered during the study will include, but will not be limited to: pesticides, paint sludges, solvents, lead sludges, chemical toilet wastes and oily sludges. Wastes will be identified which are not amenable to biodegradation or which must first be chemically altered before being applied to biological systems. The study will encompass a literature review, site investigations, and engineering and economic analyses of treatment plant designs and operation. A detailed questionnaire will be used to elicit information from plant operators. From this information, specific sites will be selected and studied in detail.
PROJECT MILESTONES: (1) 09/76 Contract award. (2) 02/77 Interim report--3 existing biodegradation processes. (3) 10/77 Interim report--chemicals effectively destroyed by biodegradation. (4) 02/78 Demonstration of practical system for hazardous chemical destruction. (5) 03/79 Project completed. (6) 00/79 Final report.
KEYWORDS: BIODEGRADATION;ORGANIC COMPOUNDS;HAZARDOUS MATERIALS;MUNICIPAL WASTES;INDUSTRIAL WASTES;WASTE DISPOSAL;WASTE PROCESSING;WASTE PROCESSING PLANTS;DESIGN

<071001>
TITLE: Air Exposures and Their Effects--Refinement of Public Health Risk Assessment on Regulated and Nonregulated Transportation Pollutants
PROJECT NUMBER: D601B-1
PRINCIPAL INVESTIGATOR: Clarke, N.A.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hinners, R.G.
77 FUNDING: Environmental Protection Agency FY77:$750,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To construct, operate and maintain an automotive engine-dynamometer and animal exposure chamber system for conducting animal studies.
APPROACH: Determine components of atmospheres containing pollutants from automotive catalyst emissions through measurement by methods and instruments adapted to the nature of the components. These components will be measured as required during the animal exposure studies.
RESULTS: Exposures of animals in current study were initiated in August 1976 and will be terminated in 1977.
PROJECT MILESTONES: 08/76 Initiate animal exposures-catalytic converter. 04/77 Complete animal exposures-catalytic converter. 12/77 Complete data analysis and report.
KEYWORDS: AIR POLLUTION;PUBLIC HEALTH;RISK ASSESSMENT;TRANSPORTATION SYSTEMS;EXHAUST GASES;ENVIRONMENTAL IMPACTS;CATALYTIC CONVERTERS;AUTOMOBILES;ANIMALS;HEALTH HAZARDS

<071002>
TITLE: Air Exposures and Their Effects--Refinement of Public Health Risk Assessment on Regulated and Nonregulated Transportation Pollutants
PROJECT NUMBER: D601B-2
PRINCIPAL INVESTIGATOR: Clarke, N.A.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Moore, W.
77 FUNDING: Environmental Protection Agency FY77:$750,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This is a multidisciplinary research program focusing on the public health consequences of regulated and nonregulated pollutants from mobile sources. To determine the biological effects of inhalation exposure to total emissions from automotive engines equipped with catalytic converters.
APPROACH: The major emphasis of the research approach will be in evaluating the major target organ--the lungs. (a) evaluate pulmonary function in animals exposed to the exhaust. Measurements include such parameters as respiratory rate, pulmonary compliance, pulmonary resistance expiratory flow rates, CO2, O2 and heart rate. (b) Assess effects of exposure on susceptibility to respiratory infection by pathogenic microbes. (c) Pathological assessment of lungs and other selected tissues. (d) Neurophysiological and behavioral tests including activity, food and water consumption and acid-base analysis.
RESULTS: Exposure of animals will be initiated in the Fall of 1976 and terminated in 1977.
PROJECT MILESTONES: 08/76 Initate animal exposures. 04/77 Complete animal exposures. 12/77 Complete data analysis and report.
KEYWORDS: AIR POLLUTION;TRANSPORTATION SYSTEMS;INHALATION;AUTOMOBILES;EXHAUST GASES;CATALYTIC CONVERTERS;AIR POLLUTION ABATEMENT;ENVIRONMENTAL IMPACTS;BIOLOGICAL EFFECTS;RESPIRATION;NEUROLOGY;PHYSIOLOGY;BEHAVIOR;FOOD CHAINS;WATER;ENVIRONMENTAL TRANSPORT;MINERAL CYCLING

<071003>
TITLE: Air Exposures and Their Effects--Refinement of Public Health Risk Assessment on Regulated and Nonregulated Transportation Pollutants
PROJECT NUMBER: D601B-3
PRINCIPAL INVESTIGATOR: Clarke, N.A.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Moore, W.
77 FUNDING: Environmental Protection Agency FY77:$525,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This is a multidisciplinary research program focusing on the health consequences of nonregulated pollutants from mobile sources. This research program is designed to provide information on the biological effects in laboratory animals of inhalation exposure to sulfuric acid and other nonregulated pollutants.
APPROACH: (1) Evaluate pulmonary function in laboratory animals following exposure to ultrafine sulfuric acid measurements will include such parameters as respiratory rate, pulmonary compliance, pulmonary resistance, expiratory flow rates, PCO2, PO2 and heart rate. (2) Assess effects of exposure to ultrafine sulfuric acid on susceptibility to respiratory infection by pathogenic microbes including recovery time. (3) Assess early biochemical lesions (lung enzymes) due to exposures including metal sulfates and other emission associated metals such as manganese. (4) Histopathological assessment of lungs and other selected tissues from exposed animals.

PROJECT MILESTONES: 08/77 Develop ultrafine aerosol generator. 12/77 Initiate animal exposures. 12/78 Analysis of data. 08/79 Report.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;RISK ASSESSMENT;TRANSPORTATION SYSTEMS;ANIMALS;AEROSOL GENERATORS;DATA ANALYSIS;LUNGS;INHALATION;CHRONIC INTAKE;SULFURIC ACID;PATHOLOGICAL CHANGES;SULFATES;METALS;MANGANESE;TOXICITY;EXHAUST GASES

<071004>
TITLE: Physiological Effects of Sulfuric Acid and Sulfate Particulates in Rats and Guinea Pigs
PROJECT NUMBER: D601B-4
PRINCIPAL INVESTIGATOR: Cooper, G.P.
AFFILIATION: Cincinnati Univ., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Lewkash, J.P.
77 FUNDING: Environmental Protection Agency FY77:$89,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: These experiments were designed to assess the health effects of sulfuric acid and other sulfates in rats and guinea pigs.
APPROACH: A comparison will be made of the effect of H_2SO_4, $Al_2(SO_4)_3$, and $CaSO_4$ in order to assess the relative effects of acid and non-acid particulates. Exposures will last 60 days or more. Particulate concentration will be 5 mg/M3 or less and these will be examined during the final week of exposure and will include measurements of static and dynamic compliance, resistance, tidal volume, breathing rate, minute volume and diffusion capacity. Measurements will be made using both stressed and non-stressed animals. The stress may be one of several types, such as heat or forced activity. Blood acid-base analyses (pCO_2, pH, HCO_3, base excess) will be done during the final week of exposure. In addition, growth and food and water consumption will be measured in all exposures. Pregnant animals will be used in all exposures to assess any effects on reproduction and neonatal growth due to exposure.
PROJECT MILESTONES: 08/76 Award contract. 08/76 Quarterly reports begin. 12/78 Final report and publication.
KEYWORDS: SULFURIC ACID;SULFATES;AEROSOLS;PARTICLES;RATS;PHYSIOLOGY;GUINEA PIGS;AIR POLLUTION;BIOLOGICAL EFFECTS;METABOLISM;ALUMINIUM SULFATES;CALCIUM SULFATES;PH VALUE;RESPIRATION;PREGNANCY;NEONATES;REPRODUCTION;RISK ASSESSMENT;ENVIRONMENTAL TRANSPORT

<071005>
TITLE: Multi-route Exposure and Their Effects--Identification of the Health Effects of Non-Pesticide Organic and Inorganic Substances
PROJECT NUMBER: D601E-5
PRINCIPAL INVESTIGATOR: Clarke, N.A.;Moore, W.;Lewkowski, J.;Lee, S.D.;Malanchuk, M.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Moore, W.
77 FUNDING: Environmental Protection Agency FY77:$330,000
PROJECT DESCRIPTION: The objective is directed toward discerning-exposure-effects relationships between health and certain non-pesticide environmental contaminants which typically reach man by multiple routes of exposure.
APPROACH: Laboratory animals will be exposed by different routes to the pollutants and the following approach used: (1) Effects of selected non-pesticide environmental pollutants on neurophysiological and behavioral paremeters. The spontaneous electroencephalograms and evoked potential will be used initially to ascertain the effects of various pollutants. (2) Effects of selected trace metals on selected subcellular components, enzyme system and other biochemical parameters. (3) Pathological assessment of tissues from animals exposed to trace metals.
PROJECT MILESTONES: 06/76 Initiate exposures. 09/77 Interim report. 09/78 Report.
KEYWORDS: ORGANIC COMPOUNDS;INORGANIC COMPOUNDS;HEALTH HAZARDS;RISK ASSESSMENT;ENVIRONMENTAL EXPOSURE PATHWAY;ANIMALS;NEUROLOGY;PHYSIOLOGY;BEHAVIOR;TRACE AMOUNTS;METALS;ENZYMES;METABOLISM;BIOCHEMISTRY;PATHOLOGICAL CHANGES;ENVIRONMENTAL TRANSPORT;HYDROCARBONS

<071006>
TITLE: Influence of Factors Found in Hard and Soft Waters on the Development of Cardiovascular Disease
PROJECT NUMBER: D614-69
PRINCIPAL INVESTIGATOR: Douglas, B.H.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bull, R.J.
77 FUNDING: Environmental Protection Agency FY77:$197,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The purpose of the proposed study is to examine the effects on the normotensive and hypertensive experimental animal of varying calcium, magnesium, cadmium, lead, sodium and potassium in the diet. An assessment of the relative contribution of these individual factors to the development of cardiovascular disease in animals on a standard diet and on an atherogenic diet will be the prime objective.
APPROACH: Experimental animals will be subjected to variations (high or low dietary quantities) of each mineral individually with and without the atherogenic regimen.
RESULTS: The effect on vascular and organ pathology, serum and tissue electrolytes, blood pressure, and weight will be determined. The data should provide insight into the mechanism of the repeated epidemiological observation that the incidence of cardiovascular disease is negatively correlated with the hardness of drinking water.
PROJECT MILESTONES: 04/77 Start date. 03/81 Completion and final report.
KEYWORDS: DRINKING WATER;CHEMICAL COMPOSITION;CALCIUM;MAGNESIUM;CADMIUM;LEAD;SODIUM;POTASSIUM;HEALTH HAZARDS;METABOLISM;DIET;NUTRIENTS;CARDIOVASCULAR DISEASES;HYPERTENSION;ETIOLOGY;EPIDEMIOLOGY;WATER POLLUTION;BIOLOGICAL STRESS;NERVOUS SYSTEM DISEASES

<071007>
TITLE: Effects of Cadmium on Renovascular Function
PROJECT NUMBER: D614B-106
PRINCIPAL INVESTIGATOR: Heffernan, W.P.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Heffernan, W.P.
77 FUNDING: Environmental Protection Agency FY77:$15,000
PROJECT DESCRIPTION: The purpose of the project is to determine effects of cadmium on renovascular function as it relates to the Renin-Angiotensin system.
APPROACH: Efforts are directed toward developing a responsive experimental animal system in which a hypertensive response to cadmium is elicited while metabolic/alteration of the Renin-Angiotensin system is analyzed. Rats exposed to cadmium will be sacrificed and blood plasma renin activity, angiotensin I and angiotensin II concentrations will be determined by radioimmunoassay. Circulating levels of the peptides will be correlated with blood pressure.
PROJECT MILESTONES: 09/75 Modify RLA technique for rat plasma. 12/77 Complete exposure studies. 01/79 Complete project, prepare report.
KEYWORDS: CADMIUM;RATS;BLOOD PLASMA;HYPERTENSION;ETIOLOGY;TOXICITY;DRINKING WATER;RENIN;BLOOD PRESSURE;WATER QUALITY;ENVIRONMENTAL EXPOSURE PATHWAY;NERVOUS SYSTEM DISEASES;CARDIOVASCULAR DISEASES;BIOLOGICAL STRESS;HEALTH HAZARDS

<071008>
TITLE: Development of a Tissue Selective in Vivo Bioassay for Environmental Agents Producing DNA Damage
PROJECT NUMBER: D614B-44
PRINCIPAL INVESTIGATOR: Hart, R.W.;Witiak, D.T.;Koestner, A.;Lewis, N.J.;Perter, R.
AFFILIATION: Ohio State Univ., Columbus (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Garner, R.J.
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The long-term goal of this program is the development and quantitation of a rapid, inexpensive, tissue specific in vivo bioassay system for environmental carcinogens/mutagens. It is anticipated that ultimately this assay will permit the quantitative and qualitative prediction of the carcinogenic potential of various agents alone or in combination on any tissue or organ in vivo.
APPROACH: Since most carcinogens damage cellular DNA, the assay will be based on an analysis of this damage in vivo by employment of endonuclease sensitive site assays in combination with DNA molecular weight analysis (sucrose gradient sedimentation and gel electrophoresis). Quantitation of DNA will be accomplished by newly-developed, sensitive spectrofluoromatic assay. We will quantitate this assay by (1) use of 14C-labeled carcinogens of high specific activity (DMBA, BP, and ENU) to measure the extent of binding to, and removal from, DNA; and (2) by comparing the extent of DNA damage in various animals model systems with differential tissue and species sensitivities to the effects of these carcinogens. From such data, we will produce a predictive model system for the rational extrapolation of this information to carcinogenic potentials in man.
PROJECT MILESTONES: 03/79 Molecular quantitation of effects of ethyl-N-nitrosourea. 09/79 Pathology of ENU studies. 03/80 Molecular quantitation of effects of 7,12-dimethylbenzo(alpha)anthracene (DMBA). 09/80 Patholcgy of DMBA studies. 03/81 Molecular quantitation of effects of benzo(gamma)pyrene and amido. 09/81 Pathology of BP. 12/81 Completion of study: final report.
KEYWORDS: MUTAGENS;CARCINOGENS;BIOASSAY;DNA;STRAND BREAKS;ANIMAL CELLS;MOLECULAR WEIGHT;LABELLED COMPOUNDS;TRACER TECHNIQUES;CHEMICAL BONDS;SENSITIVITY;GENETIC VARIABILITY;LABORATORY ANIMALS;BIOLOGICAL EFFECTS;MOLECULAR BIOLOGY;BIOLOGICAL MODELS

<071009>
TITLE: Relevance of Drinking Water Quality to Atherosclerosis
PROJECT NUMBER: D614B-51
PRINCIPAL INVESTIGATOR: Revis, N.
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bull, R.J.
77 FUNDING: Environmental Protection Agency FY77:$165,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The relative softness (or hardness) of drinking water has been associated with hypertension. Both positive and negative correlations have been found between soft water and cardiovascular disease in human epidemiological and clinical studies. These apparent discrepancies may be explained, in part, by environmental factors (e.g., rainfall, temperature and relative humidity) which may alter the water quality. Since it is difficult to control all of these variables in humans, another approach has been proposed which involves studying the effect(s) of water quality in the development and progression of atherosclerosis in an experimental animal where the above variables can be carefully controlled. The pigeon was chosen as the experimental animal because they develop atherosclerotic lesions similar to those found in humans.
APPROACH: The experimental design involves the long-term exposure of pigeons to hard (represented by Ca and Mg) and soft (represented by Pb and Cd) drinking water for an overall timetable that consists of forty periods of four weeks. A five factoral design was chosen to best investigate the effects of any one element or diet in the etiology and/or progression of atherosclerosis in pigeons. During each period (i.e., every four weeks), 32 pigeons from eight different experimental groups will be sacrificed and the following test performed: (1) determination of the number of atherosclerotic plaques and fatty streaks in the vasculature, (2) assessment of myocardial, renal and aortic morphology, (3) determining absorption rate of exogenous lipids, (4) serum lipid determination and (5) blood and tissue levels of Pb, Cd, Ca and Mg.
PROJECT MILESTONES: 00/77 Start date. 12/77 Completion of pilot study for determination of levels to be used.

06/81 Completion of project and final report.
KEYWORDS: DRINKING WATER;HEALTH HAZARDS;RISK ASSESSMENT;HYPERTENSION;CARDIOVASCULAR DISEASES;NERVOUS SYSTEM DISEASES;EPIDEMIOLOGY;CHEMICAL COMPOSITION;ARTERIOSCLEROSIS;BIOLOGICAL STRESS;PIGEONS;CHRONIC INTAKE;CALCIUM;MAGNESIUM;LEAD;CADMIUM;METABOLISM;ETIOLOGY;MORPHOLOGICAL CHANGES;BLOOD SERUM;TISSUE DISTRIBUTION;BIOLOGICAL ACCUMULATION

<071010>
TITLE: Absorption and Distribution of Low Levels of Cadmium--A Comparison Between Water and Food
PROJECT NUMBER: D614B-53
PRINCIPAL INVESTIGATOR: Tinsley, I.J.;Whanger, P.D.
AFFILIATION: Oregon State Higher Education System, Salem (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bull, R.J.
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: We will measure the absorption and tissue distribution of cadmium in rats receiving low concentrations of 109-CdCl2 in drinking water, in a diet containing flour from wheat grown on 109-CdCl2 and in a diet containing added 109-CdCl2.
APPROACH: The influence of various factors, such as calcium, magnesium and iron in the water, and protein quality and concentration in the diet on the absorption of 109-CdCl2 from drinking water also will be assessed. We will also determine the amount of 109-Cd present in the low molecular weight cadmium binding protein from kidneys of rats receiving various concentrations of cadmium.
PROJECT MILESTONES: 12/74 Start date. 12/76 109-Cd adsorption data completed from drinking water. 12/77 Arrangements for growing 109-Cd labelled food products finalized.
KEYWORDS: RATS;METABOLISM;CADMIUM;TRACER TECHNIQUES;LABELLED COMPOUNDS;TISSUE DISTRIBUTION;DIET;INGESTION

<071011>
TITLE: Occurrence and Effects of Inorganic Contaminants in Drinking Water
PROJECT NUMBER: D614B-54
PRINCIPAL INVESTIGATOR: O Neill, J.J.
AFFILIATION: Temple Univ., Philadelphia, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bull, R.J.
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: (1) To examine the developmental aspects of the central nervous system as they relate to synaptogenesis. (2) To determine whether heavy metals such as lead, affect this normal development and thus account for the behavioral toxicology related to heavy metal poisoning. (3) To measure oxide-reduction intermediates of metabolism to determine whether heavy metals affect the ratio of oxidized to reduced nucleotides. (4) To continue studies on the proof of existence of the purine nucleotide cycle in brain tissue under the influence of elevated potassium. (5) To examine whether the proposed purine nucleotide cycle is affected by heavy metals. (6) To study the effects of heavy metals on their organic derivatives on the physiological bulk transport cations as this affects the balanced control of metabolic or important organic compounds (e.g. substrates and transmitters.)
APPROACH: A. In vivo: chronic exposure to pregnant animals initially with low levels of lead will be employed and its effects on tissue metabolism of the pregnant female will be evaluated. In addition developmental alterations in vitro in the foetal central nervous system will be studied by monitoring fine structural alterations in the spinal cord at the EM level of resolution: particular emphasis will be placed on the processes leading to synaptogenesis. In vitro studies will employ brain sections, isolated organelles and synatosomes, liver and kidney tissues; human platelets will be employed as a single cell model to further evaluate specific effects on ion transport and bioenergetics.
PROJECT MILESTONES: 04/76 Start date. 09/77 Demonstrated that Pb without observable ultrastructural effects. 04/78 Work to begin on the effects of alkyltin compounds. 04/79 Project completion.
KEYWORDS: DRINKING WATER;CHEMICAL COMPOSITION;INORGANIC COMPOUNDS;BIOLOGICAL STRESS;RISK ASSESSMENT;HEALTH HAZARDS;LEAD;METABOLISM;TOXICITY;NERVOUS SYSTEM DISEASES;ETIOLOGY;BEHAVIOR;NUCLEOTIDES;BRAIN;TISSUE CULTURES;POTASSIUM;PURINES;BIOCHEMICAL REACTION KINETICS;CHRONIC INTAKE;PREGNANCY;SPINAL CORD;LIVER;KIDNEYS

<071012>
TITLE: Effect of Environmental Contaminants of Cell Mediated Immunity
PROJECT NUMBER: D614B-55
PRINCIPAL INVESTIGATOR: Koller, L.D.
AFFILIATION: Oregon State Higher Education System, Salem (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bull, R.J.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: I propose to study the effect that environmental contaminants--particularly at subclinical doses--will have on cell-mediated immunity and to explore possible mechanisms of alteration by observing characteristics of macrophages and lymphocytes. Several different cell-mediated tests will be utilized and subclinical doses of the contaminants will be administered. Lead will be examined initially, but the effect of other heavy metals and insecticides will be measured should lead alter the immune response in mice.
APPROACH: Lead acetate will be administered in the drinking water of mice for prolonged periods so there will be a gradual accumulation simulating natural conditions. Kidneys will be analyzed for content of lead to determine actual concentration and histopathology will determine alterations that may occur from exposure. We will endeavor to ascertain the effect lead, etc., has on: migration of macrophages via direct or indirect sensitization of mice with Bacillus Calmette-Guerin (BCG); possible decrease of phagocytosis of macrophages via measurement using opsonized sheep red blood cells (SRBC); possible suppression of T lymphocyte activity by injecting footpads and measuring CMI; possible suppression of T cell helper function in humoral antibody response and measure the effect of macrophage helper function. If low levels

of environmental contaminants render the host more susceptible to cell-mediated immunity, then permissible levels of these compounds for humans should be re-examined.
PROJECT MILESTONES: 02/76 Start of project. 02/78 End of project and final report.
KWORDS: LEAD;BIOLOGICAL EFFECTS;MICE;KIDNEYS;PATHOLOGICAL CHANGES;BLOOD CELLS;MACROPHAGES;PHAGOCYTOSIS;BACTERIA;INFECTIVITY;SENSITIVITY;IMMUNE REACTIONS

<071013>
TITLE: The Effects of Trace Metals on the Developmental Patterns of Intermediary Metabolism in the Brain
PROJECT NUMBER: D614B-97
PRINCIPAL INVESTIGATOR: Bull, R.J.
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bull, R.J.
77 FUNDING: Environmental Protection Agency FY77:$54,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Lead administered pre- and immediately postnatally to rats and mice has been observed to produce hyperactivity in young animals. The state is of considerable interest because of its resemblance to hyperactivity in children, particularly in the paradoxical responses to certain therapeutic agents common to both syndromes. A general retardation in the development of the central nervous system is suggested in this state by certain behavioral findings and an immature pattern of intermediary metabolism has also been detected. Presently available neurochemical findings, primarily related to neurotransmitter concentration, have not been developed in sufficient detail structurally to explain the behavioral findings nor the developmental retardation.
APPROACH: Present work will concern itself with the effects of lead, methyl mercury and organic tin compound on the development of intermediary and oxidative metabolism in the brain of neonatal rats. These agents have been shown to interfere with the oxidation of cytosolic reducing equivalents in the brains of adult rats. Since this lesion is incompatible with the fact that normal adult brain relies almost exclusively on glucose as substrate, it should result in adaptations in the intermediary metabolism of brain in the young animal. The ramifications of such a lesion will be studied in relationship to synaptogenesis and the metabolism of neurotransmitter substances within the central nervous system.
PROJECT MILESTONES: 07/76 Start date. 01/77 Established model, produced pilot work with Pb. 09/77 Demonstration of metabolic defect in neonatal rat. 12/77 Completion of ultrastructural analysis of brain tissue. 12/78 Completion of Pb work. 10/80 Completion of alkyltin work.
KEYWORDS: BRAIN;METABOLISM;METALS;TRACE AMOUNTS;JUVENILES;RATS;MICE;BEHAVIOR;NERVOUS SYSTEM DISEASES;ETIOLOGY;LEAD;METHYLMERCURY;TIN COMPOUNDS;BIOLOGICAL STRESS

<071014>
TITLE: Environmental Assessment Interface and Research Studies
PROJECT NUMBER: D623D-111
AFFILIATION: Environmental Protection Agency, Cincinnati, Ohio (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Stara, J.F.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The overall objective of this AP is to provide the OEMI Environmental Assessment Program necessary consultation, data, and research information in the development, use, and interpretation of: (1) decision criteria (2) impact factors, and (3) bio-assays related to health effects. The HERL/Cinc, focus mainly on health effects related to water pollutants.
KEYWORDS: ENVIRONMENTAL IMPACTS;WATER POLLUTION;WASTE WATER;HEALTH HAZARDS;MONITORING;WASTE PROCESSING;WASTE DISPOSAL;WATER QUALITY;ENVIRONMENT;DATA ACQUISITION;BIOASSAY;SAMPLING

<071015>
TITLE: Investigation of Effects of Prolonged Inhalation of Nickel-Enriched Fly Ash in Syrian Golden Hamsters
PROJECT NUMBER: D625F-112
PRINCIPAL INVESTIGATOR: Wehner, A.P.
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Moon, W.
77 FUNDING: Environmental Protection Agency FY77:$325,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To investigate (a) development of lesions induced by inhalation of Ni-enriched fly ash (NEFA) as a function of exposure time and aerosol concentration, (b) mortality as a function of exposure. (c) reversibility of NEFA-induced lesions as a function of exposure and age by periodically withdrawing hamsters from exposure and maintaining them for life-span observations.
APPROACH: Phase I--NEFA and fly ash (FA) will be prepared and characterized. Exposure facilities and equipment will be prepared and tested. Hamsters will be ordered and quarantined. Acute and subacute toxicity tests with NEFA and FA will be conducted. Phase II--Four groups of main Syrian gold hamsters will receive high-level exposures to NEFA, low-level exposures to NEFA, high-level exposures to FA, and sham exposures, respectively. Each group will consist of a subgroup of 50 animals receive life-span (15 months) exposures, a subgroup of 20 animals to be sacrificed quarterly in lots of 5, and another subgroup of 20 animals to be withdrawn from exposure quarterly in lots of 5 for further observation. Dead animals will be necropsied. Lungs and grossly observed lesions will be histopathologically examined.
PROJECT MILESTONES: 11/76 Initiate contract work. 09/77 Generate fly ash. 12/77 Initiate animal exposure. 09/78 Initiate Phase II of study.
KEYWORDS: NICKEL;FLY ASH;CHEMICAL COMPOSITION;HAMSTERS;INHALATION;TOXICITY;AEROSOLS;MORTALITY;COAL INDUSTRY;HEALTH HAZARDS;CHRONIC INTAKE;NEOPLASMS

<071016>
TITLE: Health Effects of Energy By-Products on Drinking Water
PROJECT NUMBER: D625-F-113
PRINCIPAL INVESTIGATOR: Shapiro, M.A.
AFFILIATION: Pittsburgh Univ., Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Greathouse, D.G.
77 FUNDING: Environmental Protection Agency FY77:$102,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: The objectives of this study are (a) evaluation of sources, production and utilization of coal energy related by-products, (2) evaluation of health effects of coal energy by-products, (3) evaluation of coal energy by-products introduced into drinking water supplies, (4) evaluation of information obtained from 1, 2 and 3 above to define future research needs. This study will be based on information published in periodicals, books, reports or available raw data.
APPROACH: Five separate tasks will cover all the essential aspects of sources and health effects of contaminants derived from coal energy production as well as the pathways through which they enter drinking water supplies.
RESULTS: The conclusions of the study will allow formulation of future research and development needs in the area of coal energy utilization and production as related to drinking water quality.
PROJECT MILESTONES: 10/78 Project completion.
KEYWORDS: ENERGY SOURCE DEVELOPMENT;HEALTH HAZARDS;DRINKING WATER;CHEMICAL COMPOSITION;COAL INDUSTRY;BY-PRODUCTS;WATER POLLUTION;DATA COMPILATION;ENVIRONMENTAL TRANSPORT;ENVIRONMENTAL EXPOSURE PATHWAY;HUMAN POPULATIONS;CHRONIC INTAKE

<071017>
TITLE: Health Impacts of Acid Mine Drainage on Drinking Water Supplies in Western Coals
PRINCIPAL INVESTIGATOR: Wixson, B.G.
AFFILIATION: Missouri Univ., Rolla (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Greathouse, D.G.
77 FUNDING: Environmental Protection Agency FY77:$158,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: The objectives of this project are: (1) Identify coal mining areas in western states where acid mine drainage may get into drinking water supplies. (2) Carry out a literature review to identify possible compounds and levels of organics or inorganics that might cause disease. (3) Identify health effects associated with these compounds and their possible ingestion. (4) Determine, where possible, those compounds that are removed by drinking water treatment. (5) Evaluate the mortality data in respect to specific disease relationship in the western coal states. (6) Propose a representative area and specify the analytical procedures, water characteristics and type of epidemiological studies that will be necessary to establish valid baselines, define problems and seek possible control measures.
RESULTS: The information collected and evaluated by this project should play a major role in determining the appropriate area for concentrated studies on the problems of acid mine drainage-water supplies and health. This information will be critical to the future development of western coals and allow for the maximum utilization of funds and research to answer possible questions of health effects associated with acid mine drainage and drinking water supplies.
PROJECT MILESTONES: 09/78 Evaluation of literature and sampling plan formulated. 10/79 Project completed.
KEYWORDS: ACID MINE DRAINAGE;DRINKING WATER;WATER POLLUTION;HEALTH HAZARDS;RISK ASSESSMENT;COAL INDUSTRY;CHRONIC INTAKE;REVIEWS;DATA COMPILATION;ORGANIC ACIDS;INORGANIC ACIDS;PATHOLOGICAL CHANGES;INGESTION;WATER TREATMENT;MORTALITY;EPIDEMIOLOGY

<071018>
TITLE: Effects of Energy Consumption Related Pollutants on Pulmonary Fibrosis
PROJECT NUMBER: D625F-115
PRINCIPAL INVESTIGATOR: Bhatnagar, R.S.
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Lee, S.D.
77 FUNDING: Environmental Protection Agency FY77:$106,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Determine effects of energy consumption-related trace metals, Ru, Ni, Hg, Cu and Zn.
APPROACH: We propose to (1) Determine effects of trace metals on pulmonary connective tissue biosynthesis using lung organ cultures; (2) Determine the dose response of these compounds; (3) Determine qualitative and quantitative changes in collagen induced by above pollutants. Similar studies will be initiated with elastin; (4) Correlate observed biochemical changes with morphological lesions; (5) Parameters of collagen synthesis will be examined in lungs of rats exposed to the above pollutants, at the EPA, Cincinnati. We will also investigate the effect of Cadmium on the synthesis of connective tissue macromolecules. Further studies in relation to the metallic pollutants will involve examination of the interactions of the toxins with critical enzymes involved in connective tissue macromolecular synthesis to determine their sites of action. Studies will also be carried out to determine the effect of the above pollutants on informational macromolecule synthesis in lung organ cultures. The effects of these trace metals on DNA and RNA synthesis will be investigated.
PROJECT MILESTONES: 06/74 Initiate experiments. 06/75 Report on toxic effects of Pd. 06/76 Report on toxic effects of Cd and Pt. 09/77 Report on lung organ culture as a screening system (Ru, Ni, Hg, Cu and Zn). 09/78 Effects on oxidants on pulmonary fibrosis. 11/79 Final report.
KEYWORDS: ENERGY CONSUMPTION;CONSUMPTION RATES;HEALTH HAZARDS;LUNGS;TOXICITY;LEAD;CADMIUM;PLATINUM;RUTHENIUM;NICKEL;MERCURY;COPPER;ZINC;BIOLOGICAL STRESS;METABOLISM;DOSE-RESPONSE RELATIONSHIPS;MORPHOLOGICAL CHANGES;RATS;DNA;RNA;BIOSYNTHESIS;ENVIRONMENTAL IMPACTS;AIR POLLUTION

<071019>
TITLE: Subcommittee on the Geochemical Environment in Relation to Health and Disease (GERHD)
PROJECT NUMBER: D625F-116
PRINCIPAL INVESTIGATOR: Petrie, W.L.
AFFILIATION: National Academy of Sciences, Washington, D.C. (USA); Midwest Research Inst., Kansas City, Mo. (USA); Mayo Clinic, Rochester, Minn. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Grube, W.E.
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: GERHD has broad interdisciplinary interests encompassing both earth scientists and biomedical specialists and is concerned with the concentrations of certain minerals in localized areas and with abnormally high and low concentrations of certain elements that may cause specific biologic effects. For example, problems may be related to excesses of iron, selenium, fluorine, copper, zinc, and manganese; on the other hand, problems have been correlated with deficiencies of iodine, zinc, cobalt. Interactions of certain elements such as copper, molybdenum, zinc, iron, and sulfate associated with mining and industrial activities may have potential biological effects. GERHD identifies the association of abnormal levels of trace elements as a guide to research into understanding and protection of plant, animal, and human health. It also evaluates important research opportunities concerned with industrial production, health and environmental interest, and governmental regulatory agencies. Ad hoc Panels preparing reports on their studies are: Panel on the Geochemical Environment and Urolithiasis, George K. Davis, biochemist,University of Florida, Gainesville. Panel on Aging and the Geochemical Environment, Howard C. Hopps, pathologist, University of Missouri Medical Center, Columbia. Panel on the Geochemistry of Water in Relation to Cardiovascular Disease, Ernest E. Angino, geochemist, University of Kansas, Lawrence. Panel on the Trace Element Geochemistry of Coal Resource Development Related to Health, Bobby G. Wixson, biogeochemist, University of Missouri, Rolla.
PROJECT MILESTONES: 01/78 Final report due.
KEYWORDS: BIOGEOCHEMISTRY;ENVIRONMENT;HEALTH HAZARDS;DISEASES;IRON;SELENIUM;FLUORINE;COPPER;ZINC;MANGANESE;IODINE;ZINC;COBALT;COPPER;MOLYBDENUM;SULFATE ;PLANTS;ANIMALS;HUMAN POPULATIONS;BIOLOGICAL EFFECTS;ETIOLOGY;CARDIOVASCULAR DISEASES;METABOLISM

<071201>
TITLE: Standards for and Methods of Analysis of Rainwater for Acidity
PROJECT NUMBER: E601B-3
PRINCIPAL INVESTIGATOR: Tyree, S.Y.
ADDRESS: College of William and Mary, Williamsburg, VA 23185
AFFILIATION: College of William and Mary, Williamsburg, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Thompson, R.J.
TELEPHONE: F629-2150
TYPE OF FUNDING: Grant No.-R804998
77 FUNDING: Environmental Protection Agency FY77:$15,900
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (30%);PARTICULATES (40%);SPECIFIED OTHER POLLUTANTS/Inorganic metals (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical (30%);DEVELOPMENT/Laboratory scale (70%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Provide a procedure which will successfully produce solutions with selected characteristics of rainwater.
APPROACH: Examine the chemistry of possible interactions of potential ingredients and attempt to select a set which will remain stable under conditions of packaging and produce desired solution behavior when used.
RESULTS: A recipe for preparing relevant solution.
PROJECT MILESTONES: (1) 4/77 Procedure Supplied.
KEYWORDS: ACID RAIN;CHEMICAL ANALYSIS;RAIN;MEASURING METHODS;STANDARDS;PRECIPITATION SCAVENGING;BASELINE ECOLOGY;WATER QUALITY;EARTH ATMOSPHERE;PH VALUE;AIR POLLUTION;MONITORING

<071202>
TITLE: Aerosol Characterization of Ambient Particulate Samplers Used in Environmental Monitoring Studies
PROJECT NUMBER: E-601-B-7
PRINCIPAL INVESTIGATOR: McFarland, A.R.
ADDRESS: Texas A and M Research Foundation, Faculty Exchange Box H, College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA). Research Foundation
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Rodes, Charles
TELEPHONE: C(919)841-1276
TYPE OF FUNDING: Contract No.-68-02-2720
77 FUNDING: Environmental Protection Agency FY77:$84,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (34%);METALS (33%);PARTICULATES (33%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To test in a wind tunnel ambient air particle samplers to characterize inlet sampling biases as functions of particle size (2 to 20 km) and wind direction (for non-circular inlets).
APPROACH: For selected systems, flow insulation studies will be performed through use of a smoke generation system and transparent models of the samplers. In parallel with the laboratory studies, the samplers will be field tested in College Station, TX, and Santa Monica, CA.
KEYWORDS: AIR SAMPLERS;TESTING;AEROSOLS;PARTICLE SIZE;WEATHER;METEOROLOGY;WIND;AERODYNAMICS;WIND TUNNELS

<071203>
TITLE: Los Angeles Catalyst Study
PROJECT NUMBER: E-601-B-9
PRINCIPAL INVESTIGATOR: Parry, E.P.;Colovos, G.
ADDRESS: AVR Monitoring Center, 2421 Hillcrest Dr., Newbury Park, CA 91320
AFFILIATION: Rockwell International Corp., Newbury Park, Calif. (USA). Air Monitoring Center
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Rodes, Charles E.
TELEPHONE: C(919)541-3076
TYPE OF FUNDING: Contract No.-68-02-2292
77 FUNDING: Environmental Protection Agency FY77:$825,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/NO;NOXIOUS GAS/CO (50%);METALS/Lead (50%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: A study is being conducted to (1) determine the ambient air concentrations of carbon monoxide, lead, and sulfur dioxide, in order to predict the sulfuric acid (H_2SO_4) ambient levels resulting from catalyst automobile emissions on a heavily traveled freeway and (2) evaluate and improve field methodology for detection of air quality changes attributable to catalyst emissions.
APPROACH: Roadside air monitoring sites were set up in Los Angeles adjacent to the San Diego Freeway in June, 1974, and monitoring data generated.
RESULTS: The first three years of data are summarized in the EPA technical document The Los Angeles Catalyst Study Symposium (EPA-600/4-77-034).
PROJECT MILESTONES: 4/77 3-yr summary report (EPA 600/4-77-034).
KEYWORDS: AIR POLLUTION;URBAN AREAS;ROADS;AUTOMOBILES;EXHAUST GASES;CARBON MONOXIDE;LEAD;SULFUR DIOXIDE;AIR QUALITY;CATALYTIC CONVERTERS

<071204>
TITLE: Who Collaborating Center on Air Pollution Control
PROJECT NUMBER: E-606-A-1
PRINCIPAL INVESTIGATOR: de Koning, H.W.
ADDRESS: World Health Organization, Geneva, Switzerland, XX
AFFILIATION: World Health Organization, Geneva (Switzerland)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Fair, Donald H.
TYPE OF FUNDING: Contract No.-68-02-2471
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: A continuing support program to the World Health Organization (WHO) to maintain an international data bank containing results from the WHO Air Monitoring Program.
APPROACH: Countries are invited by WHO to participate in this project. The original number of participants in 1973 was 14 countries and in 1976 this was extended to 25. Each selected city designated three reporting sites: an industrial, commercial and residential site.
RESULTS: (1) ''Air Quality in Selected Urban Areas 1973-1974,'' WHO Publication No. 30, GEMS: Global Environmental Monitoring System. (2) ''Air Quality in Selected Urban Areas 1975,'' WHO, 1977. (3) ''Air Quality in Selected Urban Areas 1975-1976,'' WHO in Progress, est. June 1978 for publication.
PROJECT MILESTONES: (1) 10/76 ''Air Quality in Selected Urban Areas 1973-1974.'' (2) 3/77 ''Air Quality in Selected Urban Areas 1975.'' (3) 3/78 ''Air Quality in Selected Urban Areas 1975-1976.''
KEYWORDS: AIR POLLUTION;MONITORING;URBAN AREAS;AIR QUALITY;DATA COMPILATION;GLOBAL ASPECTS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS;AEROSOLS

<071205>
TITLE: Mobile Source Benzene Monitoring
PROJECT NUMBER: E-606-A-17
PRINCIPAL INVESTIGATOR: Hartlage, T.A.;Martin, B.E.
ADDRESS: Environmental Monitoring and Support Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Martin, Barry E.
TELEPHONE: F629-3076
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Auto exchanges (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To measure benzene from auto tailpipe emissions in 6 metropolitan areas to provide a data base for writing a health assessment document.
APPROACH: The data are obtained by collecting an integrated sample on a solid support for 24 hours and analyzing the samples in the laboratory. The data collected will be representative of the benzene concentrations that the general public would be exposed to in large cities.
RESULTS: The study was initiated in July, 1977 after benzene was determined to be hazardous. The study will

last approximately 2 years to establish a data base for benzene. The data collected will be available from the National Aerometric Data Bank.
PROJECT MILESTONES: (1) 12/77 Preliminary Data Summary. (2) 12/78 Annual Data Summary. (3) 12/79 Annual Data Summary.
(WORDS: AIR POLLUTION;MONITORING;AUTOMOBILES;EXHAUST GASES;URBAN AREAS;BENZENE;HEALTH HAZARDS;HUMAN POPULATIONS;DATA COMPILATION;USA

<071206>
TITLE: NO2 Reclassification Study
PROJECT NUMBER: E-606-A-18
ADDRESS: Process Instruments Div., Route 219 N, Lewisburg, WV 24901
AFFILIATION: Bendix Corp., Lewisburg, W.Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Hartlage, Thomas A.
TYPE OF FUNDING: Contract No.-68-02-1781
77 FUNDING: Environmental Protection Agency FY77:$260,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO2 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: a. Measure continuously ambient NO2 concentration in 45 metropolitan areas to obtain data for reevaluation of air quality control regions. b. Measure continuously ambient NO2 concentrations in 19 metropolitan areas to support the possible establishment of a short-term ambient air quality standard.
APPROACH: These measurements are obtained using continuous chemiluminescent Bendix analyzers. Data are obtained on a continuous strip chart and results are reported on an hourly basis.
RESULTS: Study was initiated in 1973 at 45 metropolitan areas. In 1975, study was reduced to 19 metropolitan areas. Hourly averages for each site are available through the National Aerometric Data Bank. To support validity of data, monthly calibrations and quarterly audits are performed. Study is anticipated to continue through October, 1978. Data are being used to assess ambient NO2 levels and to assist state agencies in development of State Implementation Plans (SIP).
PROJECT MILESTONES: (1) 1/74 Data summary report. (2) 1/75 Data summary report. (3) 1/76 Data summary report. (4) 1/77 Data summary report. (5) 1/78 Data summary report. (6) 1/79 Final report.
KEYWORDS: AIR POLLUTION;MONITORING;AIR POLLUTION MONITORS;NITROGEN DIOXIDE;URBAN AREAS;DATA COMPILATION;USA;AIR QUALITY;SAMPLING;METEOROLOGY;CHEMICAL EFFLUENTS

<071207>
TITLE: Collaborating Center on Background Air Pollution Data
PROJECT NUMBER: E-606-A-20
PRINCIPAL INVESTIGATOR: Kohler, A.
ADDRESS: Environmental Protection Branch--World Meteorological Organization, Geneva, Switzerland, XX
AFFILIATION: World Meteorological Organization, Geneva (Switzerland)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Fair, Donald H.
TYPE OF FUNDING: Agency in-house effort-Task No. E-606-A-20
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (75%);GENERAL SCIENCE (25%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To receive, store, summarize and then publish precipitation chemistry data contributed from a worldwide network of stations.
APPROACH: Precipitation sampling stations are designated by WMO to be Regional or Baseline stations. They take monthly precipitation samples and analyze them for a variety of parameters as requested by WMO. These parameters are explained in detail in WMO manual No. 299. Results are recorded on standard forms and forwarded to EMSL/RTP, North Carolina. These forms are keypunched and material is stored on magnetic tape. Before publication, all data are sent back to the participant to ensure the values have been punched and stored properly.
RESULTS: The final output is an annual publication printed by the NOAA people in Asheville, N.C. But it is a joint venture by the World Meteorological Organization, the Environmental Protection Agency, and the National Oceanic and Atmospheric Administration.
PROJECT MILESTONES: (1) 1/74 ''Atmospheric Turbidity and Precipitation Chemistry for the World 1972.'' (2) 9/75 ''Atmospheric Turbidity and Precipitation Chemistry for the World 1973.'' (3) 11/76 ''Atmospheric Turbidity and Precipitation Chemistry for the World 1974.'' (4) 8/77 ''Atmospheric Turbidity and Precipitation Chemistry for the World 1975.'' (5) 1/78 ''Atmospheric Turbidity and Precipitation Chemistry for the World 1976.''
KEYWORDS: GLOBAL ASPECTS;AIR POLLUTION;MONITORING;DATA COMPILATION;AEROSOLS;METALS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS;METEOROLOGY;ATMOSPHERIC PRECIPITATIONS;SAMPLING

<071208>
TITLE: Improvement and Evaluation of Methods for Sulfate Analysis
PROJECT NUMBER: E-621-A-14
PRINCIPAL INVESTIGATOR: Wesolowski, J.J.
ADDRESS: Air and Industrial Hygiene Lab., 714 P Street, Sacramento, CA 94704
AFFILIATION: California Dept. of Public Health, Sacramento (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Puzak, J.C.
TELEPHONE: F629-2220

TYPE OF FUNDING: Grant No.-R805447-01
77 FUNDING: Environmental Protection Agency FY77:$69,300
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Theoretical (20%);DEVELOPMENT/Pilot plant (20%);ANALYTICAL (60%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this work include: (1) optimizing a simple analytical procedure for sulfate determination and evaluating it for ruggedness; (2) evaluating a series of sulfate methods; and (3) evaluating two techniques for extracting sulfate from atmospheric samples.
APPROACH: Methods evaluation will involve determining the practical working range, precision, accuracy, comparability between methods and the influence of potential interferents. For this study, the practical working range of the methods will be defined as the concentration range of analyte yielding constant variance and accuracy. The barium sulfate turbidimetric procedure is the method to be optimized. The sulfate methods to be evaluated are the optimized turbidimetric method, the Colovos and Midwest Research versions of the automated methylthymol blue method and the Dionex ion chromatograph method.
PROJECT MILESTONES: (1) 10/78 Complete evaluation of sulfate methods. (2) 10/79 Complete evaluation of H2SO4 method.
KEYWORDS: AIR POLLUTION;MONITORING;SULFATES;QUANTITATIVE CHEMICAL ANALYSIS;AUTOMATION;SAMPLING;AIR

<071209>
TITLE: Ambient Air Monitoring Reference and Equivalent Methods Program
PROJECT NUMBER: E-621-A-16
PRINCIPAL INVESTIGATOR: McElroy, F.
ADDRESS: Environmental Monitoring and Support Laboratory, Research Triangle Park, NC 77843
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Hauser, Thomas R.
TELEPHONE: C(919)541-2106
TYPE OF FUNDING: Agency in-house effort-Task No. E-621-A-16
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/O3;NOXIOUS GAS/CO;NOXIOUS GAS/NO2 (50%);PARTICULATES (50%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To provide for EPA designation (as either a reference or equivalent method) those models of ambient air monitoring analyzers (or other methods) which have been shown to meet certain prescribed minimum performance specifications and designation of these analyzer models allows States and other users to more easily specify and obtain air monitoring analyzers which are adequate for their monitoring requirements under the ''Clean Air Act.''
APPROACH: Minimum performance specifications applicable to ambient air monitoring analyzers and other methods for SO2, O3, CO, and NO2, together with detailed test procedures to measure each performance parameter, are set forth in EPA regulations at 40 CFR Part 53. Also contained in that Part are instructions for submitting an application for designation. The ambient air monitoring reference and equivalent program receives applications for designation, technically evaluates the submitted test data and other information to determine compliance with all requirements and recommends successful methods for designation by the Administrator. The program also (1) reviews the minimum performance specifications to reassess the tradeoffs between practicality of the methods, (2) enforces compliance with designated method requirements, (3) evaluates new measurement principles applicable to reference methods, and (4) develops and tests calibration procedures for ambient monitoring instruments.
RESULTS: Current progress/plans--As of September, 1977, 25 methods have been designated with several additional methods under evaluation. A new measurement principle and two calibration procedures applicable to reference methods for measuring NO2 have been promulgated. Evaluation of several improved calibration procedures for O3 analyzers is in progress. Future plans call for developmental work on methodologies for TSP and lead.
PROJECT MILESTONES: (1) 9/77 Designation of 14 reference methods and 11 equivalent methods. (2) 12/76 Promulgation of measurement principle and 2 calibration procedures for NO2 reference methods. (3) 9/78 Promulgation of improved calibration procedures for ozone reference methods. (4) 9/78 Post-designation tests for all methods designated prior to 5/78. (5) 6/78 Improved methodology for total suspended particulate (TSP).
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;SULFUR DIOXIDE;OZONE;CARBON MONOXIDE;NITROGEN DIOXIDE;USA;CALIBRATION STANDARDS;MONITORING;SPECIFICATIONS

<071210>
TITLE: Quality Assurance in Support of Energy Related Monitoring in Western USA
PROJECT NUMBER: E-625-C-11
PRINCIPAL INVESTIGATOR: Cher, M.
ADDRESS: 2421 W. Hillcrest Dr., Newbury Park, CA 91320
AFFILIATION: Rockwell International Corp., Newbury Park, Calif. (USA). Air Monitoring Center
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Bromberg, S.M.
TELEPHONE: F629-2573
TYPE OF FUNDING: Contract No.-68-02-2412
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop and implement a quality assurance program for air pollution monitoring in the vicinity of present and proposed energy development projects in the Western USA.

APPROACH: (1) Provide on-site systems reviews and assessments for agencies monitoring for air pollutants in 8 western states; (2) Conduct quarterly performance evaluation using ''blind'' samples; and (3) Provide technical assistance as required.
SULTS: Reports on each of the above activities and air quality data of improved quality.
OJECT MILESTONES: (1) 9/76 Conducted on-site systems reviews and assessments. (2) 1/77 Initiated quarterly ''blind'' sample performance evaluations.
KEYWORDS: USA;AIR POLLUTION;AIR POLLUTION MONITORS;PERFORMANCE TESTING;AIR QUALITY;HYDROCARBONS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS;SPECIFICATIONS;MONITORING

<071211>
TITLE: General Analytical Services
PROJECT NUMBER: E601B-04
PRINCIPAL INVESTIGATOR: Yoakum, A.M.
AFFILIATION: Stewart Labs., Inc., Knoxville, Tenn. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Walling, J.
TYPE OF FUNDING: Contract No.-68-02-2425
77 FUNDING: Environmental Protection Agency FY77:$130,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Provides routine analyses as batches of samples are supplied. Utilizes selected routine state of the art procedures. Data and quality control equipment are supplied in hard copy or paper tape media as required.
PROJECT MILESTONES: (1) Not applicable. This is an on demand contract. (2) Data are sent on a specified timetable.
KEYWORDS: ENVIRONMENT;CHEMICAL ANALYSIS;QUALITY CONTROL;SAMPLING;DATA ANALYSIS

<071212>
TITLE: Assessment, Control and Health Effects of Indoor Air Pollution
PROJECT NUMBER: E601B-12
PRINCIPAL INVESTIGATOR: Moschandreas, D.
AFFILIATION: Geomet, Inc., Rockville, Md. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Bromberg, S.M.
TYPE OF FUNDING: Contract No.-68-02-2294
77 FUNDING: Environmental Protection Agency FY77:$225,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To develop a model for estimating extent of indoor air pollution.
APPROACH: Monitor indoor/outdoor levels of selected air pollutants in order to develop and verify the model.
RESULTS: A model that will relate levels of outdoor pollution to levels of pollutants expected in adjacent indoor structures, particularly residences.
PROJECT MILESTONES: (1) 11/76 Background report; (2) 03/77 monitoring completed in Baltimore; (3) 06/77 monitoring completed in Pittsburgh; (4) 01/78 monitoring completed in Chicago; and (5) 09/78 tentative model available.
KEYWORDS: AIR POLLUTION;MATHEMATICAL MODELS;HOUSES;RESIDENTIAL SECTOR;EARTH ATMOSPHERE;MONITORING;AIR POLLUTION CONTROL;HEALTH HAZARDS;BUILDINGS;ENVIRONMENTAL TRANSPORT;ECOLOGICAL CONCENTRATION;MARYLAND;PENNSYLVANIA;ILLINOIS;AIR QUALITY

<071213>
TITLE: Reactor Use at NC State University
PROJECT NUMBER: E606A-05
PRINCIPAL INVESTIGATOR: Weaver, J.
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lambert, P.
TYPE OF FUNDING: Contract No.-68-02-1765
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: NUCLEAR/General (100%)
PROJECT DESCRIPTION: Provides for use of nuclear reactor, office and laboratory space for routine neutron activation analysis. Approach and output are irrelevant to this type of service contract.
PROJECT MILESTONES: 00/00 Not applicable. Provides negotiated services on demand.
KEYWORDS: NORTH CAROLINA;ACTIVATION ANALYSIS;NEUTRONS;TRAINING REACTORS;EDUCATION;NCSCR-1 REACTOR;FINANCING

<071214>
TITLE: Certified Synthetic Reference Samples for Precipitation Analyses II
PROJECT NUMBER: E606A-06
PRINCIPAL INVESTIGATOR: Taylor, J.
AFFILIATION: Department of Commerce, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Highsmith, V.
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Prepare for use in the field reference samples which simulate properties of rainwater. Approach is to utilize a procedure developed in a grant (R 804998). Output is the set of samples so prepared, analyzed and certified.
PROJECT MILESTONES: 09/77 Delivery of samples prepared.
KEYWORDS: STANDARDS;SAMPLING;RAIN;CHEMICAL ANALYSIS;STANDARDIZATION;PRECIPITATION SCAVENGING;AIR POLLUTION

<071215>
TITLE: Environmental Monitoring Support for Measurement of Air Pollutants
PROJECT NUMBER: E606A-08
PRINCIPAL INVESTIGATOR: Hochheiser, S.
AFFILIATION: PEDCO-Environmental Specialists, Inc., Cincinnati, Ohio (USA); Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Hochheiser, S.
TYPE OF FUNDING: Contract No.-68-02-2722
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: Short-term methods validation for measurements of concern, field studies to assess the magnitude and distribution of air pollutants around suspected sources, measurement of background levels nationally at strategic locations.
APPROACH: Valid methods to be used in air pollution assessment studies, design field study including quality assurance program, perform laboratory analyses, statistically analyze data and develop decision models and interpretive reports.
RESULTS: Valid data on concentration and distribution of air pollutants in selected areas, valid methods for measurement of pollutants, quality assurance test materials and protocols.
PROJECT MILESTONES: (1) 08/77 Report on asbestos levels in Maryland; (2) 09/77 report on field audit for air monitoring stations; (3) 09/78 assessment of methods for organic toxic pollutnts in air; and (4) 09/79 report of magnitude and distribution of toxic pollutants
KEYWORDS: AIR POLLUTION;MONITORING;MEASURING METHODS;STANDARDIZATION;STANDARDS;AEROSOL MONITORING;QUALITY CONTROL;DATA PROCESSING;DECISION MAKING;DATA ANALYSIS;ASBESTOS;TOXIC MATERIALS;ORGANIC COMPOUNDS;ECOLOGICAL CONCENTRATION;FINANCING

<071216>
TITLE: National Forest Ozone Study
PROJECT NUMBER: E606A-10
PRINCIPAL INVESTIGATOR: Martin, B.E.;Pierovich, J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Monitoring and Support Lab.; Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Martin, B.E.
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: To measure continuously bakground ozone and meteorological data in remote regions. These data will be used to determine background concentrations of ozone and transport characteristics of ambient ozone. The data is obtained using continuous chemiluminescent ozone analyzers and modern meteorological systems. The data are recorded continuously on strip chart recorders. The results are reported in hourly averages. Study was initiated in 1973 at 3 National Forest sites. Data in hourly averages for each site is available from the National Aerometric Data Bank. Bi-monthly calibrations ae performed with periodic external audits.
PROJECT MILESTONES: (1) 01/78 Data summary report; (2) 01/79 data summary report; (3) 01/80 data summary report; and (4) 01/81 final report.
KEYWORDS: FORESTS;OZONE;ECOLOGICAL CONCENTRATION;AEROSOL MONITORING;METEOROLOGY;BASELINE ECOLOGY;ENVIRONMENTAL TRANSPORT;AUTOMATION;PUBLIC LANDS;INFORMATION RETRIEVAL;DATA ACQUISITION SYSTEMS;DATA ACQUISITION

<071217>
TITLE: Air Pollution Analyzer Testing and Technical Support Services for References and Equivalent Method Determination
PROJECT NUMBER: E621A-02
PRINCIPAL INVESTIGATOR: Decker, C.E.
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: McElroy, F.F.
TYPE OF FUNDING: Contract No.-68-02-2714
77 FUNDING: Environmental Protection Agency FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GEOTHERMAL/General (25%);SOLAR/General (25%)
PROJECT DESCRIPTION: The objective of this project is to provide support and technical assistance to the Environmental Monitoring and Support Laboratory in its air pollution analysis testing program for reference and equivalent method determination. The scope of this project includes possible task assignments in the following areas: (1) reference or equivalent method testing of automated or manual methods; (2) technical support services for assessing applications of reference or equivalent method determinations; (3) abridged or special reference equivalent method tests; (4) equivalency-related laboratory tests; and (5) test procedures for determining equivalent mehods for particulates. A major portion of the contract effort will be devoted to conducting abridged or special reference equivalent method tests. Second priority task assignments will involve equivalency-related laboratory tests with the remaining time slated for application review. All procedures will be conducted according to 40 CFR 53, ''Ambient Air Monitoring Reference and Equivalent Methods.''
PROJECT MILESTONES: (1) 09/78 Review 6 applications for reference or equivalent method designations; (2) 09/78 conduct post-equivalency tests on designated analyzers (6); and (3) 09/78 conduct special tests to support equivalency testing program.
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;AIR POLLUTION;SAMPLING;FINANCING;MEASURING METHODS;AEROSOL MONITORING;STANDARDS;AEROSOLS;QUALITY CONTROL

<071218>
TITLE: Quality Assurance for Environmental Pollutant Monitoring
PROJECT NUMBER: E621A-13
PRINCIPAL INVESTIGATOR: Decker, C.E.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: von Lehmden, D.J.
TYPE OF FUNDING: Contract No. 50 02 2725
77 FUNDING: Environmental Protection Agency FY77:$169,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: Provide the following quality assurance services for air pollution monitoring: (1) measurement method evaluation and standardization; (2) quality assurance guideline development; (3) quality assurance plan review; (4) independent performance evaluations; and (5) audit material development.
APPROACH: Single and multiple laboratory methods evaluation, development and distribution of guidelines on good monitoring practices, review of quality assurance plans for adherence to good monitoring practices, conduct of independent performance evaluations and development of materials for use in performance evaluations.
RESULTS: Reports on each of the above activities and air quality data of improved quality.
PROJECT MILESTONES: (1) 10/77 Audit performance of ozone and Nox analyzers in Tampa Bay area. (2) 09/77 Audit performance of a variety of monitoring instruments. (3) 01/78 Prototype SO2 measurement performance evaluation system. (4) 06/78 Handbook on quality assurance available.
KEYWORDS: QUALITY CONTROL;AEROSOL MONITORING;STANDARDIZATION;EVALUATION;RECOMMENDATIONS;STANDARDS;QUALITY ASSURANCE;MEASURING METHODS;PERFORMANCE TESTING;OZONE;NITROGEN OXIDES;AIR POLLUTION MONITORS

<071219>
TITLE: Standardization and Quality Assurance of Stationary Source Emission Methodology
PROJECT NUMBER: E621A-15
PRINCIPAL INVESTIGATOR: Hamil, H.F.
AFFILIATION: Southwest Research Inst., San Antonio, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Midgett, M.R.
TYPE OF FUNDING: Contract No.-68-02-2489
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GEOTHERMAL/General (25%);SOLAR/General (25%)
PROJECT DESCRIPTION: (1)Stationary source emission measurement methodology evaluation and standardization. (2) Evaluate the performance of organizations making stationary source emission measurements.
APPROACH: Single and multiple laboratory examination for methodology evaluation and standardization. Use of independent standards and on-site assessments for performance evaluations.
RESULTS: Reports on each of the above activities and air quality data of improved quality.
PROJECT MILESTONES: (1) 07/77 Initiate semiannual audit of continuous source monitors, (2) 09/77 Initiate semiannual audit of analysis portion of source methodology, and (3) 07/78 Evaluate tentative emission method for organics
KEYWORDS: STATIONARY POLLUTANT SOURCES;EMISSION;AEROSOL MONITORING;AIR POLLUTION;INVENTORIES;STANDARDIZATION;EVALUATION;STANDARDS;POLLUTION CONTROL AGENCIES;PERSONNEL;POLLUTION REGULATIONS;ENFORCEMENT;AIR QUALITY;DATA ANALYSIS;QUALITY ASSURANCE

<071301>
TITLE: Assessment of Environmental Emissions from Oil Refining
PROJECT NUMBER: F-604-B-5
PRINCIPAL INVESTIGATOR: Mesich, F.;Rosebrook, D.
ADDRESS: 8500 Shoal Creek Blvd., Austin, TX 78766
AFFILIATION: Radian Corp., Austin, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Contract No.-6802-2147
77 FUNDING: Environmental Protection Agency FY77:$577,600
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The project objectives are to quantify emissions to the environment from petroleum refineries.
APPROACH: The discharge concentrations are compared to estimated risk levels in the environment. Emissions data are confirmed within known limits of error by the most appropriate means available. Actual field sampling is a major part of this program. The discharge levels are compared to estimate measures of risk by extrapolation from known adverse effects levels. Interested parties in Government as well as industry are invited to participate in the program to ensure the results will be of use to all parties.
RESULTS: Outputs will be reports of emissions data useful for standards setting, offset calculations and estimates of risk from exposure to toxic materials emitted from petroleum refineries.
PROJECT MILESTONES: (1) 8/76 Acquisition of preliminary data. (2) 4/77 Begin field testing. (3) 2/78 Complete first half of field testing. (4) 3/78 Update experimental design. (5) 3/79 Final report.
KEYWORDS: MULTIPLE POLLUTANT;AIR POLLUTION;PETROLEUM REFINERIES;CHEMICAL EFFLUENTS;DATA COMPILATION;TOXICITY

<071302>
TITLE: Closed-Cycle Dyeing-Full Scale Demonstration
PROJECT NUMBER: P 610B-5
PRINCIPAL INVESTIGATOR: Brandon, C.A.
ADDRESS: LaFrance Industries, LaFrance, SC 29656
AFFILIATION: Clemson Univ., S.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Samfield, Max

TYPE OF FUNDING: Grant No.-S805182-01
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);WASTE MANAGEMENT (70%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to demonstrate the use of closed-cycle operation in a continuous dye range and to accurately determine the cost effectiveness of hyperfiltration for this application. It is expected that energy, water and materials will thus be recovered.
APPROACH: The project involves the design, installation, and twelve-month operation of a full-scale hyperfiltration (reverse osmosis) system for closed-cycle operation of a textile dyeing operation at LaFrance Industries. The closed cycle operation of a continuous dye range and the groups of ten atmospheric dye becks will be investigated. Both types of equipment are currently being used at LaFrance for dyeing heavy cotton velour fabrics. The two types of equipment are representative of the two broad categories of textile processing--continuous and batch. The full-scale membrane system will be designed for one of these textile processes that is selected based on the evaluation of conceptual system designs developed for each.
RESULTS: The output is technology transfer to the textile industry at large both in the form of an EPA report and a full-scale demo unit.
PROJECT MILESTONES: (1) 10/77 Project organization details. (2) 7/78 Textile process selection. (3) 10/78 Design and cost quantitative. (4) 7/79 Equipment procurement and installation and membrane formation. (5) 10/79 Membrane performance optimization. (6) 1/80 Initial equipment operation. (7) 10/80 Full scale closed cycle demonstration. (8) 7/81 Preparation of final report.
KEYWORDS: CLOSED-CYCLE DYEING OPERATION;TEXTILE INDUSTRY;DYES;FILTRATION;OSMOSIS;MEMBRANES;COTTON;ENERGY CONSERVATION;RESOURCE CONSERVATION;TECHNOLOGY TRANSFER;MATERIALS RECOVERY

<071303>
TITLE: Reclamation of Textile Warp Sizes Using Thermal Precipitation
PROJECT NUMBER: P 610B-7
PRINCIPAL INVESTIGATOR: Perkings, W.S.;Walker, R.P.;Warman, J.C.
ADDRESS: 101 Textile Bldg., Auburn, AL 36830
AFFILIATION: Auburn Univ., Ala. (USA). Alabama Textile Education Foundation
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Samfield, Max
TYPE OF FUNDING: Grant No.-R805125
77 FUNDING: Environmental Protection Agency FY77:$98,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (60%);WASTE MANAGEMENT (40%)
POLLUTANTS: ORGANICS (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the proposed project is to enhance water management through recovery and recycle of warp size materials in textile slashing and desizing.
APPROACH: The approach will involve the evaluation of warp sizing polymers which precipitate when the desize wastewater is heated. Applicability of the recoverable size materials will be evaluated in pilot plant tests and in production processing tests. Economics of the process will be evaluated. Environmental impact will be determined. Relative energy requirements for the process will be studied.
RESULTS: Output will be technology transfer in the form of an EPA report.
PROJECT MILESTONES: (1) 3/77 Search for materials applicable as recoverable warp sizes. (2) 6/77 Preliminary study. (3) 7/77 Arrange for mill trials. (4) 6/77 Design and construction of pilot scale recovery systems. (5) 8/77 Mill trials. (6) 9/77 Recovery trials on desizing wastewater. (7) 5/78 Evaluation of environmental and economic impact of the system. (8) 6/78 Final report.
KEYWORDS: WARP SIZING POLYMERS;TEXTILE INDUSTRY;RESOURCE CONSERVATION;MATERIALS RECOVERY;TECHNOLOGY TRANSFER;ENERGY CONSERVATION;WATER REQUIREMENTS;ECONOMICS;ENVIRONMENTAL EFFECTS;HYDROCARBONS;WASTE WATER

<071304>
TITLE: Energy Conservation Through Point Source Recycle with High Temperature Hyperfiltration
PROJECT NUMBER: P 610B-8
PRINCIPAL INVESTIGATOR: Brandon, C.A.
ADDRESS: Department of Mechanical Engineering, Clemson, SC 29631
AFFILIATION: Clemson Univ., S.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Samfield, Max
TYPE OF FUNDING: Grant No.-R803875
77 FUNDING: Environmental Protection Agency FY77:$85,000
TECHNOLOGY: CONSERVATION/End use (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (40%);SPECIFIED OTHER POLLUTANTS/Toxics (60%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLCGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective is to develop the application of membrane separation technology to a variety of textile manufacturing processes. The direct recycle of both the hot purified process water and the concentrated residue will be studied.
APPROACH: In consultation with the SCTMA and EPA, four manufacturing sites will be selected for this study representing at least one case each of batch and continuous processing and as many as possible of the EGD categories. Information obtained from site visits will be used to carry out accurate and detailed assessments of energy savings possible by recycle and to evaluate the feasibility of hyperfiltration

membrane separations in laboratory scale tests with the samples collected.
RESULTS: The output of this project will be the development of an acceptable process to simultaneously reduce pollutant discharge and effect energy conservation by direct discharge. Information will be transferred by an official EPA publication of the final results of the study.
JECT MILESTONES: (1) 6/75 Selection of plant processes for study. (2) 12/75 Evaluation of energy savings. (3) 10/75 Hyperfiltration screening tests. (4) 10/75 In-plant reuse evaluation and data review. (5) 2/76 Selection of sites and on-site testing. (6) 4/76 Energy and economic impact assessment. (7) 6/76 Process modification study. (8) 9/76 Begin continuous dye beck studies. (9) 6/77 Start writing draft of final report. (10) 12/77 Final report due.
KEYWORDS: HYPERFILTRATION;TEXTILE INDUSTRY;SEPARATION PROCESSES;MEMBRANES;WATER REQUIREMENTS;ENERGY CONSERVATION;MATERIALS RECOVERY;RECYCLING;CARCINOGENS;MUTAGENESIS

<071305>
TITLE: Non-Personal, Quick Reaction Engineering and Technical Services
PROJECT NUMBER: F610B-11
PRINCIPAL INVESTIGATOR: Bourgeois, S.V.
ADDRESS: 4800 Bradford Dr., Huntsville, AL 35805
AFFILIATION: Lockheed Missiles and Space Co., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: NicSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2614
77 FUNDING: Environmental Protection Agency FY77:$6,300
TECHNOLOGY: FOSSIL FUEL/General (25%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (25%);CONSERVATION/General (25%);CONSERVATION/End use (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple pollutants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The work to be performed under this contract is in support of the technical functions carried out by the Environmental Protection Agency.
APPROACH: Assess environmental and economic impact of the pollution control systems as they become commercially available to the user industries. Provide detailed cost estimates for pollution control systems that are being developed by the EPA. Evaluate the energy conservation potential of new pollution control technologies with the emphasis placed on near term pay off systems. Assess R/D programs in coal liquefaction, low, medium, and high BTU gasification; advanced combustion research; and improved coal extraction and reclamation techniques. Identifying new environmentally acceptable power systems that can provide cleaner, more efficient utilization of fossil fuels.
RESULTS: Process--emissions and control technology survey. Engineering analyses. Associated technical services. Regional assistance and state implementation planning.
PROJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: TECHNOLOGY;POLLUTION CONTROL EQUIPMENT;ENVIRONMENTAL EFFECTS;ECONOMICS;EVALUATION;ENERGY CONSERVATION;COAL LIQUEFACTION;COAL GASIFICATION;COAL;CONTROL SYSTEMS

<071306>
TITLE: Environ. Assessment/Systems Analysis and Program Support for Fluidized-Bed Combustion
PROJECT NUMBER: F-623A-1
PRINCIPAL INVESTIGATOR: Nack, H.
ADDRESS: 505 King Ave., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Henschel, D.B.
TELEPHONE: C(919)541-2825
TYPE OF FUNDING: Contract No.-68-02-2138
77 FUNDING: Environmental Protection Agency FY77:$294,000
TECHNOLOGY: FOSSIL FUEL/General (30%);FOSSIL FUEL/Coal (70%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub y/ (40%);PARTICULATES (30%);ORGANICS/Hydrocarbons (30%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Paper studies, data evaluation will develop health/ecological goals, and will assess existing data on emissions and control technology for fluidized-bed combustion. Comprehensive analyses of emissions from existing FBC units will be conducted as soon as units are available.
APPROACH: To establish environmental goals for the fluidized-bed combustion process based ultimately on health/ecological effects. To obtain comprehensive analysis of emissions from existing fluidized-bed combustors. By comparison of goals with measured emissions, to design a control technology program to meet the goals.
RESULTS: Initial list of potential pollutants of concern developed, with preliminary prioritization. Have participated in development of methodology for environmental assessment. Have completed initial emissions/control technology data review. Have completed sampling for comprehensive analysis on two experimental fluidized combustion units.
PROJECT MILESTONES: (1) 9/76 Complete initial review of available data. (2) 10/76 Complete initial attempt at environmental goals-setting (MEG). (3) 4/77 Complete level 1 comprehensive analysis on 18-inch MERC unit. (4) 6/77 Complete preparation of initial pollutant list, and preliminary prioritization. (5) 8/77 Complete level 1 comprehensive analysis on Miniplant. (6) 10/77 Complete standards support plan for fluidized-bed combustion. (7) 12/77 Complete skeleton standards development research data base report.
KEYWORDS: COAL;FLUIDIZED-BED COMBUSTION;POLLUTION CONTROL EQUIPMENT;FLUE GAS;ENVIRONMENTAL EFFECTS;POLLUTION REGULATIONS

<071307>
TITLE: Miniplant Studies in Support of the Fluidized-Bed Combustion Program
PROJECT NUMBER: F623A-4
PRINCIPAL INVESTIGATOR: Bertrand, R.R.
ADDRESS: P. O. Box 8, Linden, NJ 07036
AFFILIATION: Exxon Research and Engineering Co., Linden, N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Henschel, D.B.
TELEPHONE: C(919)541-2825
TYPE OF FUNDING: Contract No.-68-02-1312
77 FUNDING: Environmental Protection Agency FY77:$1,806,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub y/ (30%);PARTICULATES (40%);ORGANICS/Hydrocarbons (30%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To conduct comprehensive analysis of emissions from a pressurized fluidized-bed combustor, and to identify the effects of process operating conditions on emissions; to study the potential and environmental impact of sorbent regeneration; and to study add-on devices for particulate control.
APPROACH: A 480 lb/hr (218 kg/hr) pressurized fluidized-bed coal combustion Miniplant and a 25 lb coal/hr (13 kg/hr) bench-scale unit are being operated.
RESULTS: Comprehensive analysis of emissions from the Miniplant combustor have been completed at one set of conditions; future analyses are also planned to further define best technology. A 100-hour Miniplant combustion/regeneration demonstration run has been completed; further short-duration tests are planned. Shakedown of a granular bed filter is underway on the Miniplant to control particulate emissions at high temperature and pressure.
PROJECT MILESTONES: (1) 11/75 Demonstrate operability of Miniplant with 240-hour run. (2) 12/76 Complete first phase testing--SO2 and NO/sub x/ emissions. (3) 8/77 Complete level 1 comprehensive analysis on Miniplant combustor. (4) 7/78 Complete first phase testing of granular bed filter on Miniplant. (5) 6/82 Complete environmental testing on Miniplant combustor/regeneration.
KEYWORDS: COAL;FLUIDIZED-BED COMBUSTION;COMBUSTION PRODUCTS;POLLUTION CONTROL EQUIPMENT;ENVIRONMENTAL EFFECTS;SULFUR DIOXIDE;NITROGEN OXIDES;FLUE GAS

<071308>
TITLE: NO/sub x/ Emissions from Fluidized Combustion
PROJECT NUMBER: F623A-5
PRINCIPAL INVESTIGATOR: Beer, J.M.
ADDRESS: Dept. of Chemical and Fuel Engineering, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Steen, Walt
TELEPHONE: C(919)541-2825
TYPE OF FUNDING: Grant No.-R804978
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (80%);COMBUSTION OR END USE (20%)
POLLUTANTS: NOXIOUS GAS (40%);PARTICULATES/Dust (30%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (30%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To develop a mechanistic mathematical model for the prediction of NO emission from coal burning fluidized beds. (2) To provide physical-chemical input parameters for the model by an experimental study of the NO formation-destruction processes in fluidized beds. (3) To generate information necessary for the development of new control technology of NO/sub x/ emission based on detailed pilot plant scale and bench scale studies at both atmospheric and elevated pressure. (4) To test the mathematical models severely over sufficiently wide ranges of operating variables.
APPROACH: The experimental study consists of two parallel investigations: (1) The study of the NO formation-destruction processes in continuously operated fluidized combustors; (2) Batch type kinetic studies carried out with the 7.5 cm dia externally heated fluidized bed and the 10 cm dia PFB. In the continuous fluidized combustion experiments the spatial distributions of the gaseous and solid species concentrations and of temperature will be determined in the fluidized bed and the freeboard for the variation of operational and design parameters. A batch type combustor will be used to investigate the char oxidation reaction. The experimental data from the continuous combustor and the batch combustor will be used to test the model for the formation and deformation of NO in fluidized bed combustors.
RESULTS: (1) An understanding of the mechanism of formation and destruction of ''fuel NO'' in fluidized beds. (2) The model of NO emission will provide information for the scaling up and further development of fluidized combustion plants.
PROJECT MILESTONES: (1) 4/77 Installation of 7.5 cm batch type combustor. (2) 9/77 Design and installation of 30 x 30 cm APB and sampling train. (3) 10/78 Design and construction 10 cm PFB. (4) 4/79 Complete data analysis. (5) 5/79 Complete mathematical model development.
KEYWORDS: COAL;FLUIDIZED-BED COMBUSTION;NITROGEN OXIDES;CHEMICAL REACTION YIELD;MATHEMATICAL MODELS;NITRIC OXIDE;COMBUSTION KINETICS;POLLUTION CONTROL EQUIPMENT

<071309>
TITLE: Development of CAFB Gasifier for Generation of Clean Fuel for Use in an Existing or New Combuster
PROJECT NUMBER: F-623A-6
PRINCIPAL INVESTIGATOR: Johnes, G.L.
ADDRESS: Esso Research Centre, Abingdon, Oxfordshire, Great Britain, XX
AFFILIATION: Esso Research Centre, Abingdon (UK)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Rakes, S.L.
TELEPHONE: F629-2825
TYPE OF FUNDING: Contract No.-68-02-2159
77 FUNDING: Environmental Protection Agency FY77:$450,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);FOSSIL FUEL/Oil and Gas (40%);FOSSIL FUEL/Oil Shale (20%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/ (80%);SPECIFIED OTHER POLLUTANTS/Multiple pollutants (20%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The work covers all aspects of the atmospheric CAFB development program required to support a Foster Wheeler Energy Corporation demonstration of the CAFB process at the La Palma station of Central Power and Light Company (CPL) in San Benito, Texas, under contract 68-02-2106.
APPROACH: This project includes operation of an 0.75MWe Chemically Active Fluid Bed (CAFB) pilot plant in three periods of extended duration, to test selected design features and modes of operation for the 20MW CAFB demonstration, particularly as they relate to operation on coal and pitch fuels, and bed materials available for the CPL plant. Other work involves batch gasification test, development of process for reducing coal ash retention in the fluid bed, and assistance to Foster Wheeler and CPL in development of plant operational procedures and test programs, and in selection of equipment and materials for high temperature fluid bed operations.
RESULTS: Operation and demonstration of pilot plant. Guidelines for building and running CAFB.
PROJECT MILESTONES: (1) 8/76 Complete mini-run on coal. (2) 9/77 Report on mini-run on coal. (3) 10/77 Provide input to FWEC-operating manual-oil feed input. (4) 1/78 Topical report--solid fuels Batch tests. (5) 5/78 Topical report--run 11 pilot unit. (6) 10/78 Topical report--run 12 pilot unit. (7) 5/79 Topical report--run 13 pilot unit. (8) 3/78 AID in start up demonstration unit at La Palma.
KEYWORDS: COAL GASIFICATION;CAFB PROCESS;AIR POLLUTION;DEMONSTRATION PROGRAMS;BENCH-SCALE EXPERIMENTS;ASHES;PILOT PLANTS;FLUIDIZED BED;PITCHES;AIR POLLUTION ABATEMENT

<071310>
TITLE: Preliminary Environmental Assessment CAFB-Lignite and Coal
PROJECT NUMBER: F-623-A-7
PRINCIPAL INVESTIGATOR: Werner, A.S.
ADDRESS: Burlington Rd., Bedford, MA 01730
AFFILIATION: GCA Corp., Bedford, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Rakes, Sam
TELEPHONE: F629-2825
TYPE OF FUNDING: Contract No.-68-02-2632
77 FUNDING: Environmental Protection Agency FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (40%);COMBUSTION OR END USE (30%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx;NOXIOUS GAS/CO;NOXIOUS GAS/Hydrocarbons (50%);PARTICULATES (20%);ORGANICS (30%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific England
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The Chemically Active Fluid Bed Process (CAFB) is to be evaluated to determine air, water and solid emissions to the environment resulting from gasification and combustion of lignite at the Esso Research Centre, Abingdon (ERCA), England, pilot plant. Recommendations will be developed for control requirement for a demonstration plant under construction in Texas.
APPROACH: This environmental assessment will be carried out according to EPA's Level 1 procedures. An extensive field and laboratory program is planned to determine organic and inorganic emissions from the stack, boiler blowdown and solid waste. The field measurement program will determine total particulate, particulate size distributions, CO, CO2, O2, C1-C6 hydrocarbons, NOx, SO2 and SO3 from the stack. In addition, all gas, particulate, solid and water samples will be analyzed by gas chromatography, liquid chromatography, infrared spectroscopy and low resolution mass spectrometry for organic functional groups. These samples will also be analyzed for trace elements by spark source mass spectrometry and atomic absorption spectroscopy. Particulates and solids will be analyzed by x-ray photoelectron spectroscopy (ESCA) for surface elements and compounds, with particular attention paid to vanadium and sulfur species.
RESULTS: The pilot plant is scheduled for continuous operation during the second week in October. The field program will take place during this period.
PROJECT MILESTONES: (1) 1/77 Complete site visit survey and planning. (2) 3/77 Submit sampling plan. (3) 3/77 Complete preliminary Engineering Analysis. (4) 11/77 Complete field testing. (5) 1/78 Complete lab analyses. (6) 2/78 Complete engineering analysis. (7) 4/78 Submit Final report.
KEYWORDS: COAL INDUSTRY;ENVIRONMENTAL IMPACTS;LIGNITE;NITROGEN OXIDES;SULFUR DIOXIDE;CARBON MONOXIDE;HYDROCARBONS;FLUIDIZED-BED COMBUSTION;VANADIUM;AEROSOLS;PILOT PLANTS;AIR POLLUTION CONTROL;EQUIPMENT;WASTE MANAGEMENT;COAL;COAL GASIFICATION

<071311>
TITLE: Engineering Support of the CAFB Demonstration Plant Program
PROJECT NUMBER: F-623-A-8
PRINCIPAL INVESTIGATOR: Keairns, D.L.
ADDRESS: Beulah Rd., Pittsburgh, PA 15235
AFFILIATION: Westinghouse Research Labs., Pittsburgh, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Rakes, S.L.
TELEPHONE: C(919)541-2825
TYPE OF FUNDING: Contract No.-68-02-2142
77 FUNDING: Environmental Protection Agency FY77:$118,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (60%);FOSSIL FUEL/Oil and Gas (40%)
ENERGY CYCLE: PROCESSING, CONVERSION (40%);COMBUSTION OR END USE (30%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/NOx;NOXIOUS GAS/CO (40%);PARTICULATES (30%);ORGANICS (30%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Europe
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The contractor will perform experimental and engineering studies to support the CAFB demonstration plant program, to develop the fluidized bed gasification process, and to provide program assistance to EPA.
APPROACH: The tasks include work on the high temperature sulfur removal system, including sorbent selection, spent sorbent processing, spent sorbent utilization, and spent sorbent disposal; alternate concepts, including sorbents, fuels, applications, and process design; control technology; environmental impact; and systems evaluation. The program will extend previous work carried out by Westinghouse in all of the areas identified.
RESULTS: The program will develop design and operating data, identify test programs, test alternative system components, provide technical support, and provide evaluation of test data.
PROJECT MILESTONES: (1) 3/77 Topical Report on Candidate Stones, CAFB DEMO. (2) 7/77 Spent Sorbent Characterization. (3) 7/77 Market potential spent sorbents determined. (4) 10/77 Issue annual report. (5) 10/78 Final report.
KEYWORDS: FLUIDIZED-BED COMBUSTION;PILOT PLANTS;ENVIRONMENTAL IMPACTS;ENVIRONMENTAL ENGINEERING;DEMONSTRATION PROGRAMS;SULFUR DIOXIDE;REMOVAL;COAL GASIFICATION;RECYCLING;WASTE DISPOSAL;WASTE PROCESSING;DESIGN;PROCESS CONTROL;SYSTEMS ANALYSIS;AIR POLLUTION ABATEMENT;NITROGEN OXIDES;TECHNOLOGY ASSESSMENT;POLLUTION CONTROL EQUIPMENT;AIR;ECONOMICS

<071312>
TITLE: CAFB Demonstration
PROJECT NUMBER: F623A-9
PRINCIPAL INVESTIGATOR: Zoldak, F.
ADDRESS: 12 Peach Tree Hill Road, Livingston, NJ 07039
AFFILIATION: Foster Wheeler Energy Corp., Livingston, N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Rakes, S.L.
TELEPHONE: F629-2825
TYPE OF FUNDING: Contract No.-68-02-2106
77 FUNDING: Environmental Protection Agency FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (60%);FOSSIL FUEL/Oil and Gas (40%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/CO (70%);PARTICULATES (20%);ORGANICS (10%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (20%);FULL SCALE DEMONSTRATION (70%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Estuarine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Europe
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective is to demonstrate, on a commercial scale (about 20 MW), the CAFB process and to perform environmental assessment of the process.
APPROACH: Task I--Design preparation and review: Design, development, fuel selection, definitive design process design manual. Task II--Construction planning: Site planning and approval, construction and fabrication drawings, construction progress. Task III--Experimental test program: Operating variables primary fuel, performance parameters, operating variables secondary fuels, operating variables solids fuels. Task IV--Performance and emission testing: Records, baseline correlations, spent material studies. Task V--System evaluation: Process design manual update. Task VI-Reports of work: Conceptual design commercial systems (about 250 MW).
RESULTS: Definitive design report, a preliminary process design manual and a final report are expected. In addition design drawings, reports of research and operating reports are expected. A conceptual design for a 250 MW unit will be developed.
PROJECT MILESTONES: (1) 12/75 Preliminary design manual. (2) 3/75 Preliminary process manual. (3) 34/76 Definitive design manual. (4) 6/76 Identify primary solid fuel. (5) 12/76 Identify primary liquid fuel. (6) 12/76 Identify primary bed material. (7) 5/77 Start construction. (8) 1/78 Complete construction. (9) 5/78 Start up. (10) 10/79 Complete test program.
KEYWORDS: FLUIDIZED-BED COMBUSTION;COAL GASIFICATION;NATURAL GAS;PETROLEUM;DEMONSTRATION PROGRAMS;AIR QUALITY;WASTE MANAGEMENT;ENVIRONMENTAL IMPACTS;PROCESS CONTROL;MANUALS;COMMERCIALIZATION;NITROGEN OXIDES;POLLUTION CONTROL EQUIPMENT;COAL;ECONOMICS

<071313>
TITLE: Environmental Assessment/Systems Analysis Utilizing Residual Oil
PROJECT NUMBER: F623A-10
PRINCIPAL INVESTIGATOR: Tyndall, M.F.
ADDRESS: P. O. Box 15232, Charlotte, NC 28210
AFFILIATION: Catalytic, Inc., Charlotte, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Rakes, S.L.
TELEPHONE: C(919) 541-2825
77 FUNDING: Environmental Protection Agency FY77:$250,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (60%);FOSSIL FUEL/Oil and Gas (40%)

ENERGY CYCLE: PROCESSING, CONVERSION (40%);COMBUSTION OR END USE (30%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/CO (60%);PARTICULATES (20%);ORGANICS (20%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Europe, Japan
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Catalytic, Inc. will make an assessment of all residual fuel oil desulfurization processes in order to determine the costs and efficiencies for reduction of pollution.
APPROACH: The study will start with a literature search of all commercial processes now in operation and those which may be placed in operation during the next three years. The commercial processes to be studied are partial oxidation, hydrodesulfurization and flue gas scrubbing. Demonstration plants will then be studied including the chemically active fluid bed process (CAFB). The study will include only production of fuel for boilers, pipe line gas and combined cycle turbines.
RESULTS: A review and analysis of all environmental data, including health aspects has been made for each process. This will be followed by plant testing. The analysis will include sulfur compounds, NO/sub x/, particulates, trace elements, CO, hydrocarbons and carcinogenic compounds.
PROJECT MILESTONES: (1) 8/76 Set up information storage and retrieval system. (2) 11/76 Define categories of usage for residual aid. (3) 2/77 Select units for sampling and testing. (4) 3/77 Make site visit to determine data and data gaps. (5) 8/77 Issue technology background report. (6) 11/77 Complete preliminary preparation for sampling--Level 1 and 2. (7) 4/78 Make sampling trip. (8) 8/78 Issue EA annual report. (9) 12/79 Issue standards of practice manuals.
KEYWORDS: COAL GASIFICATION;PETROLEUM INDUSTRY;NATURAL GAS INDUSTRY;DESULFURIZATION;ECONOMICS;AIR POLLUTION ABATEMENT;FLUIDIZED-BED COMBUSTION;DEMONSTRATION PROGRAMS;ENVIRONMENTAL IMPACTS;HEALTH HAZARDS;SULFUR DIOXIDE;NITROGEN OXIDES;AEROSOLS;PARTICLES;ELEMENTS;CARBON MONOXIDE;HYDROCARBONS;CARCINOGENS;COAL INDUSTRY;COMMERCIALIZATION;BOILER FUEL;TURBINES;RESIDUAL FUELS

<071314>
TITLE: Hazardous Substances in Residual Oil
PROJECT NUMBER: F 623A-11
PRINCIPAL INVESTIGATOR: Wolfe, C.R.
ADDRESS: Beulah Road, Pittsburgh, PA 15235
AFFILIATION: Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Research and Development Center
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Rakes, S.L.
TELEPHONE: F 629-2825
TYPE OF FUNDING: Contract No.-68-02-2638
77 FUNDING: Environmental Protection Agency FY77:$106,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (30%)
POLLUTANTS: METALS (30%);ORGANICS (20%);SPECIFIED OTHER POLLUTANTS/Multipollutants (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Europe
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this program are to provide comprehensive chemical analyses of up to 100 residual oil samples, achieving parts per million resolution where possible of both organic and inorganic constituents. In addition, mutagenic testing of selected samples and isolable components of the oils will be performed. Recommendations will be made for the best use of each of the various residual oils based on an evaluation of the potential environmental problems seen as a result of the analyses and interpretation of the bioassay tests.
APPROACH: Briefly, the approach involves extensive use of gas chromatography (GC), GC-mass spectrometry, infrared, raman, fourier-transform spectroscopy, liquid chromatography, derivative preparation, and various extraction procedures in order to isolate and measure organic components of the oils. The inorganic analyses will be obtained by extensive use of atomic absorption spectroscopy, optical emission spectroscopy, spectrophotometry, electroanalytical techniques, and wet chemical techniques. Inorganic compound identification will be accomplished by utilizing infrared, x-ray diffraction and Auger spectroscopy.
RESULTS: The bioassay testing will be accomplished by a combination of subcontracts to Litton Bionetics and Stanford Research and concurrent work at Westinghouse Research. E Coli, Salmonella, and Saccharomyces test systems will be utilized. The radionuclide analyses will be subcontracted to Eberline Laboratories of Albuquerque, New Mexico. The elemental analyses of the major constituents of the oils will be subcontracted to Galbraith Laboratories of Knoxville, Tennessee.
PROJECT MILESTONES: (1) 7/77 Submit work plan. (2) 10/77 Complete survey available data. (3) 11/77 Samples selected, test plan complete. (4) 12/77 First samples group acquired. (5) 3/78 Sample collection completed. (6) 6/79 Analysis of samples completed. (7) 9/79 Final report issued.
KEYWORDS: RESIDUAL FUELS;HAZARDOUS MATERIALS;PETROLEUM;METALS;ORGANIC COMPOUNDS;CHEMICAL EFFLUENTS;CHEMICAL COMPOSITION;MUTAGENS;MEASURING METHODS;BIOASSAY;ENVIRONMENTAL TRANSPORT;RADIONUCLIDE MIGRATION;BIOLOGICAL EFFECTS;HYDROCARBONS;TERATOGENESIS;CARCINOGENS;CHROMATOGRAPHY;SPECTROSCOPY;FLUIDIZED-BED COMBUSTION;ENVIRONMENTAL IMPACTS

<071315>
TITLE: Design and Construction of a Fluidized-Bed Coal Combustion Sampling and Analytical Test Rig
PROJECT NUMBER: F-623A-12
PRINCIPAL INVESTIGATOR: Clark, K.J.
ADDRESS: 485 Clyde Ave., Mountain View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wasser, J.H.
TYPE OF FUNDING: Contract No.-68-02-2170
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx (70%);SPECIFIED OTHER POLLUTANTS/Multi pollutants (30%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of the project is to design, fabricate, and install in High Bay area (Wing G) of the Industrial Environmental Research Laboratory (IERL), a fluidized-bed combustion sampling and analytical test rig and auxiliary equipment that shall be used for IERL in-house research program. This test rig is fundamentally a research tool. Therefore, the design philosopy utilized shall be based on considerations of flexibility, accuracy, and utility.
APPROACH: The approach consists of designing a test rig with a wide range of sampling access locations suitable for use of alternative sampling and analytical techniques, and to build the rig in a modilae configuration to permit evaluation of alternative control devices. Specifically, the FBC Test Rig will be designed with the flexibility to evaluate variables such as: coal and sorbent system (feed rate, injection point and method, type, size), start-up technique, air system (flow and FGR rate, excess air), distributor configuration, heat removal (bed and flue gas), bed conditions (temperature, fluidizing velocities, depth, area), freeboard, waste solids.
RESULTS: Aerotherm will prepare a conceptual design based on the results of input/output data gathering. A final design will be completed after analysis, review and approval of the conceptual design. The test rig will then be fabricated and installed at the EPA facility, Research Triangle Park, North Carolina. Acceptance testing and personnel training will be performed. An operating manual and as-built drawings will be delivered.
PROJECT MILESTONES: (1) 9/76 Preliminary Design. (2) 2/77 Final Design. (3) 7/77 Installation. (4) 9/77 Acceptance Test. (5) 1/78 Final Report.
KEYWORDS: FLUIDIZED-BED COMBUSTION;SAMPLING;COAL;ENVIRONMENTAL IMPACTS;DESIGN;PROCESS CONTROL;GASEOUS WASTES;EQUIPMENT;AIR SAMPLERS;NITROGEN OXIDES;SULFUR DIOXIDE;CHEMICAL EFFLUENTS

<071316>
TITLE: Catalytic Desulfurization and Denitrogenation
PROJECT NUMBER: P-623A-14
PRINCIPAL INVESTIGATOR: Satterfield, C.N.
ADDRESS: Dept. of Chemical Engineering, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Petril, T.W.
TYPE OF FUNDING: Grant No.-R804123-03
77 FUNDING: Environmental Protection Agency FY77:$70,400
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/NOx (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (60%);ANALYTICAL (40%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Catalytic hydrodesulfurization (HDS) and hydrodenitrogenation (HDN) reactions for the removal of organic sulfur and nitrogen compounds from liquid fuels are becoming increasingly important as strict sulfur and nitrogen oxide emission standards are set, and ''dirtier'' oils derived from shale and coal attain wider use. The objective is to investigate this process.
APPROACH: A quantitative description of the interferences between these two reactions, which have only recently begun to be studied, is necessary for optimal design of commercial processing units. To date, we have studied thiophene, pyridine and quinoline as representative sulfur and nitrogen compounds in a continuous flow microreactor to model basic interactions. Pyridine inhibits thiophene HDS under all experimental conditions used. Sulfur compounds exhibit a dual effect on the HDN of pyridine; a reaction rate inhibition gives way to an enhancement at more severe reaction conditions.
RESULTS: Theoretical considerations have been presented to account for each of these effects. Reactions of more complex compounds and their interactive reaction kinetics are currently under investigation.
PROJECT MILESTONES: (1) 10/75 Report on HDS of Thiophene and HDN of Pyridine. (2) 9/76 Report on extension to high pressure of HDS and HDN. (3) 9/77 Report on extension to more complex substances. (4) 9/78 Summary report including model of HDS-HDN interaction.
KEYWORDS: CATALYTIC EFFECTS;DESULFURIZATION;DENITRIFICATION;SULFUR;REMOVAL;NITROGEN;ORGANIC SULFUR COMPOUNDS;ORGANIC NITROGEN COMPOUNDS;OIL SHALE INDUSTRY;COAL INDUSTRY;PYRIDINES;QUINOLINES;THIOPHENE;CATALYSTS;CHEMICAL REACTION KINETICS;NATURAL GAS INDUSTRY;WASTE PROCESSING;AIR

<071317>
TITLE: Interim Support for Horner City Coal Cleaning Demonstration
PROJECT NUMBER: P-623A-15
PRINCIPAL INVESTIGATOR: Weiss, L.H.
ADDRESS: 747 Third Ave., New York, NY 10017
AFFILIATION: Chem Systems, Inc., New York (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Kelgrial, D.
TYPE OF FUNDING: Contract No.-68-02-2639
77 FUNDING: Environmental Protection Agency FY77:$5,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple pollutants (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide interim services for the planned coal cleaning demonstration program, whose overall objectives are to: (1) quantify the performance of the system and its components as a means of controlling emissions to meet both existing and new source performance standards; (2) measure the effects of cleaned coal on electrostatic precipitator and boiler performance and availability; (3) compare its cost effectiveness with the alternate of flue gas desulfurization; (4) determine means of predicting and controlling the cleanability of coal reserves; (5) characterize ancilliary environmental effects.
APPROACH: Interim tasks are: (1) provide technical support and analytical services to the heavy medium

cyclone pilot plant test loop operated in conjunction with the USBM at Bruceton, PA through October 1977; (2) conduct initial tests (mass, sulfur, and energy balances) on the initial portion of the coal preparation plant starting up in September 1977; (3) develop the overall three year demonstration program plan; (4) obtain and analyze face samples from the Helen and Helvetia mines for evaluation of the inseam variation of sulfur and trace elements in the Homer City Coal reserve in conjunction with the U.S. Geological Survey.
RESULTS: (1) Produce demonstration program plan. (2) Provide analysis of face samples.
PROJECT MILESTONES: 3/78 Draft report of interim preparation plant tests.
KEYWORDS: COAL INDUSTRY;ENVIRONMENTAL IMPACTS;POLLUTION CONTROL EQUIPMENT;FLUE GAS;DESULFURIZATION;DEMONSTRATION PROGRAMS;ECONOMICS;ELECTROSTATIC PRECIPITATORS;PURIFICATION;AIR CLEANING SYSTEMS;TECHNOLOGY ASSESSMENT;COAL;SULFUR DIOXIDE;REMOVAL;NITROGEN OXIDES;AIR

<071318>
TITLE: Demetallization of Residual Oils (Phase V Denitrogenation Catalyst Evaluation)
PROJECT NUMBER: P-623A-16
PRINCIPAL INVESTIGATOR: Kang, C.C.
ADDRESS: Trenton, NJ
AFFILIATION: Hydrocarbon Research, Inc., Trenton, N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Petril, T.W.
TYPE OF FUNDING: Contract No.-68-02-0293
77 FUNDING: Environmental Protection Agency FY77:$91,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/NOx (50%);METALS/Heavy (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Phase V of this research program aims to test the relative worth of various metals used in current denitrogenation catalysts. Another aim is to examine the effect of increasing macropores in the catalysts. Possibly, the effect of hydrogen partial pressure may be tested.
APPROACH: Interactions among these variables are of interest. Especially manufactured catalysts will be used in the series of experiments with coal liquids.
RESULTS: The data should help in the development of more effective catalysts to denitrogenate coal liquids. Completed phases of this program have been described in previous notices of this research project.
PROJECT MILESTONES: (1) 12/73 Completed first test of Catalysts to promote Demetallization. (2) 12/74 Finished extended tests. (3) 12/75 Foreign residual oils tested. (4) 12/76 Work with Russian Catalysts completed. (5) 9/77 Optimum Catalyst identified.
KEYWORDS: MACROPORE;RESIDUAL FUELS;DENITRIFICATION;PURIFICATION;ENVIRONMENTAL IMPACTS;NITROGEN OXIDES;AIR POLLUTION ABATEMENT;CATALYSTS;COAL LIQUEFACTION;METALS;TECHNOLOGY ASSESSMENT;REMOVAL

<071319>
TITLE: Environmental Assessment of Effluents from Coal Liquefaction
PROJECT NUMBER: P-623A-17
PRINCIPAL INVESTIGATOR: Emerson, D.B.
ADDRESS: 9190 Red Branch Road, Columbia, MD 21045
AFFILIATION: Hittman Associates, Inc., Columbia, Md. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Rhodes, W.J.
TYPE OF FUNDING: Contract No.-68-02-2162
77 FUNDING: Environmental Protection Agency FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (30%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: The overall technical objective of this program is the performance of a comprehensive multimedia environmental assessment of the technologies for converting coal into liquid fuels and of the utilization of these liquid fuels in stationary source applications. Technologies for conversion of coal to liquid fuels will be considered to encompass all methods of coal treatment in which the majority of the coal-like structure of the raw feed material is transformed to a liquid form, either at the treatment conditions of the process or at ambient conditions. Technologies which involve the production of liquid fuels from coal through the initial use of commercial gasification techniques will also be considered.
APPROACH: The approach to meeting this technical objective will be a ten-phase study program composed of: (1) technical and environmental overviews; (2) technology characterizations; (3) effluent problem definition; (4) identification of technology and information requirements; (5) environmental test program; (6) data acquisition; (7) environmental assessments; (8) effluent control technology evaluations; (9) reassessments and recommendations, and (10) environmental assessment program support.
PROJECT MILESTONES: (1) 7/76 Start. (2) 12/77 Data Base Report. (3) 1/78 Combustion test report. (4) 6/78 Assessment/Control Process report. (5) 7/79 Final status report.
KEYWORDS: COAL LIQUEFACTION;ENVIRONMENTAL IMPACTS;COAL INDUSTRY;TECHNOLOGY ASSESSMENT;COAL GASIFICATION;GASEOUS WASTES;AIR POLLUTION;DATA ACQUISITION;POLLUTION CONTROL EQUIPMENT;WASTE MANAGEMENT;WATER QUALITY

<071320>
TITLE: Control Technology Development for the Products and By-Products of Fuel Conversion/Utilization Systems
PROJECT NUMBER: P-623A-18
PRINCIPAL INVESTIGATOR: Cherry, A.B.
ADDRESS: Centre Square West, 1500 Market Street, Philadelphia, PA 19102
AFFILIATION: Catalytic, Inc., Philadelphia, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Vozel, Chester A.
TYPE OF FUNDING: Contract No.-68-02-2167
77 FUNDING: Environmental Protection Agency FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple pollutants (100%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The objective of this project is to assess the degree of removal and recovery or destruction of contaminants that can occur during processing for upgrading the products and by-products to make them suitable for marketing. Products of fuel systems are defined to encompass the primary marketable materials from fuel systems. By-products of fuel systems are defined to encompass all other useable or potentially useable components of a fuel system output slate. Fuel system products or by-products which either (1) are totally consumed within the basic production system (as for steam-raising) or (2) are totally consumed as a petrochemical feedstock shall not be considered for control technology development.
APPROACH: Catalytic, Inc. shall conduct a program that will result in the development of technology for the control of environmental pollution from utilization of the products and by-products of fuel conversion/fuel utilization systems based on coal.
PROJECT MILESTONES: (1) 9/76 Contract signing. (2) 1/78 Report on Control Assay Development. (3) 6/78 Applicability of Coke Oven Controls to Synthetic Fuels. (4) 9/79 Evaluation of all applicable controls.
KEYWORDS: CONTROL TECHNOLOGY;TECHNOLOGY TRANSFER;ENERGY SOURCES;BY-PRODUCTS;RECOVERY;ECONOMY;AIR POLLUTION CONTROL;LIQUEFACTION;GASIFICATION

<071321>
TITLE: Bench Scale Study of the Meyers Process for Coal Desulfurization
PROJECT NUMBER: P-623-A-19
PRINCIPAL INVESTIGATOR: Meyers, R.A.
ADDRESS: One Space Park, Redondo Beach, CA 90278
AFFILIATION: TRW Systems Group, Redondo Beach, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Tamny, R.D.
TYPE OF FUNDING: Contract No.-68-02-2121
77 FUNDING: Environmental Protection Agency FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The Contractor shall process different types of raw coal through a bench scale facility for chemical leaching of pyritic sulfur from coal.
APPROACH: The Contractor shall completely characterize the raw coal samples and shall determine at least proximate and ultimate analyses and sulfur forms analyses. The Contractor shall also examine the raw coal samples for trace constituents.
RESULTS: The Contractor shall, as a minimum, gather the following data: (1) sulfur removal by chemical leaching as a function of time; (2) characterization of the products and (3) trace element distribution in the products.
PROJECT MILESTONES: (1) 3/75 Complete literature Survey. (2) 7/75 Complete Coal Processing characterization. (3) 8/75 Complete Chemical Analyses of Coal Samples. (4) 9/75 Complete Product Recovery Analyses. (5) 1/77 Complete Coal Sample depyritization. (6) 5/77 Complete Data Analysis. (7) 7/77 Complete Engineering Analysis.
KEYWORDS: EMISSIONS;MEYERS PROCESS;BENCH-SCALE EXPERIMENTS;COAL;DESULFURIZATION;CHEMICAL COMPOSITION;TRACE AMOUNTS;MUTAGENESIS

<071322>
TITLE: Reactor Test Project for Chemical Removal of Pyritic Sulfur from Coal
PROJECT NUMBER: P-623A-20
PRINCIPAL INVESTIGATOR: Meyers, R.A.
ADDRESS: One Space Park, Redondo Beach, CA 90278
AFFILIATION: TRW Systems Group, Redondo Beach, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-1880
77 FUNDING: Environmental Protection Agency FY77:$980,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The Contractor will construct a reactor test unit for evaluation of the pyrite leaching from fine coal, leach solution regeneration, and initial filtration operations of the Meyers Process for coal desulfurization. The Reactor Test Unit will be capable of continuous operation at the nominal rate of 250 tc 750 pounds of coal per hour.

APPROACH: The input material to the Test Reactor System is properly sized coal, either cleaned or uncleaned; the output material is the reacted coal which has been filtered and washed on the filter.
RESULTS: This test unit will be constructed in accordance with the predesign specifications prepared under Contract 68-02-1335 for the reactor test unit (omitting the coarse coal reactor system). The reactor test unit will be erected at a site provided by the Contractor.
PROJECT MILESTONES: (1) 10/78 Initial test operation of reactor test unit scheduled. (2) 10/79 Long-term continuous operation (120 hr.) of Reactor Test Unit.
KEYWORDS: CONTROL TECHNOLOGY;COAL;DESULFURIZATION;PYRITE;LEACHING;MEYERS PROCESS;REGENERATION;FILTRATION

<071323>
TITLE: Development Program for Treatment of Coal to Produce Low-Sulfur, Solid Fossil Fuel
PROJECT NUMBER: P-623A-21
PRINCIPAL INVESTIGATOR: Flemming, D.K.
ADDRESS: 3424 South State Street, Chicago, IL 60616
AFFILIATION: Institute of Gas Technology, Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Tamny, R.D.
TYPE OF FUNDING: Contract No.-68-02-2126
77 FUNDING: Environmental Protection Agency FY77:$161,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this program is to determine on a bench- and pilot-unit scale the operating parameters for the IGT Process to desulfurize coal by thermal and chemical means.
APPROACH: Coal will be treated with a reducing atmosphere in the presence of a sulfur getter. Sulfur removal will be determined as a function of temperature, residence time, coal/getter ratio, coal composition, and particle size.
RESULTS: In work to date under earlier contracts, Midwestern coal with 3.5 to 4% sulfur content has been converted into solid fossil fuel that can be burned directly in conformance with Federal EPA New Source Performance Standards for sulfur emission.
PROJECT MILESTONES: (1) 10/76 Coal Sample Test Batch Reactor Operational. (2) 10/76 Coal Sample Selection for Batch Test Finalized. (3) 10/76 Coal Sample Thermobalance Test Unit Operational. (4) 7/77 Coal Sample Batch Reactor Unit Tests Completed. (5) 9/77 Analysis of Batch Reactor Unit Tests Completed. (6) 8/77 Coal Sample Reactor Test Runs Gas Sample Analysis Initiated. (7) 9/77 Prepared for inclusion in final report.
KEYWORDS: COAL;DESULFURIZATION;BENCH-SCALE EXPERIMENTS;PILOT PLANTS;TEMPERATURE DEPENDENCE;CHEMICAL COMPOSITION;TIME DEPENDENCE;PARTICLE SIZE;CHEMICAL EFFLUENTS;AIR POLLUTION

<071324>
TITLE: Coal Desulfurization by Microwave Energy
PROJECT NUMBER: P-623A-22
PRINCIPAL INVESTIGATOR: Zavitsanos, P.D.
ADDRESS: P.O. Box 8555, Philadelphia, PA 19101
AFFILIATION: General Electric Co., Philadelphia, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Tamny, R.D.
TYPE OF FUNDING: Contract No.-68-02-2172
77 FUNDING: Environmental Protection Agency FY77:$147,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this program is to conduct research and development which will lead into a cost effective method for reducing sulfur oxide emissions (during coal combustion) to environmentally acceptable levels.
APPROACH: The approach is based on the use of microwave energy which can be coupled preferentially into iron pyrites and leachants and induce reactions which produce sulfur compounds which can either be separated easily from coal, or do not convert into sulfur oxides during combustion.
RESULTS: Results to date show that iron pyrite (FeS2) and NaOH do indeed couple with microwave efficiently and react to form water soluble sulfur products. Coal on the other hand is a low loss material. The plan is to investigate the mechanism of energy absorption and important reactions involving sulfur rearrangement.
PROJECT MILESTONES: (1) 8/76 Selection of coal samples with reaction characteristics suitable to exposure to microwave energy stimulation. (2) 10/76 Evaluation of the effectiveness of various microwave frequencies to desulfurized coal samples. (3) 3/77 Evaluation of sulfur reaction to various lengths of exposure. (4) 6/77 Evaluation of benefits received from coal wash with sodium hydroxide prior to exposure to microwave energy.
KEYWORDS: COAL;DESULFURIZATION;MICROWAVE RADIATION;PYRITE;SODIUM HYDROXIDES;CHEMICAL REACTIONS;ECONOMICS;AIR

<071325>
TITLE: Pollutants from Synthetic Fuels Production
PROJECT NUMBER: P-623-A-24
PRINCIPAL INVESTIGATOR: Mixon, F.O.
ADDRESS: P.O. Box 12194, Research Triangle Park, NC 27709
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Petrie, T.W.
TYPE OF FUNDING: Grant No.-R-804979-02
77 FUNDING: Environmental Protection Agency FY77:$156,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)

ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/HO/sub x/;NOXIOUS GAS/SO/sub x/ (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: The purpose of this research is to develop a fundamental understanding of those factors and conditions which will cause the production of environmental pollutants of synfuels processes and to provide to EPA and to the scientific and technical community the information needed to guide the control of potentially hazardous materials from synfuels plants of the future.
APPROACH: The research plan includes both an experimental and an analytical study. The experimental study includes the design, fabrication and operation of one or more laboratory reactors to simulate conditions which may be utilized in actual synfuels processes, the development and implementation of chemical analysis procedures for the examination of elements and compounds that result, for screening of the major coals that are available in the U.S., and for the determination of the kinetics of formation of the pollutants of significance.
RESULTS: The analytical study provides for utilizing results of the screening tests to (1) project potential human exposure to effluents and emissions from these plants and to establish priority ratings for the various pollutants based upon the extent to which projected exposures are hazardous.
PROJECT MILESTONES: (1) 7/77 Reactor Facility and Analysis Equipment Operational. (2) 12/77 Test Plan Formulated. (3) 12/78 Kinetics of Pollutant Formation Screened. (4) 10/79 Kinetics of Pollutant Formation Measured Thoroughly. (5) 11/80 Environmental Assessment Completed. (6) 7/81 Recommendations for Control Strategies Made.
KEYWORDS: COAL GASIFICATION PLANTS;COAL LIQUEFACTION PLANTS;SYNTHETIC FUELS;CHEMICAL EFFLUENTS;POLLUTION CONTROL;BENCH-SCALE EXPERIMENTS;HEALTH HAZARDS;CHEMICAL REACTION KINETICS

<071326>
TITLE: Measurement of High Temperature, High Pressure Processes
PROJECT NUMBER: F623A-26
PRINCIPAL INVESTIGATOR: Moreno, F.
ADDRESS: 485 Clyde Ave., Mt. View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Kuykendal, William B.
TELEPHONE: F629-2557
TYPE OF FUNDING: Contract No.-68-02-2153
77 FUNDING: Environmental Protection Agency FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The objective is to develop measurement techniques to generate engineering data for environmental assessment and control technology development projects evaluating high temperature, high pressure processes. The two processes of initial interest are high pressure fluidized bed combustion and coal gasification. EPA in-house research projects will be supported through review of program plans and test plans in the area of high temperature, high pressure processes and design and construction of an EPA in-house sampling test rig.
APPROACH: The program will first establish a baseline technology effort to provide the resources for continual problem solving. This baseline program will be supplemented with specific assignments by the EPA Project Officer. The technical level of effort will be maintained relatively constant.
RESULTS: A probing system has been designed, fabricated, and demonstrated on a pressurized fluidized bed combustor. The system measures particle size and mass as well as provides a gas sample.
PROJECT MILESTONES: (1) 5/77 Demonstration of probe system for fluidized bed combustion. (2) 2/78 Design of probe system for coal gasification.
KEYWORDS: COAL GASIFICATION;COAL LIQUEFACTION;AIR POLLUTION CONTROL;FLUIDIZED-BED COMBUSTION;MEASURING METHODS;COAL;TECHNOLOGY ASSESSMENT

<071327>
TITLE: Studies Related to the Organic Chemical Analysis of Industrial Samples
PROJECT NUMBER: F-623-A-28
PRINCIPAL INVESTIGATOR: Lochmuller, C.H.
ADDRESS: Department of Chemistry, Durham, NC 27706
AFFILIATION: Duke Univ., Durham, N.C. (USA). Dept. of Chemistry
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Johnson, L.O.
TELEPHONE: F629-2557
TYPE OF FUNDING: Grant No.-R805490-01
77 FUNDING: Environmental Protection Agency FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS/Polymers (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of these studies is to provide a firmer understanding of the behavior of porous polymer sorbents in source sampling efforts.
APPROACH: Previous work has dealt with the effects of reaction with acids and acid gases on the sorption capacity and selectivity of these materials. Results to date indicate that sulfonation and nitration can indeed effect both the amount and the relative distribution of representative organic compounds on these sorbents. This effect will be especially significant if the sampling effort is carried out past

breakthrough; that is, if the sorbent trap capacity is exceeded by the challenge concentration. Porous polymer sorbents have been used to sample ambient air and sources at temperatures in which the principle sorption mechanism is gas-solid adsorption. More recently, these sorbents have been used in source sampling at temperatures which cause the condensation of significant amounts of water. This reduces the probability of acid-polymer reaction but also changes the nature of the sorption process to a liquid-solid mechanism. In the work proposed both dynamic (liquid chromatography) and static methods will be examined as methods for the laboratory measurement of sorption capacity and selectivity as a function of pH and temperature. In addition, the relation between water-benzene distribution and water-styrene polymer (XAD-2) adsorption will be examined. Information obtained from literature values for benzene-water-solute systems and laboratory-measured polymer studies will be used to attempt to develop a predictive model for sampling purposes.
RESULTS: Final report to be entered into ORD system. Of direct use to IERL but also of interest to scientific community.
PROJECT MILESTONES: (1) 9/77 Grant starts. (2) 11/79 Final Report.
KEYWORDS: ORGANIC COMPOUNDS;SAMPLING;QUANTITATIVE CHEMICAL ANALYSIS;COAL GASIFICATION;POLYMERS;CHEMISORPTION;SORPTIVE PROPERTIES;CHROMATOGRAPHY;SULFUR COMPOUNDS

<071328>
TITLE: Review of Control Technologies for Open Sources of Particulate Emissions
PROJECT NUMBER: F-623-A-30
PRINCIPAL INVESTIGATOR: Cooper, D.W.
ADDRESS: 656 Huntington Ave., Boston, MA 02115
AFFILIATION: Harvard School of Public Health, Boston, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Drehmel, D.C.
TELEPHONE: F629-2925
TYPE OF FUNDING: Grant No.-R805294-01
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: STORAGE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To assess control technology for open sources
APPROACH: This work will identify, describe, and analyze existing methods for the control of open sources of particulate emissions. From the analysis of the state of the art and of the areas of need, the investigators will determine priorities for research, development, and application in the control of open source emissions.
RESULTS: Review and ranking of open source control procedures and devices.
PROJECT MILESTONES: (1) 7/77 Award grant. (2) 7/78 Complete ranking of control technology.
KEYWORDS: CONTROL TECHNOLOGY;AIR POLLUTION CONTROL;AEROSOLS;DUSTS;EQUIPMENT;SPECIFICATIONS;PERFORMANCE

<071329>
TITLE: Effects of High Temperature and Pressure on Particle Collection Mechanisms
PROJECT NUMBER: F-623-A-31
PRINCIPAL INVESTIGATOR: Calvert, S.
ADDRESS: 8901 Morena Blvd., Suite 402, San Diego, CA 92117
AFFILIATION: Air Pollution Technology, Inc., San Diego, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Drehmel, D.C.
TELEPHONE: F629-2925
TYPE OF FUNDING: Contract No.-68-02-2137
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: To conduct a theoretical and experimental investigation to determine the effects of high temperature (1100 degrees C), high pressure (15 atm), and particle diameter on particulate collection mechanisms and to identify mechanisms that might be used to remove particles from high temperature and/or high pressure gas streams. Existing and proposed energy processes requiring high temperature and/or high pressure particulate cleanup will also be studied to determine the important characteristics, cleanup requirements, and potential problems of each process.
APPROACH: The investigation will include a thorough literature search, survey, and evaluation of the present state of knowledge concerning high temperature and pressure aerosol mechanics and collection mechanisms. Laboratory scale experiments will be conducted to obtain necessary data on the behavior of aerosols in high temperature and pressure environments, and the results will be used to improve present theory, to identify useful high temperature and high pressure collection mechanisms for particulate removal, and to recommend programs for the development and demonstration of particulate control devices based upon these mechanisms.
RESULTS: Review of theory and bench scale verification of the theory.
PROJECT MILESTONES: (1) 12/75 Contract award. (2) 1/77 Complete theoretical review. (3) 9/77 Complete study of collection requirement for various applications. (4) 4/78 Complete bench scale verification theory.
KEYWORDS: AIR FILTERS;PRESSURE DEPENDENCE;TEMPERATURE DEPENDENCE;PERFORMANCE;DUSTS;PARTICLES;AEROSOLS;REMOVAL;GASEOUS WASTES;PURIFICATION;COAL INDUSTRY;DATA COMPILATION

<071330>
TITLE: New Concept for Fine Particle Control at High Temperature and Pressure
PROJECT NUMBER: F-623-A-32
PRINCIPAL INVESTIGATOR: Calvert, S.
ADDRESS: 4901 Morena Blvd., Suite 402, San Diego, CA 92117
AFFILIATION: Air Pollution Technology, Inc., San Diego, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Drehmel, D.C.
TELEPHONE: F629-2925
TYPE OF FUNDING: Contract No.-68-02-2164
77 FUNDING: Environmental Protection Agency FY77:$330,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The development of advanced energy sources such as coal and shale oil gasification result in high temperature and pressure process gas streams which require removal of particulates before utilization. The objective of this research is to evaluate a novel concept for fine particle control in these systems. The apparatus would collect fine particles by mechanisms such as diffusion, inertial impaction, interception and electrophoresis.
APPROACH: A preliminary evaluation of the new concept will be performed, followed by experimental verification of fine particle collection. Presently theoretical calculations are being performed for mechanisms involved in particle collection and system regeneration. The power and residence time requirements for particle capture will be predicted for the most promising mechanisms. Based on these calculations, preliminary bench-scale experiments will be performed to demonstrate the feasibility of fine particle capture in the proposed particle collection system. This will be followed by the economic analysis and recommendations. The second phase of the project will consist of the construction and testing of a model of the new concept with at least 500 SCFM capacity.
RESULTS: Prove feasibility of dry scrubber concept for control of particulate at high temperature and pressure. This concept will bear on the economic success of the advanced energy processes.
PROJECT MILESTONES: (1) 8/76 Contract Award. (2) 8/77 Complete Study of Components of New Device. (3) 8/78 Complete Feasibility Tests of Integrated System.
KEYWORDS: EMISSIONS;AIR FILTERS;DESIGN;DUSTS;PARTICLES;SCRUBBERS;COAL GASIFICATION;SHALE OIL;GASIFICATION;REMOVAL;DIFFUSION

<071331>
TITLE: Fine Particle Control by Hot Filtration
PROJECT NUMBER: F-623A-33
PRINCIPAL INVESTIGATOR: Moreno, F.E.
ADDRESS: 485 Clyde Ave., Mountain View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Drehmel, D.C.
TELEPHONE: F629-2925
TYPE OF FUNDING: Contract No.-68-02-2169
77 FUNDING: Environmental Protection Agency FY77:$400,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: To demonstrate the technical and economic viability of fabric filtration as a means of fine particle control at high temperatures (1500 degrees F) and pressures (10 atm).
APPROACH: Phase I consists of a matrix of bench scale tests designed to demonstrate the basic feasibility of candidate materials and regeneration mechanisms. These materials will be developed by a combination of inhouse expertise and subcontracted work to a fabric weaver. The program will include the development of a high temperature/pressure filtration theory; a thorough search for viable materials to supplement those already identified; and the design, fabrication and use of a bench scale testing apparatus. With the identification of the most promising materials systems an economic analysis will be performed and recommendations made for the continuation of the development program, i.e., Phase II. Phase II of the proposed program will continue the development of the promising concepts identified in Phase I. A pilot scale (500 scfm) facility will be constructed at Aerotherm to demonstrate the reliability of these concepts.
RESULTS: Phase I was initiated 8/76 and will require 16 months for completion. Phase II is anticipated to be an 8 month effort.
PROJECT MILESTONES: (1) 8/76 Contract award. (2) 12/77 Complete matrix of bench scale tests on candidate filtration materials. (3) 8/78 Complete life testing of best materials.
KEYWORDS: AEROSOLS;PARTICLES;AIR POLLUTION CONTROL;POLLUTION CONTROL EQUIPMENT;AIR FILTERS;FILTRATION;BENCH-SCALE EXPERIMENTS;HIGH TEMPERATURE;FEASIBILITY STUDIES;TEXTILES;FABRICATION;TESTING;PILOT PLANTS;AIR CLEANING SYSTEMS;DUSTS

<071332>
TITLE: Use of Electrostatically Charged Fog for Control of Dust from Open Sources
PROJECT NUMBER: F-623-A-34
PRINCIPAL INVESTIGATOR: Hoenig, S.A.
ADDRESS: Department of Electrical Engineering, Tucson, AZ 85721
AFFILIATION: Arizona Univ., Tucson (USA). Dept. of Electrical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Drehmel, D.C.
TELEPHONE: F629-2925
TYPE OF FUNDING: Grant No.-R-805-228

77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
GY CYCLE: STORAGE (100%)
UTANTS: PARTICULATES/Dust (100%)
ACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To continue the studies of industrial dusts and fumes and the development of apparatus for inducing these pollutants to agglomerate and fallout. Also to investigate the phenomena involved in dust/fume charging with the hope of providing better dust control systems.
APPROACH: The studies will be primarily experimental and will generate the appropriate dusts and fumes under controlled conditions to determine the parameters involved in charging phenomena. University of Arizona will make appropriate industrial measurements and studies to evaluate charging and dust control techniques in the factory environment.
RESULTS: University of Arizona has investigated the charging behavior of a variety of dusts and fumes. Most materials seem to have negative charges, at least for the respirable material, but there are some notable exceptions, i.e., magnetite. It has been demonstrated that these dusts and fumes can be induced to agglomerate and fallout when exposed to properly charged water fog. A number of industrial tests are underway to test prototype fog generators as mechanisms for dust control. University of Arizona has done some preliminary work on control of power plant fly ash and coal tar volatiles (from coke ovens). Here again it appears that the charged fog system has significant potential as a control technique.
PROJECT MILESTONES: (1) 6/77 Grant Award. (2) 6/78 Complete Laboratory Study of Controlling Parameters. (3) 6/79 Complete Field Tests.
KEYWORDS: DUST COLLECTORS;DESIGN;FOG;SPRAYS;ELECTROSTATIC PRECIPITATORS;AIR FILTERS;POWER PLANTS

<071333>
TITLE: Photochemical Study of NOx Removal from Stack Gases
PROJECT NUMBER: P-623A-35
PRINCIPAL INVESTIGATOR: Fox, D.L.
ADDRESS: School of Public Health, Chapel Hill, NC 27514
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, Joseph A.
TYPE OF FUNDING: Grant No.-R804740-01
77 FUNDING: Environmental Protection Agency FY77:$38,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO;NOXIOUS GAS/NOx (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: The objective of the proposed research is to evaluate the feasibility of NOx removal from flue gases by photochemical conversion of NO to NO2 followed by aqueous scrubbing. The proposed research has the potential for removal of fine particulates and SOx as well as NOx.
APPROACH: There is a good probability that the fine particulate with the high humidity of a stack gas will act as nucleation sites for nitric and sulfuric acid mist formation. The formation of aerosols would be enhanced by any photochemically active hydrocarbons that may be in the flue gas.
PROJECT MILESTONES: (1) 11/76 Grant award. (2) 12/78 Research complete.
KEYWORDS: AIR;PHOTOCHEMICAL REACTIONS;NITROGEN DIOXIDE;NITROUS OXIDE;SULFUR DIOXIDE;AEROSOLS;PARTICLES;REMOVAL;FLUE GAS;SCRUBBING;DENITRIFICATION;PHOTOCHEMICAL OXIDANTS;HYDROCARBONS

<071334>
TITLE: Fine Particle Emission Information System Development
PROJECT NUMBER: P-623A-36
PRINCIPAL INVESTIGATOR: Schrag, M.P.
ADDRESS: 425 Volker Blvd., Kansas City, MO 64110
AFFILIATION: Midwest Research Inst., Kansas City, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Johnson, Gary L.
TYPE OF FUNDING: Contract No.-68-02-2641
77 FUNDING: Environmental Protection Agency FY77:$148,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil and Gas (50%)
POLLUTANTS: PARTICULATES/Dust (50%);SPECIFIED OTHER POLLUTANTS/Multiple (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Provide technical expertise and support to EPA (IERL/RTP) in maintaining and furthering the development of the Fine Particle Emissions Information System (FPEIS) data base.
APPROACH: Specific activities will include (1) periodic updates of the FPEIS data base, including four published summary reports at semiannual intervals; (2) analytical methods development to improve the utility of the data base including documentation. Three such methods are anticipated; (3) technology transfer activities including two user workshops at annual intervals to provide an interchange of information about the system among the user community. Proceedings of these workshops will be published.
PROJECT MILESTONES: (1) 2/77 FPEIS in operation. (2) 12/77 Data from approximately 2000 test runs in system. Continual up-dates of system. (3) 9/79 Development contract complete.
WORDS: AIR POLLUTION;HEALTH HAZARDS;PARTICLES;AEROSOLS;BIOASSAY;EARTH ATMOSPHERE;INFORMATION SYSTEMS;DATA ACQUISITION;TECHNOLOGY TRANSFER;EDUCATION;INFORMATION RETRIEVAL;DOCUMENTATION;DUSTS;COAL INDUSTRY;CHEMICAL EFFLUENTS;PETROLEUM INDUSTRY;NATURAL GAS INDUSTRY;ENVIRONMENTAL IMPACTS

<071335>
TITLE: Nonpersonal, Quick Reaction Engineering and Technical Services
PROJECT NUMBER: F-623A-37
PRINCIPAL INVESTIGATOR: Mixon, F.O.
ADDRESS: P.O. Box 12194, Research Triangle Park, NC 27709
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2612
77 FUNDING: Environmental Protection Agency FY77:$672,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This project is for support of the technical activities of the Laboratory in the following areas: (1) assessment of environmental and economic impact of pollution control systems as they become commercially available to user industries; (2) process analysis; (3) cost estimation of pollution control systems that are being developed by EPA; (4) process research; (5) evaluation of the energy conservation potential of new pollution control technologies; (6) engineering analysis; (7) assessment of R and D programs in coal liquefaction, low, medium, and high BTU gasifiction, advanced combination research, and improved coal extraction and reclamation techniques; (8) process emissions and control technology surveys; (9) identification of new environmentally acceptable power systems that can provide cleaner more efficient utilization of fossil fuels; (10) associated technical services; and (11) regional assistance and State implementation planning.
APPROACH: The Environmental Protection Agency's Industrial Environmental Research Laboratory has the mission to support and encourage the development of technology for the control of air pollution from all sources. The activities of the Laboratory range from the identification of emissions sources and quantification of the emissions therefrom, through the development of control technology from conceptual ideas to full-scale implementation, to the evaluation of the economic and environmental impact of applications to the technology. This contract will provide a variety of short-term engineering and technical studies as the needs arise.
PROJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: ECONOMICS;ENVIRONMENTAL IMPACTS;POLLUTION CONTROL EQUIPMENT;PROCESS CONTROL;ECONOMICS;EVALUATION;ENERGY CONSERVATION;ENVIRONMENTAL ENGINEERING;TECHNOLOGY ASSESSMENT;COAL LIQUEFACTION;COAL GASIFICATION;COAL MINING;LAND RECLAMATION;FOSSIL FUELS;COMBUSTION KINETICS;TECHNOLOGY UTILIZATION;REGIONAL ANALYSIS;IMPLEMENTATION;PLANNING;POLLUTION REGULATIONS;RESEARCH PROGRAMS;US EPA

<071336>
TITLE: Methodologies for Utilization of Environmental-Impact-Assessment Data
PROJECT NUMBER: F-623A-38
PRINCIPAL INVESTIGATOR: Babcock, L.R. Jr.
ADDRESS: Medical Center, P.O. Box 6998, Chicago, IL 60680
AFFILIATION: Illinois Univ., Chicago (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Ripberger, C.T.
TYPE OF FUNDING: Grant No.-R805476-01
77 FUNDING: Environmental Protection Agency FY77:$59,500
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The proposed research seeks to define methodological approaches for use within EPA which would facilitate the identification of hazards and setting of standards and control priorities. A new comprehensive type of assessment data is being generated within EPA, and the proposed research, in part, would attempt to define how such information might be best utilized by health-effects, atmospheric-chemistry and other involved groups in order to generate meaningful cause-effect results in the shortest time.
APPROACH: The research will include definition of pertinent EPA units and procedures and obstacles to interchange of research results. Methods for improving knowledge transfer will be proposed. Comprehensive alternatives to ''single-pollutant'' methods will be developed. Several approaches will be considered including, but not limited to, those based on previously-developed air quality indexes, prioritization methodologies, and assessments of hypersensitive populations.
RESULTS: The first year will emphasize linkages between the Industrial Environmental Research Laboratory and health effects and standards-setting units of EPA. The second year would emphasize linkages with transport-and-transformation research. The third year would emphasize integration of diverse aspects of the environmental management system.
PROJECT MILESTONES: (1) 10/78 Complete research related to health effect linkages. (2) 10/79 Complete research related to Transport-Transformation. (3) 10/80 Complete integration studies.
KEYWORDS: ENVIRONMENTAL IMPACT STATEMENTS;TECHNOLOGY TRANSFER;HEALTH HAZARDS;SAFETY;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;DATA PROCESSING;ENVIRONMENTAL EFFECTS;POLLUTION REGULATIONS;ENVIRONMENT;MANAGEMENT;TECHNOLOGY UTILIZATION;INDEXES

<071337>
TITLE: Field Testing: Application of Combustion Modification Techniques to Control Pollutant Emissions from Industrial Boilers
PROJECT NUMBER: F-624-A-1
PRINCIPAL INVESTIGATOR: Thompson, R.E.
ADDRESS: 17332 Irvine Boulevard, Tustin, CA 92680
AFFILIATION: KVB Engineering, Inc., Tustin, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hall, Robert E.
TYPE OF FUNDING: Contract No.-68-02-1074
77 FUNDING: Environmental Protection Agency FY77:$29,000

TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/HC;NOXIOUS GAS/CO (50%);PARTICULATES/Dust;PARTICULATES/Smoke (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The purpose of this work is to determine the effectiveness of known combustion modification techniques to control pollutant emissions from industrial boilers. In addition, the effort will establish what the boiler manufacturers and users can do to control emissions with existing state-of-the-art technology and where combustion research activities should be concentrated.
APPROACH: An experimental field test program was carried out to investigate the effects of operating variables and combustion modification (e.g., excess air level, load, flue gas recirculation, staged combustion, fuel temperature and burner design) on air pollutant emissions from industrial boilers of various designs fired with coal, oil, gas and mixed fuels. The pollutants of interest in this study were oxides of nitrogen, oxides of sulfur, hydrocarbons, carbon monoxide, smoke, combustible and non-combustible particulate and trace elements.
RESULTS: Final reports providing the data and conclusions from the testing of more than sixty industrial boilers under a variety of conditions have been issued. At present, an industrial boiler operator's manual and a manufacturer's manual are being prepared and are expected to be completed in the first half of 1977.
PROJECT MILESTONES: (1) 6/73 Contract Start Date. (2) 10/73 Submit Boiler Survey. (3) 7/74 Phase I--50 Short term boiler field tests completed. (4) 9/74 Phase I--Final Report completed. (5) 10/74 Phase II--Work Plan Submitted. (6) 8/75 Phase II--20 Long term boiler field tests completed. (7) 3/76 Phase II--Final Report Completed. (8) 12/76 Industrial Boiler Operator Guideline Completed. (9) 6/77 Phases I and II--Data Supplement completed. (10) 8/77 Industrial Boiler Design Guideline completed.
KEYWORDS: BOILERS;AIR POLLUTION ABATEMENT;COMBUSTORS;PERFORMANCE TESTING;MODIFICATIONS;SULFUR OXIDES;NITROGEN OXIDES;HYDROCARBONS;FLUE GAS

<071338>
TITLE: Preparation for Guidelines for Adjustment of Atmospheric Base Burners for Residential and Commercial Heating
PROJECT NUMBER: P-624-A-2
PRINCIPAL INVESTIGATOR: Locklin, D.W.
ADDRESS: 505 King Ave., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
MONITOR: Hall, Robert E.
TYPE OF FUNDING: Contract No.-68-02-2653
77 FUNDING: Environmental Protection Agency FY77:$26,700
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/Hydrocarbons;NOXIOUS GAS/CO (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The program objective is to provide guidelines for adjustment of residential and commercial atmospheric gas burners. The document will be used by service technicians to adjust gas burners for reduced air pollutant emissions and improved efficiency. The guideline can also be used for training gas burner service technicians.
APPROACH: The approach will include sub-contracting to gas industry experts who are familiar with gas burner operation. There will be an independent industry review before final publication.
RESULTS: A homeowners' bulletin shall also be prepared for final editing and printing by EPA.
PROJECT MILESTONES: (1) 9/77 Contract Start Date. (2) 1/78 Complete guideline draft for Industry Review. (3) 4/78 Complete homeowners bulletin draft. (4) 6/78 Complete Guideline (users Manual).
KEYWORDS: COMBUSTORS;NATURAL GAS;RESIDENTIAL SECTOR;COMMERCIAL SECTOR;RECOMMENDATIONS;AIR POLLUTION;IN-SERVICE INSPECTION;POLLUTION CONTROL EQUIPMENT;EDUCATION;MANUALS;HEATERS;OPERATION;HYDROCARBONS;NITROGEN OXIDES;AIR POLLUTION CONTROL

<071339>
TITLE: Fuel Decomposition and Flame Reactions in Conversion of Fuel Nitrogen to NOx
PROJECT NUMBER: P-624-A-4
PRINCIPAL INVESTIGATOR: Nuridr, W.H.
ADDRESS: 6633 Canoga Ave., Canoga Park, CA 91304
AFFILIATION: Rockwell International Corp., Canoga Park, Calif. (USA). Rocketdyne Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, G.B.
TYPE OF FUNDING: Contract No.-68-02-1886
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: An eighteen-month experimental and analytical program has been initiated to provide information on fuel decomposition, fuel oxidation and flame reactions which is required for the evelopment of a complete understanding of the chemical phenomena involved in the conversion of organic uel nitrogen compounds to NOx during combustion.
APPROACH: The program is divided into three tasks. Task I consists of additional experimental studies of the types of chemical reactions that fuel nitrogen species can undergo as fuel reacts in the early (preflame) stages of combustion. The pyrolysis and oxidation of model nitrogen compounds, coals, residual oil and alternate fuels will be investigated. Task II involves the study of combustion kinetics involved in fuel NOx formation from HCN and NH3 in premixed CH4 flames including: (1) interactions with thermal NOx formation; (2) more detailed analysis of nitrogen-containing species, and (3) organic nitrogen additives

or diffusion flame studies.
PROJECT MILESTONES: (1) 6/75 Initiate Contract. (2) 2/78 Identify Primary and Secondary Fuel Pyrolysis Products.
KEYWORDS: COAL;PYROLYSIS;DECOMPOSITION;NITROGEN OXIDES;AIR POLLUTION;EARTH ATMOSPHERE;FLAMES;COMBUSTION KINETICS;QUANTITATIVE CHEMICAL ANALYSIS;NITROGEN COMPOUNDS

<071340>
TITLE: Environmental Assessment of Stationary Source NO/sub x/ Control Technologies
PROJECT NUMBER: P-624-A-6
PRINCIPAL INVESTIGATOR: Mason, H.B.
ADDRESS: 485 Clyde Avenue, Mountain View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Bowen, Joshua S.
TYPE OF FUNDING: Contract No.-68-02-2160
77 FUNDING: Environmental Protection Agency FY77:$600,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/ (60%);SPECIFIED OTHER POLLUTANTS/Multiple pollutants (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (40%);ANALYTICAL (60%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The objectives of this 3-year systems study are to (1) identify the multi-media environmental impact of stationary combustion sources and NO/sub x/ combustion modification controls and (2) identify the most cost effective combustion modification approach(es) to achieving and maintaining air quality for NO2. The results of this study will guide the development and subsequent implementation of environmentally sound NO/sub x/ control techniques.
APPROACH: Detailed process engineering and multimedia impact studies will be made of the application of commercial heating systems, stationary engines and industrial process furnaces as well as of alternate concepts such as the use of catalytic combustion or of clean fuels. Control of NO/sub x/ emissions by combustion process modification will be emphasized for near-term application. The combination of combustion modification with post-combustion flue gas treatment will be considered for application in the post-1980 period. The initial effort, in progress, is to generate a comprehensive inventory and projection of gaseous, liquid and solid effluents or both controlled and uncontrolled sources. The environmental stresses of the sources and control systems will be evaluated according to pollutant transport and transformation and ultimate receptor impact. Field emission tests will be made to augment the existing data base. Process studies will yield data on control effectiveness, energy efficiency, cost and differential trace emissions for current and emerging control systems.
RESULTS: The study will culminate with a system analysis which will integrate the process engineering and envircnmental impact results to determine the optimum combination of the control systems under consideration, on a regional basis, to comply with NO2 air quality standards.
PROJECT MILESTONES: (1) 6/76 Initiate Project. (2) 2/77 Preliminary environmental assessment report. (3) 7/77 Alternate clean fuels special report. (4) 1/78 Utility Boiler NO/sub x/ Control Technology special report. (5) 5/78 Industrial boiler NO/sub x/ Control Technology Special Report. (6) 5/78 Advanced Combustion control technology Special Report. (7) 8/78 Gas turbine NO/sub x/ Control Technology Special Report. (8) 10/78 Residential heating NO/sub x/ Control Technology Special Report. (9) 12/78 IC Engine NO/sub x/ Control Technology Special Report. (10) 12/78 Complete emissions field testing. (11) Project Final report.
KEYWORDS: STATIONARY POLLUTANT SOURCES;NITROGEN OXIDES;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;CONTROL;AIR QUALITY;PROCESS CONTROL;ENVIRONMENTAL TRANSPORT;INVENTORIES;ENVIRONMENTAL ENGINEERING;STANDARDS;COMBUSTION KINETICS;MODIFICATIONS;FLUE GAS;CATALYTIC EFFECTS;ENVIRONMENTAL IMPACTS;COMBUSTORS;INDUSTRY

<071341>
TITLE: Application of Advanced Combustion Modification Techniques to Selected Industrial Process Equipment
PROJECT NUMBER: P-624-A-7
PRINCIPAL INVESTIGATOR: Bartz, D.R.
ADDRESS: 17332 Irvine Blvd., Tustin, CA 92680
AFFILIATION: KVB Engineering, Inc., Tustin, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hall, Robert E.
TYPE OF FUNDING: Contract No.-68-02-2845
77 FUNDING: Environmental Protection Agency FY77:$721,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx;NOXIOUS GAS/HC;NOXIOUS GAS/CO (60%);PARTICULATES/Dust (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (40%);DEVELOPMENT/Laboratory scale (60%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objectives are to provide information about the effect of detailed combustion modification techniques on the emissions and performance of selected industrial process combustion equipment. Technology which has been successfully developed for reducing pollutants from boilers will be applied to other types of stationary combustion equipment.
APPROACH: The approach will be to perform feasibility tests on sub-scale equipment where possible. These tests will include techniques such as modified fuel injection, controlled entrainment, steam injection, controlled heat removal, and flue gas recirculation. Approximately six units will be selected for follow-up full scale tests.
RESULTS: Products will include a final report, data supplement, and instructional guideline for manufacturers and operators of each equipment type tested.
PROJECT MILESTONES: (1) 8/77 Contract Start Date. (2) 9/77 Submit Work Plan. (3) 3/78 Complete Test Site

Selection. (4) 5/78 Sub-Scale Tests completed. (5) 8/78 Interim report completed. (6) 5/79 Full Scale Tests completed. (7) 7/79 Final Report Submitted. (8) 8/79 Guideline (Users Manual) submitted. (9) 8/79 Data Supplement submitted.
KEYWORDS: BOILERS;COMBUSTORS;MODIFICATIONS;AIR POLLUTION ABATEMENT;INDUSTRIAL PLANTS;NITROGEN OXIDES;SULFUR OXIDES;HYDROCARBONS

<071342>
TITLE: Field Testing: Application of Combustion Modification Technology to Industrial Combustion Equipment
PROJECT NUMBER: P-624-A-8
PRINCIPAL INVESTIGATOR: Bartz, D.R.
ADDRESS: 17332 Irvine Blvd., Tustin, CA 92680
AFFILIATION: KVB Engineering, Inc., Tustin, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hall, Robert E.
TYPE OF FUNDING: Contract No.-68-02-2144
77 FUNDING: Environmental Protection Agency FY77:$55,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx;NOXIOUS GAS/CO;NOXIOUS GAS/HC (40%);PARTICULATES (30%);ORGANICS/POM;ORGANICS/PCB (30%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The program objective is to evaluate the effectiveness of combustion modifications as means of emissions reduction and thermal efficiency improvement on industrial combustion equipment including kilns, ovens, dryers, process furnaces and heaters, boilers, stationary engines and gas turbines.
APPROACH: The approach will involve a field test program to measure emissions of NO, NOx, SO2, SO3, CO, gaseous hydrocarbons, particulates, trace elements, organics (POM, PCB) sulfates and nitrates. Baseline tests will be conducted on about twenty-five representative combustion devices and combustion modifications will be implemented to determine the influence on emisssions and efficiency. These modifications include lowered excess combustion air, staged combustion, reduced air preheat, fuel changes, water injection and flue gas recirculation.
RESULTS: The program is an extension of work conducted on EPA Contract 68-02-1074 that dealt with industrial boilers. Combustion modification technology that was found effective on boilers will be extended to other industrial equipment, although extensive tests on two industrial boilers equipped with staged air and/or flue gas recirculation are included.
PROJECT MILESTONES: (1) 1/76 Contract Start Date. (2) 3/76 Equipment Survey. (3) 9/76 Test Unit Selection. (4) 3/77 Field Tests completed for Industrial Process Equipment. (5) 5/77 Extensively modified boilers tested. (6) 10/77 Final Report. (7) 10/77 Modified Boiler report. (8) 10/77 Data Supplement. (9) 10/77 Data Coding.
KEYWORDS: BOILERS;COMBUSTORS;MODIFICATIONS;AIR POLLUTION ABATEMENT;SULFUR OXIDES;HYDROCARBONS;NITROGEN OXIDES

<071343>
TITLE: Field Testing: Application of Combustion Modification to Control Pollutant Emission from Power Generation Combustion System
PROJECT NUMBER: P-624-A-9
PRINCIPAL INVESTIGATOR: Bartok, W.
ADDRESS: P.O. Box 8, Linden, NJ 07036
AFFILIATION: Exxon Research and Engineering Co., Linden, N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hall, Robert E.
TYPE OF FUNDING: Contract No.-68-02-1415
77 FUNDING: Environmental Protection Agency FY77:$338,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx;NOXIOUS GAS/HC;NOXIOUS GAS/CO;NOXIOUS GAS/CO2 (60%);PARTICULATES/Trace elements (30%);ORGANICS/POM (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (40%);DEVELOPMENT/Laboratory scale (60%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The purpose of this study is to field test power generation combustion equipment including utility boilers, gas turbines, and stationary I.C. engines. Emphasis will be placed on utility boilers firing coal, but the study will include tests of gas- and oil-fired boilers and boilers capable of firing two or more fuels simultaneously. Tests with simultaneous firing of waste and fossil fuels shall also be included.
APPROACH: Emissions to be measured are oxides of nitrogen, oxides of sulfur, hydrocarbons, carbon monoxide, carbon dioxide, oxygen, opacity, sulfates, nitrates, particulate (mass and size distribution), POM, and trace elements. The effect of combustion modification on air pollutant emissions and combustion efficiency will be determined. Also, the effect of modified operation on equipment performance (e.g., slagging, fouling, and steam temperature control) will be investigated.
RESULTS: One primary goal is to determine the effect of staged combustion in coal-fired boilers on tube wall corrosion rates. Staged combustion combined with low excess air firing is the most attractive combustion modification combination because it is an effective method of reducing NOx and is relatively easy and inexpensive to implement. However, some experts suspect the reducing atmosphere in the burner zone to increase tube wall corrosion rates. The Contractor will use three methods for measuring corrosion rates: (1) corrosion probes for an easy, inexpensive, but probably an inaccurate method, (2) ultrasonic tube wall measurement which is more costly but should provide an accurate mapping of the furnace tube wall surface, and (3) test panels which will be welded into the boiler tube wall in areas where extensive corrosion is anticipated. The test panels will be removed after a 6 to 12 month period for precise measurements.
PROJECT MILESTONES: (1) 6/74 Contract Start Date. (2) 4/77 Complete Final Report on Initial Seven Boilers.

(3) 9/77 Complete horizontally opposed boiler corrosion tests. (4) 11/77 Complete Final report on all equipment emission tests. (5) 12/77 Complete Guidelines (Users Manuals). (6) 1/78 Complete Data Supplement. (7) 4/79 Complete single-wall boiler corrosion tests.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;AIR POLLUTION ABATEMENT;COMBUSTORS;MODIFICATIONS;SULFUR OXIDES;HYDROCARBONS;NITROGEN OXIDES;COMBUSTION KINETICS;AIR POLLUTION

<071344>
TITLE: Evaluation of Emissions and Control Technology for Industrial Stoker Boilers
PROJECT NUMBER: P-624-A-10
PRINCIPAL INVESTIGATOR: Giammar, R.D.
ADDRESS: 505 King Ave., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wasser, John H.
TYPE OF FUNDING: Contract No.-68-02-2627
77 FUNDING: Environmental Protection Agency FY77:$250,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx (50%);SPECIFIED OTHER POLLUTANTS/Multiple (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Battelle-Columbus is conducting a program to (1) characterize the spectrum of emissions from industrial coal-fired stoker boilers firing several types of coal under various stoker firing conditions, (2) investigate control methods to reduce these emissions, (3) determine the effect of these control methods and variations in stoker-boiler operation on the overall performance of the stoker boiler, and (4) assess the environmental impact of new technology on the future acceptability of stoker boilers.
APPROACH: The program is divided into two phases. In Phase I, the comprehensive emissions characteristics will be determined from the combustion of untreated, reconstituted, and processed coals in Battelle's 20-hp stoker boiler small-scale stoker. Appropriate data will be collected to determine if criteria pollutants and Level 1 and 2 pollutant groups are responsive to changes in fuel, stoker operation, or combustion parameters. An assessment will be developed that will include defining the potential for untreated, reconstituted, and processed coals to improve the environmental acceptability of stoker boilers. Phase II will be conducted to identify and evaluate potential control concepts for control of emissions from full-scale industrial stoker boilers. The Battelle steam plant 600-hp spreader-stoker boiler will be utilized and modified to evaluate potential control concepts. This phase will provide a systematic evaluation of control concepts while firing several representative stoker fuels, including the most promising treated coal identified in Phase I.
RESULTS: Based on the results of the research program, an assessment will be developed to define the potential of emissions control on the overall acceptability of industrial stoker coal-fired boilers.
PROJECT MILESTONES: (1) 12/77 Model Spreader stoker completed. (2) 6/78 Research program on cleaned coals completed. (3) Development program on Full Scale Spreader Stoker Completed.
KEYWORDS: BOILERS;INDUSTRIAL PLANTS;COAL;AIR POLLUTION ABATEMENT;SULFUR OXIDES;NITROGEN OXIDES;HYDROCARBONS;FLUE GAS

<071345>
TITLE: Combustion Research on Coal Nitrogen and Particulate Organic Matter
PROJECT NUMBER: P-624-A-12
PRINCIPAL INVESTIGATOR: Howard, J.B.
ADDRESS: 77 Massachusetts Ave., Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wasser, J.H.
TYPE OF FUNDING: Contract No.-R-803242
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx (50%);PARTICULATES/Soot (20%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This work has two objectives: (1) Characterization of POM from diffusion and premixed flames. (2) Determination of kinetics of devolatilization of nitrogen compounds during the high temperature pyrolysis of coal.
APPROACH: Task I: The research is concerned with the qualitative and quantitative assessment of the production of particulate organic matter in laboratory flames. The objectives are to determine within the flame and in the exhaust gases (1) the size distribution and concentrations of soot particles, (2) the identities and concentrations of organic compounds, (3) the relationship between soot and organic compounds generated in the flame. Experimental methodology used includes particle concentration and size distribution by electron microscopy, and analysis of polycyclic aromatic hydrocarbon by gas chromatographic mass spectrometry and high resolution mass spectrometry. The major emphasis involves the application of molecular beam sampler and on-line mass spectrometry for complete gas phase analysis. Additional information is obtained by sampling atmospheric pressure turbulent diffusion flames and laminar premixed flames by water-injected sampling probes. Task II: The program objectives are to obtain a better understanding of the processes contributing to the emission of NOx from coal fired boilers to better define control methods. Fuel bound nitrogen complicates development of low NOx burners because the nitrogen in char may persist into the second stage of a staged combustor.
RESULTS: During the past two years laboratory furnaces have been developed for the pyrolysis and oxidation o pulverized coal under conditions simulating utility boilers. Results on nitrogen retention in char have been determined for two coals as a function of temperature and time. Also, the conversion of the fuel nitrogen to NOx has been determined as a function of fuel/air ratio for one furnace temperature. Five additional coals will be studied over a wider range of temperatures and data will be obtained on the gas phase constituents of pyrolysis. The coals chars will be characterized to develop mechanistic models for extrapolation of data to other conditions.

PROJECT MILESTONES: (1) 8/75 Complete experimental systems and initial test. (2) 8/76 Complete study of soot and PCAH formation in turbulent diffusion flames. (3) 8/76 Complete evaluation of compound N behavior for two common coals. (4) 10/77 Final report.
KEYWORDS: NITROGEN OXIDES;SOOT;COAL;PYROLYSIS;CHEMICAL REACTION KINETICS;COMBUSTION KINETICS;NITROGEN COMPOUNDS;FLAMES;AEROSOLS;EXHAUST GASES;MASS SPECTROSCOPY;POLYCYCLIC AROMATIC HYDROCARBONS;QUANTITATIVE CHEMICAL ANALYSIS;ELECTRON MICROSCOPY;DIFFUSION

<071346>
TITLE: Environmental and Energy Assessment of Afterburner Combustion System
PROJECT NUMBER: P-624-A-12
PRINCIPAL INVESTIGATOR: Barrett, R.E.
ADDRESS: 505 King Ave., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wasser, John H.
TYPE OF FUNDING: Contract No.-68-02-2629
77 FUNDING: Environmental Protection Agency FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx;NOXIOUS GAS/HC;NOXIOUS GAS/CO (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (40%);ANALYTICAL (60%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Battelle-Columbus is conducting a program to assess the performance of afterburner emission control devices by evaluating (1) the potential of afterburners for reducing emissions; (2) the potential of afterburners generating emissions; and (3) the efficient utilization of fuel in afterburners, as it relates to emission control. Afterburner types included in the program are direct flame combustion afterburners, thermal combustion afterburners, and catalytic afterburners.
APPROACH: The program is divided into two phases. Phase I includes the collection and correlation of available data (from the literature, from EPA source tests, from state and local agencies, etc.) to assess the state-of-the-art of afterburner application technology. Phase II includes two tasks that are directed at generating new data on afterburner performance, and two that are directed at documenting the environmental and engineering aspects of afterburner application. The experimental tasks are directed toward obtaining new afterburner performance data in the field and the laboratory, respectively.
RESULTS: The last two tasks consist of utilizing the data generated in the experimental program to complete an environmental assessment of afterburners and to develop a ''Standard Practice Manual'' for use by engineers involved in afterburner application.
PROJECT MILESTONES: (1) 12/77 Preliminary Environmental Assessment Completed. (2) 11/78 Laboratory Studies Completed. (3) 1/79 Field Test completed. (4) 9/79 Environmental Assessment Completed. (5) 2/80 Standard Practice Manual Completed.
KEYWORDS: AFTERBURNERS;PERFORMANCE TESTING;ENVIRONMENTAL IMPACTS;NITROGEN OXIDES;SULFUR OXIDES;HYDROCARBONS;CARBON MONOXIDE;AIR POLLUTION CONTROL;FUEL CONSUMPTION;EXHAUST GASES;MANUALS

<071347>
TITLE: Combustor Design Concepts for NOx Control, Advanced LBG Fired Systems
PROJECT NUMBER: P-624-A-14
PRINCIPAL INVESTIGATOR: Heap, M.P.
ADDRESS: 8001 East Irvine Blvd., Santa Ana, CA 92705
AFFILIATION: Energy and Environmental Research Corp., Santa Ana, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, G.B.
TYPE OF FUNDING: Contract No.-68-02-2196
77 FUNDING: Environmental Protection Agency FY77:$280,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx (60%);PARTICULATES (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (20%);DEVELOPMENT/Laboratory scale (50%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Utilization of low Btu gas (LBG) in an environmentally acceptable and energy efficient manner requires careful attention to overall system design. While most system aspects are being extensively considered, the combustor for utilization of high temperature, nitrogen compound containing LBG without production of high levels of NOx and other pollutants has not been given sufficient attention. Preliminary calculations performed on EPA contract 68-02-1361 indicated significant promise for control of thermal and fuel NOx by proper combustion design.
APPROACH: This program will substantiate those concepts through a coordinated study including: (1) combustor design calculations; (2) bench scale experiments; and (3) design and fabrication of two prototype combustors for testing at the IERL-RTP Laboratory.
RESULTS: Two prototype combustors.
PROJECT MILESTONES: (1) 10/76 Initiate contract. (2) 6/78 Identify promising concepts. (3) 2/79 Complete prototype combustor lab tests.
KEYWORDS: COMBUSTORS;DESIGN;AIR POLLUTION ABATEMENT;NITROGEN OXIDES;LOW BTU GAS;COMBUSTION

<071348>
TITLE: Fundamental Combustion Research Applied to Pollution Control
PROJECT NUMBER: P-624-A-16
PRINCIPAL INVESTIGATOR: Tyson, T.J.
ADDRESS: 8001 Irvine Blvd., Santa Ana, CA
AFFILIATION: Energy and Environmental Research Corp., Santa Ana, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lanier, W.S.
TYPE OF FUNDING: Contract No.-68-02-2631
77 FUNDING: Environmental Protection Agency FY77:$893,000
TECHNOLOGY: FOSSIL FUEL/General (100%)

ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (30%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: This contract involves the formulation and execution of a comprehensive fundamental combustion research program to provide additional insight into the features of combustion controlling the formation of pollutants in flames. In formulating the program primary emphasis is placed upon critically selecting tasks which will maximize the impact of fundamental combustion research (FCR) on commercial realization of pollution control technology.
APPROACH: Execution of the program requires coordination with other elements of the EPA combustion research program, and work being sponsored by other government agencies and by industry. Included in the program are studies of chemical kinetics, combustion aerodynamics, numerical modelling and direct application of FCR to current problems in the Fuels R and D, Process R and D or Field Testing sections of the EPA Combustion Research Program. Additionally, a significant amount of subcontracted work is planned in order to utilize the talents, expertise and equipment at the various research establishments throughout the country.
RESULTS: Annual reports.
PROJECT MILESTONES: (1) 2/77 Initiate Contract. (2) 8/77 Complete Initial Technology Assessments. (3) 10/77 Initiate Major Subcontract Procurements. (4) 2/78 First Annual Report. (5) 12/78 First Demonstration of Application of Fundamental Research to Pollutant Control Systems. (6) 2/79 Second Annual Report. (7) 4/80 Final Report.
KEYWORDS: COMBUSTION;COMBUSTORS;AIR POLLUTION ABATEMENT;RESEARCH PROGRAMS;REACTION KINETICS;FLAMES

<071349>
TITLE: Investigation of NO/sub x/--Nitrate-Sulfate Production in Laboratory Flames
PROJECT NUMBER: F-624-A-17
PRINCIPAL INVESTIGATOR: Seery, D.J.
ADDRESS: 400 Main Street, East Hartford, CT 00108
AFFILIATION: United Technologies Research Center, East Hartford, Conn. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lanier, W.A.
TYPE OF FUNDING: Contract No.-68-02-2188
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/HO/sub x/;NOXIOUS GAS/SO/sub x/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: An experimental program will be conducted to measure the concentrations of the important stable and unstable species in methane-air flames. Particular emphasis will be placed on a determination of the presence of nitrates and sulfates in the flame zone. In addition to searching for flame formed nitrates the study will devote a major effort to determining if the nitrate precursor, NO2, is actually present in the early flame zone and if reactions are occurring within the sampling probe which perturb the actual NO/NO2 concentration ratio.
APPROACH: Various sampling techniques will be employed including cooled and uncooled quartz microprobes, optical spectroscopy, and molecular beam sampling for measurements of radical species and stable species with interferences. The molecular beam sampling--mass spectrometry technique will be augmented by use of the appearance potential measurements which greatly increases the number of species which can be measured. Measurements will be made over a range of stoichiometries and with the NO/sub x/ resulting from conversion of both atmospheric N2 and fuel-bound nitrogen.
RESULTS: One experimental series calls for doping the fuel with hydrogen sulfide and sampling to identify the presence of flame formed sulfates. This series of tests will be performed using the molecular beam sampler so that not only sulfates but also their precursors will be identified.
PROJECT MILESTONES: (1) 9/76 Initiate Contract. (2) 10/77 Complete Assessment of Clean Fuel Kinetics including NO2 formation and probe effects. (3) 9/78 Complete Study of probe effects, sulfate formation, and NO/sub x//SO/sub x/ interactions. (4) 11/78 Complete Final Report.
KEYWORDS: NITROGEN OXIDES;NITRATES;SULFATES;FLAMES;COMBUSTION KINETICS;MASS SPECTROSCOPY;CHEMICAL REACTION KINETICS;SYNTHESIS

<071350>
TITLE: Advanced Combustion Systems for Stationary Gas Turbine Engines
PROJECT NUMBER: F-624-A-18
PRINCIPAL INVESTIGATOR: Mosier, S.A.
ADDRESS: P.O. Box 2891, West Palm Beach, FL 33402
AFFILIATION: Pratt and Whitney Aircraft, West Palm Beach, Fla. (USA). Government Products Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lanier, W.S.
TYPE OF FUNDING: Contract No.-68-02-2136
77 FUNDING: Environmental Protection Agency FY77:$257,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (40%);FOSSIL FUEL/Oil and Gas (30%);FOSSIL FUEL/Oil Shale (30%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/CO (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: An exploratory development program of analysis and experimentation will be conducted to identify new stationary gas turbine combustion designs which reduce pollutant emissions. Primary emphasis will be placed upon control of the oxides of nitrogen (NOx) from both the thermal and fuel-bound sources, via dry techniques, while at least maintaining current control of carbon monoxide (CO) and unburned hydrocarbon (UHC).

APPROACH: The program is divided into four phases: (1) a review of the various combustor design approaches; (2) screening experiments of the various techniques; (3) design of full-scale combustors for a nominally 25 MW stationary gas turbine engine; (4) evaluation of the full-scale combustors in both test rigs and in an engine.
RESULTS: Through the performance of all four phases, the NOx concentration goals for the combustor designs are 50 ppmv when burning gas or oil containing no more than trace quantities of bound nitrogen and 100 ppmv when burning oil containing up to 0.5 percent (by weight) of chemically bound nitrogen. The CO concentration goal is 100 ppmv regardless of the fuel type.
PROJECT MILESTONES: (1) 12/75 Initiate Contract. (2) 5/76 Complete duty cycle review and combustor concept selection. (3) 10/77 Complete bench scale evaluation of combustor concepts. (4) 12/77 Bench scale testing final report. (5) 1/78 Complete construction of full scale combustors. (6) 8/78 Complete evaluation of full-scale hardware. (7) 10/78 Final Report.
KEYWORDS: GAS TURBINES;DESIGN;AIR POLLUTION ABATEMENT;NITROGEN OXIDES;CARBON MONOXIDE;HYDROCARBONS;COMBUSTORS;EXHAUST GASES;TEST FACILITIES

<071351>
TITLE: Investigation of Aerodynamic Phenomena in Pollution Control
PROJECT NUMBER: F-624-A-19
PRINCIPAL INVESTIGATOR: Spadaccini, L.J.
ADDRESS: 400 Main St., East Hartford, CT 06108
AFFILIATION: United Aircraft Corp., East Hartford, Conn. (USA). Research Labs.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lanier, W.S.
TYPE OF FUNDING: Contract No.-68-02-1873
77 FUNDING: Environmental Protection Agency FY77:$5,500
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/CO (70%);PARTICULATES/Dust (30%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (60%);ANALYTICAL (40%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The research program will investigate aerodynamic phenomena in the control of pollutants from gaseous and heterogeneous combustion.
APPROACH: (1) Utilize recently developed optical and probing techniques to obtain detailed information on the chemical and physical processes occurring inside a combustor operating on gaseous and liquid fuels. (2) Compare experimental observations with results from a combustor flow analysis (PREP code) to further evaluate the theoretical model. (3) Further develop the combustor flow analysis for predicting the physical and chemical processes occurring in combustors operating on gaseous and liquid fuels. (4) Utilize information obtained from the experimental and theoretical investigation to evaluate potential emission control strategies for gaseous and liquid fuel combustors.
PROJECT MILESTONES: (1) 3/75 Initiate Contract. (2) 12/75 Complete Gaseous Fuel Experiments. (3) 2/76 Complete Phase I Report. (4) 8/76 Complete Liquid Fuel Experiments. (5) 12/76 Complete Experimental Final Report. (6) 3/77 Complete Development of Numerical Analysis Procedure. (7) 8/77 Complete Final Report.
KEYWORDS: COMBUSTORS;AIR POLLUTION ABATEMENT;AERODYNAMICS;DESIGN;NITROGEN OXIDES

<071352>
TITLE: Staged Combustion for NOx Control and Enhanced SO3 Emissions
PROJECT NUMBER: F-624A-20
PRINCIPAL INVESTIGATOR: Levy, A.
ADDRESS: 505 King Ave., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Grant No.-R805330-01
77 FUNDING: Environmental Protection Agency FY77:$34,600
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (40%);FOSSIL FUEL/Oil and Gas (30%);FOSSIL FUEL/Oil Shale (30%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx;NOXIOUS GAS/Sulfates (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: Previous experimental studies indicate that staged combustion processes designed to reduce NOx emissions may enhance SO3 emission. The objective of this proposed program is to investigate the extent to which SO3/SO2 ratios may be increased when NOx emission is reduced under specific and well defined conditions of staged combustion.
APPROACH: For these studies, a simple two-stage laboratory burner will be used. Measurements of NOx, SO2, SO3, and temperature will be at the exit of each stage for both single-stage and two-stage operation of the burner under different operating conditions.
RESULTS: Results from these studies will be used to assess the extent to which enhanced SO3 production can be a problem in staged combustion systems.
PROJECT MILESTONES: (1) 7/77 Initiate Grant. (2) 1/78 Complete Assessment of Enhanced Sulfate Formation from Stage Combustion. (3) 2/78 Complete Final Report.
KEYWORDS: COAL;FUEL OILS;NATURAL GAS;COMBUSTION PRODUCTS;NITROGEN OXIDES;SULFUR OXIDES;CHEMICAL REACTION YIELD;COMBUSTORS;INHIBITION;AIR POLLUTION ABATEMENT

<071353>
TITLE: Pilot Scale Evaluation of Advanced Combustion Control Technology for Fossil and Waste Fuels
PROJECT NUMBER: P-624-A-22
PRINCIPAL INVESTIGATOR: Hartman, C.
ADDRESS: 485 Clyde Ave., Mt. View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lachapelle, David G.
TYPE OF FUNDING: Contract No.-68-02-1885
77 FUNDING: Environmental Protection Agency FY77:$250,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (50%);FOSSIL FUEL/Biomass - pyrolysis (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx (80%);PARTICULATES/Dust (20%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The objective of this experimental research project is to develop advanced low emission high efficiency combustion techniques for application to industrial and utility boilers firing fossil and waste fuels. Primary emphasis will be on control of oxides of nitrogen (NOx) through modification of combustion conditions. The facility is a subscale versatile furnace, with capacity of 3 x 10 to the sixth power Btu/hr, capable of firing a variety of solid, liquid and gaseous fuels. The furnace may be operated either in the wall firing mode, using up to 10 individual burners, or in the tangential, corner, firing mode using up to 24 individual fuel/air nozzles. The research burners for single wall or opposed wall firing are of a variable swirl double concentric design with capacities of either 300,000 Btu/hr or 1.5 x 10 to the sixth power Btu/hr.
APPROACH: The first Phase effort will focus on NOx control techniques for conventional fossil fuels, primarily pulverized coal and residual oil. Initially, the combustion characteristics of the furnace will be studied to establish the correspondence to full-scale utility and industrial boilers. Subsequent testing will optimize NOx control through two-stage combustion, flue gas recirculation and low excess air firing for the wall fired and tangentially fired configurations. Emphasis will be given to identification of optimum staging conditions for reduction of NOx from coal fired boilers. The second Phase program will explore NOx control techniques for the firing of mixed conventional fuels, new alternate fuels, waste fuels, and mixtures of conventional fuels with alternate or waste fuels.
RESULTS: Waste Fuel Study
PROJECT MILESTONES: (1) 6/75 Initiate Work. (2) 12/75 Complete System Shakedown. (3) 6/77 Complete Control Technology Tests With Coal. (4) 7/77 Initiate Coal/Oil Slurry Tests. (5) 9/77 Complete Coal/Oil Slurry Tests. (6) 10/77 Initiate Waste Fuel Studies.
KEYWORDS: BOILERS;POLLUTION CONTROL EQUIPMENT;COAL;RESIDUAL PETROLEUM;COMBUSTION PRODUCTS;AIR POLLUTION;NITROGEN OXIDES;FOSSIL-FUEL POWER PLANTS;SOLID WASTES;BIOMASS;AEROSOLS

<071354>
TITLE: Evaluation of Pollution Emissions from Industrial Burners Using Low-Medium Btu Gases from Coal
PROJECT NUMBER: P-624-A-23
PRINCIPAL INVESTIGATOR: Larson, D.H.;Waibel, R.T.;Fleming, E.
ADDRESS: 3424 South State St., Chicago, IL 60616
AFFILIATION: Institute of Gas Technology, Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lachapelle, David G.
TYPE OF FUNDING: Contract No.-68-02-2643
77 FUNDING: Environmental Protection Agency FY77:$161,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (80%);COMBUSTION OR END USE (20%)
POLLUTANTS: NOXIOUS GAS/NOx (90%);PARTICULATES/Dust (10%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The work is designed to evaluate the severity of NOx emissions from combusting ''dirty'' low- and intermediate- Btu gases. It was concluded from an environmental assessment of commercial gasification processes that there are two different groups of ''dirty'' off-gas in terms of potential sources of NOx. Ammonia is contained in both of these groups. Group differentiation is based on the type and concentration of tar-oils and particulates.
APPROACH: In order to keep the proposed work plan within the program's objectives of problem definition, we will investigate one gas with the maximum number of potential NOx sources (ammonia, tar-oils and char) at both an intermediate- (oxygen) and low-(air) Btu heating value. The gas proposed for testing is Wellman-Galusha, based on the existence of a comprehensive data bank gathered for the combustion of clean Wellman-Galusha off-gas during a recently completed program for EPA (Contract No. 68-02-1360).
RESULTS: Two burners were selected for testing based on their extremely different aerodynamic characteristics and their large level of NOx emissions with natural gas. The emissions from the ported baffle burner (PBB; used in melting, reheating, and holding furnaces) is estimated at 92.4 x 10 to the sixth power lb NO2/yr while the gas momentum control burner (GMCB; used in cement, lime, copper, and alumina kilns and drying furnaces emits 441.0 x 10 to the sixth power lb NO2/yr. These burners are the two largest polluters in the industrial category. Their differences in combustion aerodynamics arise over the method employed to control the rate of fuel-air mixing and flame shape. The PBB uses swirl (tangential velocity component) of the combustion air, while the GMCB uses the quantity and velocity of the primary air coupled with the velocity of the fuel jet.
PROJECT MILESTONES: (1) 6/77 Work Initiated. (2) Complete baseline tests with natural gas. (3) 9/77 Complete PBB tests with ''dirty'' gases. (4) 1/78 Complete GMCB tests with ''dirty'' gases. (5) 2/78 Final Report.
KEYWORDS: BURNERS;AIR POLLUTION;COAL GAS;COMBUSTION;LOW BTU GAS;NITROGEN OXIDES;MONITORING;CHEMICAL REACTION YIELD;AEROSOLS;PARTICLES;FURNACES

<071355>
TITLE: Systems Evaluation of the Use of Low Sulfur Western Coal in Existing Small and Intermediate Size Boilers
JECT NUMBER: F-624-A-24
NCIPAL INVESTIGATOR: Bartz, D.R.;Maloney, K.L.
ADDRESS: 17332 Irving Boulevard, Tustin, CA 92680
AFFILIATION: KVB Engineering, Inc., Tustin, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lachapelle, David G.
TYPE OF FUNDING: Contract No.-68-02-1863
77 FUNDING: Environmental Protection Agency FY77:$68,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/SO;NOXIOUS GAS/NO;NOXIOUS GAS/CO;NOXIOUS GAS/HC (90%);PARTICULATES (10%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (10%);FULL SCALE DEMONSTRATION (90%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Demonstrate the environmentally sound use of western coal in combustion systems presently utilizing bituminous coals. Evaluate the emissions and unit performance aspects of converting combustion systems to western coal. Provide application guidelines and evaluate the cost effectiveness of utilizing western coals to their maximum extent consistent with viability and economics. Develop a correlation of sulfur retention by ash for the coals tested.
APPROACH: Ten boilers selected on the basis of design type and size will be systematically tested with each of two coal types corresponding to the design (Eastern) coal and a Western coal. Emissons (NO/sub x/, SO/sub x/, CO, HC and particulates) will be measured. Unit efficiency and the degree of convertibility will be assessed.
RESULTS: Work initiated on February 14, 1975. Testing of 10 boilers completed 8/77.
PROJECT MILESTONES: (1) 2/75 Work Initiated. (2) 4/77 Initiate Study to Correlate sulfur retention by ash. (3) 8/77 Complete testing of 10 boilers. (4) 12/77 Final Report.
KEYWORDS: SULFUR;ECOLOGICAL CONCENTRATION;COAL;COMBUSTION PRODUCTS;COMBUSTORS;COMBUSTION;BITUMINOUS COAL;FLUE GAS;ECONOMICS;FLY ASH;BOILER FUEL;NITROGEN OXIDES;SULFUR OXIDES;CARBON MONOXIDE;HYDROCARBONS;AEROSOLS;PARTICLES;MONITORING;AIR POLLUTION ABATEMENT;SYSTEMS ANALYSIS

<071356>
TITLE: Design Optimization and Field Verification of an Integrated Residential Furnace
PROJECT NUMBER: F-624-A-25
PRINCIPAL INVESTIGATOR: Nestlerode, T.A.;Combs, L.P.;Okuda, A.S.;Beshore, D.G.
ADDRESS: 6633 Canoga Avenue, Canoga Park, CA 91304
AFFILIATION: Rockwell International Corp., Canoga Park, Calif. (USA). Rocketdyne Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, G.B.
TYPE OF FUNDING: Contract No.-68-02-2174
77 FUNDING: Environmental Protection Agency FY77:$350,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/CO (60%);PARTICULATES (40%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: A 24-month program has been initiated for design optimization, construction, and field verification testing of a prototype of the low-emission, high-performance residential warm-air-oil furnace which was developed under EPA Contract 68-02-1819.
APPROACH: The program will be conducted in two phases. The first phase will consist of analysis and laboratory testing to further optimize the furnace design and document its pollutant emissions and thermal efficiency performance. The optimum furnace's capabilities to operate with alternate fuels will also be evaluated. In preparation for the next phase, the logistics of field testing residential furnaces will be delineated. The second phase will be concerned with construction of a number of integrated furnace units to be field tested, their installation in selected residences and operation during an entire annual heating season.
RESULTS: The emission and performance characteristics of each test unit will be determined initially and remeasured monthly. Operating conditions will not be adjusted unless required to correct an unsafe or excessive emission condition. Complete descriptions of the furnace design and capabilities will be documented in a concise form usable by furnace manufacturers as a design guide book. The prototype units are being installed in six field locations for testing over a heating season.
PROJECT MILESTONES: (1) 9/76 Initiate contract. (2) 6/77 Complete laboratory optimization. (3) 9/78 Complete field evaluation documentation.
KEYWORDS: HOUSES;OIL FURNACES;DESIGN;PERFORMANCE TESTING;OPTIMIZATION;AIR POLLUTION ABATEMENT

<071357>
TITLE: Effects of Fuel Properties and Atomization Parameters on NO/sub x/ Control for Heavy Liquid Fuel-Fired Package Boilers
PROJECT NUMBER: F-624-A-26
PRINCIPAL INVESTIGATOR: Heap, M.P.;Cichanowicz, J.E.;Lobell, M.L.
ADDRESS: 8001 Irvine Boulevard, Santa Ana, CA 92705
AFFILIATION: Energy and Environmental Research Corp., Santa Ana, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, G.B.
PE OF FUNDING: Contract No.-68-02-2624
FUNDING: Environmental Protection Agency FY77:$204,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/CO (40%);PARTICULATES (30%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (25%);ANALYTICAL (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: Combustion air staging has been demonstrated to be a viable technique for the control of NO/sub x/ emissions from residual oil-fired package boilers. However, the reduction in oxides of nitrogen can be accompanied by an increase in carbonaceous particulate matter which eventually limits the amount of staging and thus the control of NO/sub x/. The formation of both pollutants is strongly linked to the fuel/air mixing process and the properties of the fuel. The overall objective of this program is to define the effect of fuel atomization techniques and of fuel properties on pollutant emissions.
APPROACH: Commercially available fuel atomizers will be surveyed and their characteristic features defined. The influence of various crude oil properties and the petroleum refining process on the characteristics of residual fuel oils will be explored.
RESULTS: The bulk of the program involves a series of experiments with a package boiler simulator to define the influence of various atomizers and fuel characteristics of pollutant formation. Two additional experiments are planned to aid in the interpretation of the experimental results generated by the package boiler simulator. These involve two specially built experimental systems to define the conversion of fuel-bound nitrogen to oxides of nitrogen and to characterize the details of the fuel spray under realistic conditions.
PROJECT MILESTONES: (1) 1/77 Initiate contract. (2) 3/78 Define preliminary criteria for atomization.
KEYWORDS: BOILER FUEL;COMBUSTION PRODUCTS;PETROLEUM;ATOMIZATION;NITROGEN OXIDES;AIR POLLUTION ABATEMENT;BOILERS;HYDROCARBONS

<071358>
TITLE: Development of Catalyst and System Design Criteria for Catalytic Combustors with Application to Stationary Sources
PROJECT NUMBER: F-624-A-27
PRINCIPAL INVESTIGATOR: Kendall, R.M.;Moyer, C.B.;Anderson, L.W.;Kesselring, J.P.;Hartman, C.D.;Murphy, A.J.
ADDRESS: 485 Clyde Avenue, Mountain View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, G.B.
TYPE OF FUNDING: Contract No.-68-02-2116
77 FUNDING: Environmental Protection Agency FY77:$382,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this program is the establishment of design criteria for application of catalytical combustion to low emission, high efficiency stationary combustion systems.
APPROACH: To accomplish this, a research and development program consisting of experimental small-scale catalyst and combustor concept screening, experimental and theoretical scale-up work for promising concepts, and design development of prototype systems based on selected concepts has been outlined.
RESULTS: A number of catalyst systems have been evaluated by small-scale screening experiments, under a variety of conditions and for several different fuels. Based on the results of single-component catalyst systems, one multi-component catalyst system has been developed and has been tested extensively. The most promising systems will then be further tested by integration into a practical combustion system. These small-scale tests will investigate the effects of interstaged cooling, mixing of secondary air, and bed heat removal. Data from these tests will be used to define optimum catalytic systems and specific equipment applications, and also to identify the mechanisms of catalyst performance by correlating the results with system properties and by conducting detailed analytical studies with appropriate computing techniques, accounting for flow, diffusion, homogeneous and heterogeneous reaction effects, and heat transfer. Larger-scale catalyst system and system concept development experiments will be performed for verification and further development of optimum system, and conceptual designs of promising concepts will be made.
PROJECT MILESTONES: (1) 6/76 Initiate contract. (2) 10/77 Identify promising catalysts. (3) 2/78 Identify system design criteria.
KEYWORDS: COMBUSTORS;CATALYTIC CONVERTERS;DESIGN;PERFORMANCE TESTING;AIR POLLUTION ABATEMENT;NITROGEN OXIDES;SULFUR OXIDES;HYDROCARBONS

<071359>
TITLE: Evaluation of Fundamental Combustion Phenomena
PROJECT NUMBER: F-624-A-28
PRINCIPAL INVESTIGATOR: Lanier, W.S.
ADDRESS: Combustion Research Branch, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lanier, W.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion Gasification (50%);FOSSIL FUEL/Oil and Gas (50%)
ENERGY CYCLE: COMBUSTION OR END USE
POLLUTANTS: NOXIOUS GAS/NO;NOXIOUS GAS/CO (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory:RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The research activities being persued under this EPA in-house program fall into two categories: (1) combustion aerodynamics and (2) chemical kinetics. In the combustion aerodynamics category, studies are under way to define the influence of external combustor and burner variables on the flow field structure.
APPROACH: Specifically, a laser doppler velocimeter is being used to map the velocity and turbulence field in a simulated furnace. External variables being investigated are the burner confinement ratio, air swirl level, inlet quarl angle and inlet air velocity level.
RESULTS: The data so generated will be compared to predicted values from appropriate computer programs. In the chemical kinetics category, primary activity centers around the use of computer codes to analyze kinetics data and to define the mechanisms for the formation of NO.

PROJECT MILESTONES: (1) 10/77 Complete assessment of laser doppler velocimetry. (2) 2/78 Complete initial evaluation of numerical techniques for solution of navier stokes equations. (3) Perform various studies elated to fundamental combustion research. (4) Contract programs.
'ORDS: COMBUSTION;PERFORMANCE;RESEARCH PROGRAMS;COMBUSTORS;AIR POLLUTION ABATEMENT;NITROGEN OXIDES;HYDROCARBONS;COMBUSTION KINETICS;CHEMICAL REACTION KINETICS

<071360>
TITLE: Emissions Control Technology for High Pressure Combustion Systems
PROJECT NUMBER: F-624-A-29
PRINCIPAL INVESTIGATOR: Wasser, J.H.
ADDRESS: Combustion Research Branch, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Wasser, J.H.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project will investigate, in an experimental system, the emissions from combustion of liquid and gaseous fuels at pressures between 1 and 8.5 atmospheres.
APPROACH: Comprehensive analysis for pollutants in addition to the criteria pollutants will be carried out over a range of operating conditions.
RESULTS: Capability for investigating several combustion system categories will be developed. Other areas of work will involve testing and modification evaluation for control technology on actual gas turbine and diesel engines. Water/fuel oil emulsions and catalytic exhaust devices are currently under study.
PROJECT MILESTONES: (1) 9/75 Completed NOx Control Evaluation of Water Injection on GT Engine. (2) 8/77 Completed NOx Control Evaluation of Water Injection on Diesel Engine. (3) 6/78 Complete Assessment of Catalytic Reactor on Diesel Engine. (4) 6/79 Complete Particulate Assessment on GT Engine and Diesel Engine. (5) 7/80 Complete High Pressure Combustion Study on Fluid Bed Model. (6) 9/81 Complete High Pressure Combustor Study.
KEYWORDS: GAS TURBINES;DIESEL ENGINES;FLUIDIZED-BED COMBUSTORS;COMBUSTORS;AIR POLLUTION CONTROL;AIR POLLUTION ABATEMENT;PRESSURE DEPENDENCE;FUEL OILS;WATER;EMULSIONS;CATALYTIC CONVERTERS;NITROGEN OXIDES;PARTICLES;HYDROCARBONS;EXHAUST GASES

<071361>
TITLE: Direct Measurement of Combustion Factor Effects on Secondary Particulate Formation
PROJECT NUMBER: F-624-A-30
PRINCIPAL INVESTIGATOR: Lanier, W.S.;Demitriades, B.
ADDRESS: Industrial Environmental Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Lanier, W.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$47,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Nitrates;NOXIOUS GAS/Sulfates (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: The proposed effort has as its objective determination of the extent to which modifications in basic combustion process and fuel constituents will affect the primary emissions of sulfates and other particulates and the extent to which such variables will affect atmospheric formation of particulates.
APPROACH: The basic technique being developed and employed is the coupling of an atmospheric reaction chamber to a laboratory boiler. Detailed boiler exhaust measurements will be performed and the progression of the photochemical conversion of these emissions to atmospheric particulates (such as sulfates and nitrates) will be monitored in the smog chambers. Conditions to be varied initially include combustion modifications, fuel sulfur level and full trace metal speciation and quantity.
RESULTS: To date the boiler has been baselined, and the atmospheric reaction chamber constructed. Actual testing will commence in mid to late August 1979.
PROJECT MILESTONES: (1) 3/77 Issue grant for smog chamber construction. (2) 6/77 Initiate baseline characterization of boiler. (3) 8/77 Initiate boiler/chamber studies. (4) 12/77 Complete initial assessment. (5) 2/78 Issue final report.
KEYWORDS: BOILERS;AIR POLLUTION CONTROL;COMBUSTORS;SULFUR OXIDES;PARTICLES;PERFORMANCE TESTING;NITROGEN OXIDES

<071362>
TITLE: Characterization of Emission and Combustion Performance of Alternate Fuels
PROJECT NUMBER: F-624-A-31
PRINCIPAL INVESTIGATOR: Martin, G.B.;Butts, W.
ADDRESS: Industrial Environmental Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Martin, G.B.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (50%);FOSSIL

FUEL/Oil Shale (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO;NOXIOUS GAS/CO (67%);PARTICULATES/Dust (33%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: The objective of this project is to evaluate emission performance of alternate fuels and advanced concept control techniques. This evaluation provides an initial assessment of problems and/or promise of different technology approaches.
APPROACH: The study utilizes a 300,000 Btu/hr versatile experimental furnace for comparison of alternate fuel performance to previously established baselines for conventional fuel. The basic furnace allows for burner design changes as well as staged combustion and flue gas recirculation.
RESULTS: To date the project has evaluated: (1) fuel nitrogen conversion and control techniques for liquid fuels; and (2) alcohol fuels. A fuel gas generator system capable of producing simulated low Btu gases with variable CO to H2 ratios, CH4 content and NH3 content at a range of temperatures from 250 degrees F to 1350 degrees F is being delivered. The effort will center on concepts for control fuel and thermal NO/sub x/.
PROJECT MILESTONES: (1) 6/74 Initiate study of alternate fuels. (2) 10/75 Complete study of alcohol fuels. (3) 2/79 Complete study of low Btu gas combustors.
KEYWORDS: COMBUSTORS;AIR POLLUTION ABATEMENT;CONTROL SYSTEMS;DESIGN;BURNERS;ALCOHOLS;LIQUID FUELS;FUELS;PERFORMANCE TESTING;NITROGEN OXIDES;HYDROCARBONS

<071363>
TITLE: Characterization and Design Evaluation for Commercial Combustion Systems
PROJECT NUMBER: F-624-A-32
PRINCIPAL INVESTIGATOR: Hall, R.E.
ADDRESS: Industrial Environmental Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hall, Robert E.
TELEPHONE: F(919)541-2477
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO;NOXIOUS GAS/CO;NOXIOUS GAS/SO;NOXIOUS GAS/CO2 (75%);SPECIFIED OTHER POLLUTANTS/Multiple (25%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: This in-house project is designed to provide the capability for fast response testing of commercially available and prototype combustion equipment and combustion improving devices. Measurements include oxides of nitrogen, oxides of sulfur, carbon monoxide, hydrocarbons, oxygen, carbon dioxide, smoke, and particulates (mass and size distribution). In some tests trace species and efficiency measurements are made.
APPROACH: Test equipment includes a residential warm-air furnace rated at 100,000 Btu/hr, a Scotch marine package firetube boiler rated at 2,400,000 Btu/hr, and a firebox firetube package boiler rated at 1,440,000 Btu/hr. Various burner designs are tested in these units. Fuel includes natural gas, distillate oil, and low sulfur residential oil.
RESULTS: Expected outputs include evaluations of water-in-oil emulsions, prototype or commercially available packaged boiler burners, and prototype or commercially available residential burners.
PROJECT MILESTONES: (1) 1/74 Publication of report on EPA in-house residential heater study. (2) 6/74 Preparation of APCA paper on EPA's residential heater program. (3) 10/74 Evaluation of Compagnie Francaise de Raffinage water/oil emulsifier. (4) 12/74 Evaluation of Cottell Reactor water/oil emulsifier. (5) 6/75 Preparation of APCA paper on water/distillate oil emulsifiers. (6) 8/75 Evaluation of Blue Ray Burner. (7) 12/75 Preparation of ASME paper on water/residual oil emulsions. (8) 7/76 Evaluation of Sono Tek prototype modulating burner. (9) 12/76 Preparation of ASME paper on EPA's residential heater program. (10) 1/77 Preparation of brochure for homeowners who heat with oil. (11) 3/78 Evaluation of Elf Union water/oil emulsion burner.
KEYWORDS: COMBUSTORS;DESIGN;AIR POLLUTION ABATEMENT;NITROGEN OXIDES;HYDROCARBONS;SULFUR OXIDES

<071364>
TITLE: Potential Beneficial Use of Industrial Waste Heat for Greenhouse Production of Bedding Plants, Cut Flowers and Foliage Plants
PROJECT NUMBER: F-624-A-39
PRINCIPAL INVESTIGATOR: Crumbly, I.J.
ADDRESS: Fort Valley, GA 31030
AFFILIATION: Fort Valley State Coll., Ga. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Minority Institute of Research Support
MONITOR: Brna, T.G.
TELEPHONE: F629-2683
TYPE OF FUNDING: Grant No.-R804499
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (33%);SPECIFIED OTHER POLLUTANTS/Pesticides, agricultural wastes (67%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The feasibility of using industrial waste heat to control the environment of greenhouse will be evaluated relative to three major overall objectives: (a) Testing the capabilities of the environmental control system, (b) determining the effects of the greenhouse environments on the production of ornamental and vegetable bedding plants, cut-flowers, and foliage plants, and (c) evaluating the overall economics of the system.
APPROACH: Two plastic greenhouses, 27 ft by 72 ft quonset-type, will be used; one will serve as the control and the other as the waste heat research greenhouse. Conventional environmental control will be used in

the control greenhouse while both heating and cooling of the research greenhouse will employ air drawn through a cel-dek pad. Heating will be effected by passing air through the cel-dek pad containing cooling water heated by a boiler prior to distributing the air in the research greenhouse. Cooling will be effected by reversing the air flow direction. Ornamental and cut-flower, foliage plant, and vegetable species, which were selected in earlier studies will be grown in the year-long greenhouse production phase of the study. Economic studies will be made for each crop to assess customer acceptance and production costs.
RESULTS: The final report for the project will provide data, methods, and results relative to the horticultural, engineering and economic objectives of the study.
PROJECT MILESTONES: (1) 8/77 Laboratory Studies Completed. (2) 9/77 Greenhouses Constructed. (3) 8/77 Final Report Completed.
KEYWORDS: WASTE HEAT UTILIZATION;GREENHOUSES;WASTE PRODUCT UTILIZATION;PLANTS;AQUACULTURE;PESTICIDES;FEASIBILITY STUDIES;CULTIVATION TECHNIQUES;ECONOMICS;HEATING;POWER PLANTS;COOLING SYSTEMS;THERMAL EFFLUENTS;WASTE MANAGEMENT

<071365>
TITLE: Wet/Dry Cooling Tower Study
PROJECT NUMBER: P-624-A-40
PRINCIPAL INVESTIGATOR: Englesson, G.A.;Hu, M.C.
ADDRESS: 30 South 17th Street, Philadelphia, PA 19101
AFFILIATION: United Engineers and Constructors, Inc., Philadelphia, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brna, T.G.
TELEPHONE: F629-2683
TYPE OF FUNDING: Contract No.-68-03-2202
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (50%);CONSERVATION/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOISE, VIBRATION (33%);HEAT, THERMAL (33%);VISUAL AESTHETICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: The objective of the proposed work is to evaluate the technical and economic feasibility of wet/dry cooling towers at specific sites for the purpose of water conservation and/or plume abatement.
APPROACH: An optimization technique will be used such that the wet/dry towers would have optimum dry and wet proportions with respect to capital cost and operational penalties plus quantity of make-up water or fogging impact. The program is conceived as consisting of a set of six tasks. The first is to lay groundwork and to accumulate data for this study. The next three are for water conservation in the coal-rich region in the western United States. For these three tasks, the wet/dry towers will be interfaced with a 1000-MWe coal fired fossil plant. The last two tasks are for plume abatement purpose in urban areas of the conterminous United States. For the last two tasks, the wet/dry towers to be evaluated will be interfaced with both a 1000-MWe fossil plant and a 1000-MWe nuclear plant. The study is scheduled to be completed in June, 1976.
RESULTS: A comprehensive report will document the methods and results of this study. The report will contain graphs and tables relating optimized wet/dry cooling systems and the reference system in terms of costs and wet/dry cooling systems for plume abatement at representative U.S. sites.
PROJECT MILESTONES: (1) 12/76 Draft report submitted to EPA for review. (2) 10/77 Final Report.
KEYWORDS: COOLING TOWERS;PLUMES;FOSSIL-FUEL POWER PLANTS;PERFORMANCE TESTING

<071366>
TITLE: Disposal of By-Products from Nonregenerable Flue Gas Desulfurization Systems
PROJECT NUMBER: P-624-A-41
PRINCIPAL INVESTIGATOR: Rossoff, J.
ADDRESS: P.O. Box 92957, Los Angeles, CA 90009
AFFILIATION: Aerospace Corp., Los Angeles, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Jones, Julian W.
TELEPHONE: F629-2489
77 FUNDING: Environmental Protection Agency FY77:$3,400
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Evaluate techniques for the environmentally sound disposal of wastes from power plant nonregenerable flue gas desulfurization systems.
APPROACH: Wastes obtained from prototype scrubbers at the TVA Shawnee Power Station at Paducah, Kentucky have been placed in seven ponds nearby. Two ponds contain untreated waste (one with limestone waste and one with lime), three ponds contain chemically treated waste (two limestone and one lime), and two ponds contain untreated waste with an underdrain (one lime and one limestone). An additional pond is scheduled to be filled with oxidized sulfite waste later in 1977. Through periodic sampling and analysis of water, soil and sludge materials, an assessment is being made of current disposal technology. Engineering cost estimates for the alternative approaches are also being developed.
RESULTS: The project was initiated in September, 1974 and is scheduled to continue through March, 1978.
JECT MILESTONES: 6/78 Final Report to be Issued.
ORDS: FLUE GAS;DESULFURIZATION;WASTE MANAGEMENT;SCRUBBERS;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL IMPACTS;WASTE DISPOSAL;WATER POLLUTION;LAND POLLUTION;CHEMICAL ANALYSIS;ENVIRONMENTAL ENGINEERING;TECHNOLOGY ASSESSMENT;LIMESTONE

<071367>
TITLE: An Assessment of the Technology of Disposal and Utilization of Flue Gas Cleaning Products
PROJECT NUMBER: P-624-A-42
PRINCIPAL INVESTIGATOR: Santhanum, C.J.;Johnson, S.L.;Lunt, R.R. Sr.;Oberholtzer, J.E. Sr.
ADDRESS: Acorn Park, Cambridge, MA 02140
AFFILIATION: Little (Arthur D.), Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Jones
TYPE OF FUNDING: Contract No.-68-02-2654
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Compile and assess data and information regarding research and development results and commercial activities in the area of disposal/utilization of flue gas cleaning by-products, with emphasis on environmental acceptability and costs; report results annually.
APPROACH: Contractor will compile and assess data and information from research and development activities conducted by EPA, TVA, and private concerns to determine the state-of-the-art of disposal and utilization of flue gas cleaning by-products. This assessment will include an evaluation of potential environmental effects of various technologies and a critical review of their economics. Physical and chemical characterization of flue gas cleaning wastes from several plants will be conducted. Results of this effort will be reported annually, and will include recommendations for applied research and development efforts.
RESULTS: Contract just underway.
PROJECT MILESTONES: (1) 12/78 Annual Report Issued. (2) 12/79 Annual Report Issued. (3) 12/80 Annual Report Issued. (4) 12/81 Final Report Issued.
KEYWORDS: FLUE GAS;DESULFURIZATION;SCRUBBERS;WASTE MANAGEMENT;WASTE DISPOSAL;TECHNOLOGY ASSESSMENT;WASTE PRODUCT UTILIZATION;FOSSIL-FUEL POWER PLANTS;AIR QUALITY;LAND USE;WATER QUALITY;ECONOMICS

<071368>
TITLE: Wet/Dry Cooling Tower Test Module Program
PROJECT NUMBER: P-624-A-43
PRINCIPAL INVESTIGATOR: Martin, W.C.
ADDRESS: 2244 Walnut Grove Avenue, Rosemead, CA 91770
AFFILIATION: Southern California Edison Co., Rosemead (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Brna, T.G.
TELEPHONE: F629-2683
TYPE OF FUNDING: Grant No.-R805220
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: HEAT, THERMAL (50%);VISUAL AESTHETICS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: In this multi-sponsored project, the program objectives are: a. to determine the water conservation and operational characteristics of the wet/dry cooling tower test module in an electrical power plant situation, and b. to develop and confirm a mathematical model for accurately describing and predicting the performance of the wet/dry cooling system.
APPROACH: A full-size wet/dry cooling tower cell will be installed and tested at a plant site over a one-year period. Test data will be used to conform the mathematical model.
RESULTS: Test module, cooling system and ambient data will be collected during the testing phase which is scheduled for completion in October 1978. These data will be included in the comprehensive report for the test program, the report to be completed in April 1979.
PROJECT MILESTONES: (1) 9/77 Completion of Construction of Cooling Tower Test Module. (2) 10/77 Start of Cooling Tower Test Program. (3) 10/78 Completion of Cooling Tower Test Program. (4) 4/79 Publication of Final Report for Wet/Dry Cooling Test Module Program.
KEYWORDS: COOLING TOWERS;PERFORMANCE TESTING;PLUMES;FOSSIL-FUEL POWER PLANTS

<071369>
TITLE: Lime/Limestone Scrubbing Waste Conversion Pilot Study
PROJECT NUMBER: P-624-A-44
PRINCIPAL INVESTIGATOR: Sliger, A.G.;Mandelik, B.G.
ADDRESS: 16200 Park Row, Industrial Park Ten, Houston, TX 77084
AFFILIATION: Pullman Kellogg, Houston, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Jones, Julian W.
TELEPHONE: F629-2489
TYPE OF FUNDING: Contract No.-68-02-2644
77 FUNDING: Environmental Protection Agency FY77:$81,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY

PROJECT DESCRIPTION: Develop key process steps, on a pilot scale, in the Pullman Kellogg "Kel-S" process for conversion of lime/limestone scrubbing waste to elemental sulfur and calcium carbonate.
APPROACH: Waste from a limestone scrubber will be reduced to calcium sulfide in a reduction kiln. The reduced product will be slurried then carbonated in a stirred reactor, releasing hydrogen sulfide gas (which can be readily converted to sulfur). The solid reaction products will consist of calcium carbonate and inerts (e.g., coal ash); the inerts will be separated from the calcium carbonate by air flotation. Design data from these pilot tests should be sufficient for scale-up to a large (prototype) test unit.
RESULTS: The project was initiated 8/22/77. Limestone scrubbing waste will be shipped to the reduction kiln site in September 1977.
PROJECT MILESTONES: (1) 1/78 Complete limestone scrubbing waste reduction to sulfide; issue interim report. (2) 4/78 Complete carbonation pilot plant construction. (3) 6/78 Complete carbonation tests. (4) Issue final report on project.
KEYWORDS: COAL GASIFICATION;KELLOGG PROCESS;WASTE PROCESSING;SCRUBBERS;SULFUR;RECOVERY;CALCIUM CARBONATES;LIMESTONE;PILOT PLANTS;HYDROGEN SULFIDES;HYDROCARBONS

<071370>
TITLE: Prototype Study of Lime/Limestone Scrubbers for SO2 and Dust Removal Advanced Testing and Data Evaluation
PROJECT NUMBER: F-624-A-45
PRINCIPAL INVESTIGATOR: Head, H.N.
ADDRESS: P.O. Box 3965, San Francisco, CA 94119
AFFILIATION: Bechtel Corp., San Francisco, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Williams, John E.
TELEPHONE: F629-2483
TYPE OF FUNDING: Contract No.-68-02-1814
77 FUNDING: Environmental Protection Agency FY77:$486,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS/SO2 (50%);PARTICULATES/Dust (40%);SPECIFIED OTHER POLLUTANTS/Multiple (10%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The process improvement objectives of the current program are to improve (1) alkali utilization, (2) SO2 removal, (3) sludge disposal properties, and (4) system reliability. Specific tasks to be performed are: limestone/lime advanced testing, sludge fixation studies, and economic studies.
APPROACH: Based on the results of the Phase III Test Program under predecessor Contract PH 22-68-67, and other supporting programs of EPA, Bechtel is performing an extended testing program at the EPA Alkali Scrubbing Test Facility, TVA Shawnee Steam Plant, Paducah, Kentucky, for the removal of SO2 and ash particulate from coal-fired furnace gas. The test facility consists of two parallel scrubber systems--a venturi followed by a spray tower and a Turbulent Contact Absorber. Each system is capable of treating approximately 10 Mw equivalent (30,000 acfm at 300 degrees F) of flue gas containing 1800-4000 ppm sulfur dioxide and 2 to 5 grains/scf of particulates. The scrubbers are integrated into the flue gas exhaust ductwork of boiler No. 10.
RESULTS: The major goals of the overall test program are (1) to characterize the effect of important process variables on sulfur dioxide and particulate removal, (2) to develop mathematical models for economic scale-up to full-size scrubber facilities, (3) to demonstrate reliability, and (4) to demonstrate process and equipment variations to improve the economics of lime/limestone scrubbing.
PROJECT MILESTONES: (1) 9/75 Publish First Progress Report. (2) 9/75 Conduct Industry Briefing Conference. (3) 9/76 Publish Second Progress Report. (4) 10/76 Conduct Industry Briefing Conference. (5) 9/77 Publish Third Progress Report. (6) 2/78 Complete Testing. (7) 5/78 Conduct Industry Briefing Conference. (8) 5/78 Publish Final Report. (9) 6/78 Complete Design/Economic Study Computer Program.
KEYWORDS: SULFUR DIOXIDE;SCRUBBERS;DEMONSTRATION PROGRAMS;PERFORMANCE;TESTING;REMOVAL;DUSTS;FLUE GAS;PURIFICATION;SLUDGES;WASTE DISPOSAL;RELIABILITY;ECONOMICS;TECHNOLOGY ASSESSMENT;FOSSIL-FUEL POWER PLANTS;MATHEMATICAL MODELS;PROCESS CONTROL;COMPUTER CODES;LIMESTONE

<071371>
TITLE: Sulfur Dioxide Oxidation in Scrubber Systems
PROJECT NUMBER: F-624-A-46
PRINCIPAL INVESTIGATOR: Hudson, J.L.
ADDRESS: Charlottesville, VA 22901
AFFILIATION: Virginia Univ., Charlottesville (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Borgwardt, Robert H.
TELEPHONE: F629-2234
TYPE OF FUNDING: Grant No.-R-805227-010
77 FUNDING: Environmental Protection Agency FY77:$79,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To investigate the effect of controllable system parameters in lime/limestone scrubbing systems in order to suggest methods of limiting oxidation to permit unsaturated operation. System parameters include the concentration and type of inhibitors and catalysts as well as physical factors which control mass transfer. (2) To investigate the possibility of maximizing the efficiency of oxidation in a hold tank when oxidation is forced by aeration. Factors important here are mass transfer (particularly as influenced by air bubble size and contact time) and the kinetics of the oxidation reaction.
APPROACH: Chemical kinetics and mass transfer will be studied in both clear solutions and slurries using stirred reactors and flow reactors in bench scale equipment. The results will be incorporated into a mathematical model to product methods of minimizing or maximizing oxidation in scrubbers.
RESULTS: Construct reactor and assemble apparatus. Study oxidation of bisulfite at pH 4-6 in flow reactor and batch reactor with single and multiple catalysts. Evaluate oxidation inhibitors. Study oxidation of

sulfite with high catalyst concentrations. Develop model for oxidation in slurries including mass transfer and kinetics.
PROJECT MILESTONES: (1) 9/77 Construct reactor and assemble apparatus. (2) 11/77 Low level catalyst studies in flow reactor. (3) 2/78 Bisulfite oxidation in batch reactor. (4) 6/78 Bisulfite oxidation with multipl catalysts. (5) 9/78 Effect of oxidation inhibitors. (6) 10/78 Concentration effects. (7) 9/78 Develop model for oxidation in slurries. (8) 6/79 Verify model. (9) 8/79 Final report.
KEYWORDS: SULFUR DIOXIDE;OXIDATION;COAL;FOSSIL-FUEL POWER PLANTS;SCRUBBERS;CHEMICAL REACTION KINETICS;MATHEMATICAL MODELS;FABRICATION;INHIBITION;SLURRIES;SCRUBBING;AIR POLLUTION CONTROL

<071372>
TITLE: Dewatering Principles and Equipment Design Studies
PROJECT NUMBER: F-624-A-47
PRINCIPAL INVESTIGATOR: Tarrer, A.R.;Shah, B.H.;Warman, J.C.
ADDRESS: 205 Samford Hall, Auburn, AL 36830
AFFILIATION: Auburn Univ., Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Jones, Julian W.
TELEPHONE: F629-2489
TYPE OF FUNDING: Grant No.-R-804531
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: Develop more economically feasible methods than those currently available for continuous treatment of flue gas cleaning (FGC) wastes. Initial efforts are to be concentrated on applying gravity sedimentation to rapidly, inexpensively dewater FGC wastes.
APPROACH: Develop methods for characterizing the physical properties and behavior of FGC wastes. Develop procedures based on the models presented herein to allow accurate design and analysis of gravity sedimentation units used in treating FGC wastes. Perform bench scale and pilot tests to evaluate the feasibility of using gravity sedimentation units for treating FGC wastes. Perform developmental studies to determine the best design for channel promoters. Bench scale and continuous pilot tests are to be performed to evaluate the feasibility of such devices for improving dewatering efficiency while treating FGC wastes. Assess filterability of different types of FGC sludges dewatered to different degrees and pumping requirements for the different sludges.
RESULTS: A gravity sedimentation system can now be proposed which should allow rapid dewatering of FGC waste to high concentrations (35 to 50 percent solids) without the need for chemical additives (flocculants). This system separates the clarification and thickening functions into two units which are much smaller and less expensive than conventional dewatering equipment. Further development of this concept is underway.
PROJECT MILESTONES: 8/78 Issue Final Report.
KEYWORDS: FLUE GAS;PURIFICATION;FEASIBILITY STUDIES;WASTE PROCESSING;SLUDGES;SEDIMENTATION;WATER REMOVAL;WASTE DISPOSAL;FLOCCULATION;SEPARATION PROCESSES;POLLUTION CONTROL EQUIPMENT;WATER POLLUTION CONTROL;DESIGN;ENVIRONMENTAL IMPACTS

<071373>
TITLE: Disposal of High Alkaline Fly Ash Sludge in a Decoaled Mine Seam
PROJECT NUMBER: F-624-A-48
PRINCIPAL INVESTIGATOR: Manz, O.E.;Groenewold, G.H.;Hung, Y.
ADDRESS: 8511 University Station, Grand Forks, ND 58202
AFFILIATION: North Dakota Univ., Grand Forks (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Jones, Julian W.
TELEPHONE: F629-2489
TYPE OF FUNDING: Grant No.-R-805459
77 FUNDING: Environmental Protection Agency FY77:$236,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/Applied (25%);FULL SCALE DEMONSTRATION (75%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Determine the environmental effects of sludge disposal from a lignite fly ash SO2 scrubber (at the Milton R. Young Power Station, Center, North Dakota) in a decoaled open pit mine. Monitor the groundwater and leachate in the proximity of the buried sludge, as well as an exposed surface sludge pond. Investigate the properties of sludge, ash and soil. Assess the stability of mine spoil deposited over the sludge.
APPROACH: (1) Study available mine, sludge, and sludge disposal characterizations from a 3-year mining plan and laboratory analyses of pilot plant sludge. (2) Conduct additional sludge and mine characterization. (3) Conduct extensive sampling and testing prior to and subsequent to: (a) construction of an exposed surface sludge pond, and (b) installation of several groundwater and leachate wells in proximity of buried sludge in the decoaled mine seam and sludge pond, analyses of groundwater, leachate, supernant, sludge and soil for 15 month period. (4) Obtain and compile cost information from the power plant for inclusion in an economic study by Arthur D. Little, Inc. of disposal of sludge in decoaled mine seam. (5) Assess the data and prepare the final report, to be incorporated in an Arthur D. Little report for Contract 68-03-2334.
RESULTS: Project just initiated.
PROJECT MILESTONES: (1) 9/78 Issue Interim Report. (2) 9/79 Issue Final Report.
KEYWORDS: FLY ASH;SLUDGES;WASTE DISPOSAL;COAL MINES;PH VALUE;SOILS;SULFUR COMPOUNDS;SULFUR DIOXIDE;LAND USE;ENVIRONMENTAL IMPACTS;COAL INDUSTRY;COAL LIQUEFACTION;COAL GASIFICATION;SOIL CHEMISTRY;LIGNITE;SCRUBBING;FLUE GAS;FOSSIL-FUEL POWER PLANTS;AIR POLLUTION CONTROL

<071374>
TITLE: Development of Environmental Assessment and Control Technology Quality Assurance Programs
PROJECT NUMBER: F-624A-49
PRINCIPAL INVESTIGATOR: Decker, C.E.;Smith, F.;Buchanan, J.;Wagoner, D.
ADDRESS: P.O. Box 12194, Research Triangle Park, NC 27709
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Kuykendal, W.B.
TELEPHONE: F629-2557
TYPE OF FUNDING: Contract No.-68-02-2156
77 FUNDING: Environmental Protection Agency FY77:$225,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The Environmental Protection Agency in its energy and industrial processes programs is involved in numerous and varied environmental assessment and technology development projects. The objective of this project is to develop, evaluate, adapt, and provide guidelines for the application of quality control and assurance practices and procedures to various measurement systems, devices, and procedures utilized in the above projects.
APPROACH: The team used on this contract has formal training in chemistry, chemical engineering, electrical engineering, and statistics with experience in sampling and analyzing materials in stationary source processes, control devices, and effluent streams. A systems approach will be utilized in developing quality assurance plans consisting of an optimum mix of techniques such as material balances, interrelation of process engineering data and control system parameter values with effluent stream measurements, maintenance of quality control charts and other statistical techniques, and quantitative performance audits to yield the maximum quality assurance at the minimum cost. The basic plan is to prepare general QC/QA plans for a project type, then evaluate the plan by short term implementation at selected IERL/RTP project sites. After field evaluation a QC/QA specific to the project is prepared. A QA plan specific to the demonstration scale projects has been prepared.
RESULTS: Two quality assurance plans have been developed for demonstration projects and environmental assessment projects. Implementation of the quality assurance plan is underway for these two classes of projects.
PROJECT MILESTONES: (1) 3/76 QA plan for demonstration projects. (2) 9/77 QA plan for environmental assessment projects. (3) 11/77 QA plan for field studies. (4) 2/78 QA plan for pilot programs. (5) 5/78 QA plan for research and bench-scale projects. (6) 9/78 QA plan for industry system studies/pollutant system studies.
KEYWORDS: ENVIRONMENT;QUALITY ASSURANCE;DEMONSTRATION PROGRAMS;POLLUTION CONTROL EQUIPMENT;PROCESS CONTROL;STANDARDIZATION;MONITORING;SAMPLING;IMPLEMENTATION;POLLUTION REGULATIONS;WATER POLLUTION;AIR POLLUTION;LAND POLLUTION

<071375>
TITLE: Sampling and Analysis Methods for POM and other Organic Pollutants
PROJECT NUMBER: F-624A-50
PRINCIPAL INVESTIGATOR: Levins, P.
ADDRESS: Acorn Park, Cambridge, MA 02140
AFFILIATION: Little (Arthur D.), Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Johnson, L.D.
TELEPHONE: F629-2557
TYPE OF FUNDING: Contract No.-68-02-2150
77 FUNDING: Environmental Protection Agency FY77:$201,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (25%);DEVELOPMENT/Laboratory scale (75%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The purpose of this contract is to provide for the evaluation, development, field testing and applications research of the organic substances sampling and analysis procedures necessary to conduct environmental assessments and technology development projects in IERL-RTP.
APPROACH: A series of technical directives aimed at accomplishing the above goals are being implemented.
RESULTS: Reports, technical manuals, and review documents. Some will be of interest to IERL only; many will be of general interest.
PROJECT MILESTONES: (1) 9/76 Sorption Agents for Ocean Incineration Report. (2) 6/77 Tech Manual for Analysis of Organics in Fuels. (3) 6/77 Report on Stability, Storage and Handling of Samples. (4) 9/77 Report on Analysis of PCB from Combustion Sources. (5) 12/77 Report on Retention Properties of Specified Organics on Sorbents. (6) 1/79 Evaluate Organic Analysis for Level 2.
KEYWORDS: SAMPLING;CHEMICAL ANALYSIS;COAL GASIFICATION;COAL LIQUEFACTION;ENVIRONMENTAL IMPACTS;ORGANIC COMPOUNDS;MARINE DISPOSAL;INCINERATORS;COMBUSTION;WASTE DISPOSAL;MANUALS;SAMPLE PREPARATION;ADSORBENTS;REMOVAL;WATER;COAL;WATER POLLUTION

<071376>
TITLE: Standardization of Operating Performance of a Droplet Measuring Device
PROJECT NUMBER: F-624A-52
PRINCIPAL INVESTIGATOR: Medicki, H.;Magnus, D.
ADDRESS: 300 Broadway, Huntington Station, NY 11746
AFFILIATION: KLD Associates, Inc., Huntington, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory, Office of R and D
TYPE OF FUNDING: Contract No.-68-02-2111
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)

ENERGY CYCLE: EXTRACTION (30%);PROCESSING, CONVERSION (40%);COMBUSTION OR END USE (30%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This study is to compare the presently used cascade impactor with the newly developed hot wire droplet sizer.
APPROACH: Laboratory and field tests will be conducted simultaneously. Discrepancies will be investigated and a report of the results prepared.
RESULTS: Laboratory testing using a closed system has been successfully tested. A field test program has been designed.
PROJECT MILESTONES: (1) 1/76 Design, construct and deliver improved droplet sizing device. (2) 3/77 Develop multiple probe interface. (3) 11/77 Comparison of hot wire and impactor techniques report.
KEYWORDS: DROPLETS;MEASURING INSTRUMENTS;DESIGN;PERFORMANCE;STANDARDIZATION;DUSTS;AEROSOLS;PARTICLES;SEPARATION PROCESSES;PARTICLE SIZE;SULFUR DIOXIDE;WASTE MANAGEMENT;AIR POLLUTION MONITORS;CASCADE IMPACTORS;COMPARATIVE EVALUATIONS

<071377>
TITLE: The Development of Fugitive Emissions Sampling Techniques
PROJECT NUMBER: F-624A-53
PRINCIPAL INVESTIGATOR: Kolnsberg, H.J.
ADDRESS: 125 Silas Deane Highway, Wethersfield, CT 06109
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory, Office of R and D
MONITOR: Harris, D.B.
TELEPHONE: F629-2557
TYPE OF FUNDING: Contract No.-68-02-2133
77 FUNDING: Environmental Protection Agency FY77:$233,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To provide fugitive emissions measurement methodologies required for environmental assessment and control technology development projects related to stationary source energy and industrial process programs of the Environmental Protection Agency.
APPROACH: Conduct a continuing program of evaluation, development, testing, and field adaptation of measurement techniques for air borne and water borne fugitive emissions from process and effluent streams, including the following: (1) Review current programs to identify measurement requirements. (2) Formulate specifications for basic sampling and analysis procedures. (3) Conduct laboratory and field studies to determine effectiveness of adapting procedures to specific process streams. (4) Review and critique measurement programs developed or proposed in other EPA programs. (5) Conduct sampling and analysis programs for special projects. (6) Prepare documents defining recommended procedures and their application to process streams.
PROJECT MILESTONES: (1) 5/76 Conduct Symposium. (2) 5/76 Technical Manual on Fugitive Emission Measurement: Upwind/Downwind. (3) 5/76 Technical Manual on Fugitive Emission Measurement: Quasi-Stack. (4) 5/76 Technical Manual on Fugitive Emission Measurement: Roof Monitor. (5) 5/77 Conduct Second Symposium. (6) 7/77 Technical Manual on Sampling Stormwater Runoff. (7) 4/78 Design Fugitive Assessment Sampling Train.
KEYWORDS: SAMPLING;MEASURING METHODS;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;WATER POLLUTION;AIR POLLUTION;RECOMMENDATIONS;TECHNOLOGY UTILIZATION;AIR POLLUTION MONITORS;WATER POLLUTION MONITORS;SULFUR DIOXIDE;NITROGEN OXIDES

<071378>
TITLE: Sampling and Analysis of Reduced and Oxidized Species in Process Streams
PROJECT NUMBER: F-624A-54
PRINCIPAL INVESTIGATOR: Burns, E.A.
ADDRESS: One Space Park, Redondo Beach, CA 90278
AFFILIATION: TRW, Inc., Redondo Beach, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory, Office of R and D
MONITOR: Brown, F.
TELEPHONE: F629-2557
TYPE OF FUNDING: Contract No.-68-02-2165
77 FUNDING: Environmental Protection Agency FY77:$385,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The primary objective of this program is to provide the measurement methodologies required for environmental assessment and control technology development projects related to the stationary source energy and industrial process programs of the Environmental Protection Agency.
APPROACH: The Contractor shall be responsible for conducting both the basic development effort and the programs necessary to adapt, apply and evaluate the application of these and other sampling and analytical techniques on specific engineering studies.
RESULTS: (1) Level 1 Manual Revisions. (2) Limestone FGD Demo Support. (3) Ocean Incineration. (4) Coal Conversion Test Manual. (5) Fluidized Bed Combustor Support. (6) Coal Processing Flow Meters. (7) Continuous Flow Impactor. (8) Particulate Measurement Errors. (9) SO3 Procedure Manual. (10) SASS Level 1 Checkout. (11) Inorganic Compound Analysis. (12) Coal Sulfur Measurements. (13) Baghouse Evaluation.
PROJECT MILESTONES: (1) 1/78 Revise Technical Manual for Inorganic Sampling and Analysis. (2) 6/77 Technical Manual for Reduced Inorganic Sampling and Analysis. (3) 6/77 Technical Manual for Inorganic Compound

Identification. (4) 6/77 Evaluation of Total Sulfur and Total Ash Monitors for Coal. (5) 6/77 Procedures Manuals for Inorganic Measurements in Specified Processes. (6) 1/78 Issue Procedures for Analysis of Sulfur Forms in Coal. (7) 2/78 Technical Manual for Reduced Inorganic Sampling and Analysis. (8) 6/79 Develop Procedures for Compound Analysis with 1000 ppm Sensitivity.
KEYWORDS: PROCESS CONTROL;SAMPLING;ENVIRONMENT;QUALITY ASSURANCE;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;POLLUTION CONTROL EQUIPMENT;AIR POLLUTION CONTROL;WATER POLLUTION CONTROL;MANUALS;SULFUR COMPOUNDS;FLY ASH;COAL INDUSTRY;CHEMICAL ANALYSIS;MONITORING;AIR CLEANING;COAL INDUSTRY;ENERGY CONVERSION;PHOTOCHEMICAL OXIDANTS;FLUIDIZED-BED COMBUSTION;EARTH ATMOSPHERE

<071379>
TITLE: Emmissions Assessment of Conventional Combustion Systems
PROJECT NUMBER: F-624-A-55
PRINCIPAL INVESTIGATOR: Matthews, B.J.
ADDRESS: One Space Park, Redondo Beach, CA 90278
AFFILIATION: TRW, Inc., Redondo Beach, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-2197
77 FUNDING: Environmental Protection Agency FY77:$1,036,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project will assess the air and water pollutants from fifty-one combustion categories, including Residential, Commercial/Institutional, Industrial and Utility. Sampling and analysis includes the following: Level 1--inorganic and organic analysis, particulate matter by at least four size fractions, particulate sulfate, POM, PCB, SO/sub x/, and NO/sub x/. The emissions rates of the pollutants will be determined by the most appropriate means, such as field sampling, material balance calculations, or manipulation of existing data.
PROJECT MILESTONES: (1) 11/77 Final report for residential sources. (2) 1/78 Final report for internal combustion, electricity generation sources. (3) 9/78 Final report external combustion, electricity generation sources. (4) 3/79 Final report commercial/institutional sources. (5) 2/80 Final report industrial sources. (6) 5/80 Final report executive summary.
KEYWORDS: COMBUSTORS;AIR POLLUTION;WATER POLLUTION;MEASURING INSTRUMENTS;MEASURING METHODS;NITROGEN OXIDES;SULFUR OXIDES;MONITORING

<071380>
TITLE: Operation of Pilot Scale ESP Versatile Fabric Filter and Baghouses
PROJECT NUMBER: F-624-A-56
PRINCIPAL INVESTIGATOR: Turner, J.H.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Industrial Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Ramsey, G.H.
TELEPHONE: F629-2161
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES/Dust (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of the in-house projects is to perform various tests on the ESP, the versatile fabric filter test unit, the single compartment shaker baghouse, and the pulse-jet baghouses to improve particulate collectability in full size collection devices. New ideas and novel collection devices and materials will be tested on the pilot-scale units in order to determine if they do have a possibility for improving the efficiency of the present methods for collecting particulates.
APPROACH: Various materials will be tested in the versatile fabric filter test unit in order to determine the feasibility of using baghouses at temperatures up to 1500 degrees F. Fabric materials will be tested on both the high temperature versatile unit and the ambient temperature units. Fabrics will be tested for both efficiency and endurance. The ESP will be used to test various dust resistivities and also to determine the feasibility of installing a wet-scrubber at the outlet of the ESP. The units are versatile enough to test at many conditions which cover the range of most commercial units.
RESULTS: Current activity is being devoted to shakedown testing of the ESP and the versatile fabric filter test unit with a report to be issued for each area of study.
PROJECT MILESTONES: (1) 6/76 Complete report of filtration study of polyester filter bags. (2) 12/76 Complete report of filtration study of expanded PTFE bags. (3) 4/77 Install pilot-scale ESP. (4) 8/77 Complete installation of versatile fabric filter test unit. (5) 12/77 Issue report of initial ESP testing. (6) 3/78 Complete study of wet-scrubber at outlet of ESP. (7) 9/78 Complete study of resistivity of fly ash. (8) 6/78 Issue report of initial testing on versatile fabric filter unit.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;AIR POLLUTION CONTROL;AIR FILTERS;POLLUTION CONTROL EQUIPMENT;PERFORMANCE TESTING;TEXTILES;FLY ASH

<071381>
TITLE: Baghouse Study as an Emission Control on a Solid Waste Incinerator Boiler
PROJECT NUMBER: P-624-A-58
PRINCIPAL INVESTIGATOR: McDermott, B.
ADDRESS: 110 First Ave., South, Nashville, TN 37201
AFFILIATION: Nashville Thermal Transfer Corp., Tenn. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Turner, N.H.
TELEPHONE: F629-2925
TYPE OF FUNDING: Grant No.-R804233
77 FUNDING: Environmental Protection Agency FY77:$67,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determine applicability and performance for pilot baghouse on waste to energy municipal incinerator.
APPROACH: Operate pilot baghouses on incinerator flue gas for one year test period. Obtain performance and durability data on two or three bag styles (Teflon, glass).
RESULTS: Preliminary performance testing accomplished; endurance testing yet to be started.
PROJECT MILESTONES: (1) 5/76 Grant award. (2) 9/77 Report on preliminary performance results. (3) 9/78 Final report.
KEYWORDS: INCINERATORS;SOLID WASTES;AIR FILTERS;PERFORMANCE TESTING;COMBUSTION;BOILERS;FLUE GAS;AIR POLLUTION CONTROL

<071382>
TITLE: Demonstration of High Efficiency-High Throughput Baghouse
PROJECT NUMBER: P-624-A-60
PRINCIPAL INVESTIGATOR: McKenna, J.
ADDRESS: 2141 Patterson Ave. SW, Roanoke, VA 24016
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Turner, J.H.
TELEPHONE: F629-2925
TYPE OF FUNDING: Contract No.-68-02-2148
77 FUNDING: Environmental Protection Agency FY77:$284,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES/Dust (50%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Examine technical and economic aspects of small, full scale, reverse air baghouse operated at filtration velocities up to 9 fpm on a stoker fired industrial boiler.
APPROACH: (a) Operate baghouse for a minimum period of 10 months using Nomex, Gore-Tex, Teflon, and Dralon T fabrics. (b) Determine fabric performance and life. (c) Determine system performance and costs. (d) Record all pertinent boiler and filter system operating parameters. (e) Characterize flue gas streams and fly ash.
RESULTS: System scheduled to start 12/76. Options include testing additional fabrics and testing SO2 removal capabilities.
PROJECT MILESTONES: (1) 3/76 Contract award. (2) 12/76 Baghouses on line. (3) 12/77 Report on first year's operation. (4) 12/77 Report on second year's operation.
KEYWORDS: BOILERS;FLUE GAS;AIR POLLUTION CONTROL;AIR FILTERS;PERFORMANCE TESTING;SULFUR DIOXIDE;FILTRATION;REMOVAL

<071383>
TITLE: Studies of Dust Cake Formation and Structure in Fabric Filtration
PROJECT NUMBER: P-624-A-61
PRINCIPAL INVESTIGATOR: Miller, B.
ADDRESS: 601 Prospect, P.O. Box 625, Princeton, NJ 08540
AFFILIATION: Textile Research Inst., Princeton, N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Turner, J.H.
TELEPHONE: F629-2925
TYPE OF FUNDING: Grant No.-R804926
77 FUNDING: Environmental Protection Agency FY77:$65,500
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Improvements in fabric filter performance obtained by control of elemental fiber geometry, fabric construction, or applied electric fields are believed to depend on differences in the structure of the deposited dust layer or cake. The object of the proposed research is to identify those features of the different dust cakes which can account for differences in filter performance.
APPROACH: The objective will be accomplished by scanning electron microscopical studies using known techniques and possibly new techniques to be developed in the course of the project.
RESULTS: On the basis of the information acquired, improved fabric constructions will be developed in which the tendency to deposit dust cakes with desirable features will be maximized.
PROJECT MILESTONES: (1) 12/76 Grant awarded. (2) 1/78 Yearly report. (3) 1/79 Yearly report. (4) 1/80 Final report.
KEYWORDS: AIR FILTERS;PERFORMANCE TESTING;DUSTS;FILTRATION;FIBERS;REMOVAL

<071384>
TITLE: High Velocity Fabric Filtration
PROJECT NUMBER: P-624-A-62
PRINCIPAL INVESTIGATOR: First, M.W.;Leith, D.
ADDRESS: 665 Huntington Ave., Boston, MA 02115
AFFILIATION: Harvard School of Public Health, Boston, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Turner, J.H.
TELEPHONE: F629-2925
TYPE OF FUNDING: Grant No.-R804700-02
77 FUNDING: Environmental Protection Agency FY77:$41,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The objectives of this project are: (1) to study the practicality of high velocity fabric filtration, (2) to investigate phenomena which limit effective high velocity operation, and (3) to develop mathematical models to interpret and predict fabric filter performance.
APPROACH: These objectives will be met using experimental work with a three bag pilot scale filter cleaned by the pulse-jet principle, and theoretical work to describe filter performance mathematically.
RESULTS: If fabric filters can be made to operate at higher than conventional velocity, a proportional reduction in filter size and initial cost will be possible, making these efficient collectors attractive for many applications where they are not currently used. For example, a high velocity filter operating at a superficial filtration velocity of 25 cm/s (air to cloth ratio of 50 cfm/square feet) need be only 10 to 25 percent as large as a unit operating at conventional velocities.
PROJECT MILESTONES: (1) 8/76 Grant awarded. (2) 9/77 Yearly report. (3) 9/78 Yearly report. (4) 9/79 Final report.
KEYWORDS: AIR FILTERS;PERFORMANCE TESTING;MATHEMATICAL MODELS;FIBERS;TEXTILES

<071385>
TITLE: Fine Particle Control with University of Washington Electrostatic Scrubber
PROJECT NUMBER: P-624-A-63
PRINCIPAL INVESTIGATOR: Pilot, M.J.
ADDRESS: FX-10, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Harmon, Dale L.
TYPE OF FUNDING: Grant No.-R804393
77 FUNDING: Environmental Protection Agency FY77:$115,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Demonstrate the effectiveness of the University of Washington Electrostatic Scrubber for controlling the emissions of fine particles from power plants and industrial plants.
APPROACH: Construct a mobile electrostatic scrubber and test the device on 3 or 4 sources in the field.
RESULTS: The unit has been completed and testing on an electric arc furnace in a steel mill has been completed. Testing on a coal-fired power plant is scheduled.
PROJECT MILESTONES: (1) 3/76 Grant funded. (2) 6/77 Complete test on electric arc furnace. (3) 10/77 Complete test on coal-fired power plant. (4) 1/78 Complete 3rd test. (5) 3/78 Final report.
KEYWORDS: ELECTROSTATIC PRECIPITATORS;RESEARCH PROGRAMS;DESIGN;PERFORMANCE TESTING;FOSSIL-FUEL POWER PLANTS;INDUSTRIAL PLANTS;GASEOUS WASTES;FLUE GAS;FILTRATION;SCRUBBERS

<071386>
TITLE: Fine Particulate Control by High Gradient Magnetic Separation (HGMS)
PROJECT NUMBER: P-624A-70
PRINCIPAL INVESTIGATOR: Mixon, F.O.
ADDRESS: P.O. Box 12194, Research Triangle Park, NC 27709
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-1879
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To demonstrate the feasibility of using a high gradient magnetic separation (HGMS) system as an effective and economic technique for control of fine particulate emissions.
APPROACH: Phase I of the project will include a review of the theoretical concepts of HGMS as applied to fine particle collection with emphasis on collection efficiency, collector regeneration, and power and residence time requirements. Bench scale experiments will follow to varify or disprove the theoretical predictions. A preliminary analysis of capital and operating costs will be performed to compare the system to conventional equipment, i.e., scrubbers, electrostatic precipitators or fabric filters. If the results obtained in Phase I are technically and economically attractive, Phase II will consist of the design, construction and operation of an experimental model of at least 500 cfm capacity to obtain additional information on the performance of the HGMS system with respect to power input, residence time, temperature, particulate type, and particulate size distribution. Phase III will consist of a 3000 cfm pilot demonstration at a plant site.
RESULTS: Demonstrated control technology for potential particulate air pollutants which are ferromagnetic or highly paramagnetic, users would include the ferroalloy and iron and steel industries.

PROJECT MILESTONES: (1) 6/75 Award Contract. (2) 7/77 Complete Feasibility Tests at Small Scale. (3) 8/79 Complete Field Pilot Demonstration.
KEYWORDS: PARTICLES;AEROSOLS;AIR POLLUTION CONTROL;POLLUTION CONTROL EQUIPMENT;PARTICLE SIZE;DUSTS;ENVIRONMENTAL TRANSPORT;FEASIBILITY STUDIES;SEPARATION PROCESSES;AIR CLEANING SYSTEMS;MAGNETIC FIELDS;DESIGN;METAL INDUSTRY;IRON COMPOUNDS

<071387>
TITLE: Technology Transfer for Scrubbers
PROJECT NUMBER: P-624-A-71
PRINCIPAL INVESTIGATOR: Parker, R.
ADDRESS: 4901 Morena Blvd., San Diego, CA 92117
AFFILIATION: Air Pollution Technology, Inc., San Diego, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Drehmel, D.C.
TELEPHONE: F629-2925
TYPE OF FUNDING: Contract No.-68-02-2190
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES/Dust (25%);ORGANICS (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide current information on advances in scrubber technology to potential users.
APPROACH: This project is to conduct a technology transfer conference dealing with novel device and scrubber control technology. In addition, the symposium proceedings will be compiled and printed, three special reports will be written, and six executive summaries will be prepared and compiled into a report.
RESULTS: The first conference was held in the eastern U.S. during the Spring of 1977.
PROJECT MILESTONES: (1) 9/76 Contract award. (2) 5/77 Conduct scrubber conference. (3) 9/77 Report on scrubber programs. (4) 11/77 Report on application areas for dry scrubbing. (5) 1/78 Executive summaries of current research. (6) 3/78 Report on scrubber performance models.
KEYWORDS: SCRUBBERS;TECHNOLOGY TRANSFER;HYDROCARBONS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS

<071388>
TITLE: Design and Construction of a Versatile Fabric Filter Test Unit
PROJECT NUMBER: P-624-A-72
PRINCIPAL INVESTIGATOR: Moreno, F.E.
ADDRESS: 485 Clyde Ave., Mountain View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Ramsey, G.H.
TYPE OF FUNDING: Contract No.-68-02-2151
77 FUNDING: Environmental Protection Agency FY77:$68,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES/Dust (25%);ORGANICS (25%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To design, fabricate, install and test in the IERL Laboratory in Research Triangle Park, N.C., a versatile, high temperature (to 1500 degrees F) fabric filter test unit which can control the gas composition, particulate leading and humidity of the inlet stream.
APPROACH: A fabric filter test unit will be designed, fabricated and installed which will allow for the testing of four tubular (35 1/2'' x 5'' diameter) fabric filters in independent test chambers. Inlet particulate loading, temperature, gas composition, filter face velocity and humidity will be controlled by the unit. Additional instrumentation will be designed which will measure and log other parameters affecting filter life.
RESULTS: A design will be generated during the initial 4 months of the contract. This design will be reviewed before parts procurement and fabrication begin. Partial fabrication of the test unit will be accomplished at Aerotherm (Mountain View, California) prior to the shipment of the device to the EPA in December 1976. Installation in the IERL Laboratory is scheduled to begin in January 1977. Unit demonstration tests will be conducted in September 1977.
PROJECT MILESTONES: (1) 3/76 Contract signed. (2) 6/76 Design drawings of versatile fabric filter test unit. (3) 8/76 Procurement of all parts. (4) 10/76 Assembly of unit at contractor's location. (5) 2/77 Shipment. (6) 5/77 Installation at RTP. (7) 11/77 Shakedown and demonstration tests.
KEYWORDS: AIR FILTERS;DESIGN;CONSTRUCTION;PERFORMANCE TESTING;FIBERS;NITROGEN COMPOUNDS

<071389>
TITLE: Design, Fabricate, and Install a Pilot Scale Electrostatic Precipitator
PROJECT NUMBER: P-624-A-73
PRINCIPAL INVESTIGATOR: Rinard, G.A.;Venditti, F.P.
ADDRESS: P.O. Box 10127, Denver Research Institute, Denver, CO 80210
AFFILIATION: Denver Univ., Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Ramsey, G.H.
TELEPHONE: F629-2161
TYPE OF FUNDING: Contract No.-68-02-2129
77 FUNDING: Environmental Protection Agency FY77:$86,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of the project is to provide a pilot-scale electrostatic precipitator (ESP) at the research EPA facility in Research Triangle Park, N.C. The ESP will provide maximum flexibility, and accuracy consistent with the basic requirement that its general configuration be similar to that of full-scale electrostatic precipitators. A burner, humidifier, and a specially designed aerosol generator will be included in order to provide a wide variety of atmospheres in the precipitator unit.
APPROACH: Phase 1: Prior to designing the precipitator, a survey of existing pilot-scale installations will be made and experts in the field of ESP design and application will be interviewed. With these background data, the features and parameters of the pilot scale ESP will be established and the design will be undertaken. Phase 2: The second part of the effort will be to fabricate and assemble the precipitator at the Cherry Creek Field Site Facility of the University of Denver for checkout. Having proven the unit, it will be partially dismantled, shipped to Research Triangle Park, N.C., and re-assembled.
RESULTS: The ESP a system has been installed at Research Triangle Park, N.C.
PROJECT MILESTONES: (1) 11/75 Contract signed. (2) 3/76 Technical Survey report of ESP experts. (3) 5/76 Design drawings of ESP system. (4) 11/76 Fabrication of ESP at contractor's site. (5) 2/77 Shipping of unit to RTP, N.C. (6) 4/77 Installation and checkout.
KEYWORDS: ELECTROSTATIC PRECIPITATORS;DESIGN;FABRICATION;INSTALLATION

<071390>
TITLE: Survey of the Use and Emission of Selected Carcinogens in New Jersey
PROJECT NUMBER: R-624-A-77
PRINCIPAL INVESTIGATOR: Preuss, P.W.
ADDRESS: Department of Environmental Protection, P.O. Box 1390, Trenton, NJ 08625
AFFILIATION: New Jersey Dept. of Environmental Protection, Trenton (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Grant No.-R805501-01
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Site specific New Jersey
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To establish a computerized data base concerning the manufacture, use, storage, processing, formation, release, disposal and repackaging in NJ of a group of carcinogenic substances selected on the basis of their large volume of production and/or their carcinogenicity.
APPROACH: To identify the area of the state and population group that are subject to an increased cancer risk due to exposure to cancer causing substances and other toxic agents in the environment.
RESULTS: The data base will permit determinations of the following: a comprehensive inventory of the selected carcinogens in New Jersey; the industrial locations where the selected carcinogens are used, manufactured, stored, released, formed, repackaged, etc. and the quantity of the carcinogen handled at each location; the products which are manufactured from the selected carcinogens, the quantity of the substances emitted and/or released to the atmosphere, water and solid waste stream, the potential occupational and community exposure to the selected materials.
PROJECT MILESTONES: (1) 77/09 Grant Award. (2) 80/09 Grant Completion.
KEYWORDS: NEW JERSEY;AIR QUALITY;CARCINOGENS;AIR POLLUTION;DATA ACQUISITION;INFORMATION SYSTEMS;INVENTORIES;WATER POLLUTION;CHEMICAL EFFLUENTS;CONTROL;EPIDEMIOLOGY;SOLID WASTES;OCCUPATIONAL DISEASES;HEALTH HAZARDS;ENVIRONMENTAL TRANSPORT;COMPUTER CODES;METAL INDUSTRY;CHEMICAL INDUSTRY

<071391>
TITLE: Quick Reaction Engineering and Technical Services
PROJECT NUMBER: F-624-A-79
PRINCIPAL INVESTIGATOR: Moreno, F.
ADDRESS: 485 Clyde Avenue, Mountain View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2611
77 FUNDING: Environmental Protection Agency FY77:$283,600
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All pollutants (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this program is to provide support and assistance to the Environmental Protection Agency. Work will be accomplished by means of specific work assignments made by the Agency. Planned areas of work are listed below. (1) Economic and environmental assessment of pollution control equipment. (2) Process analysis. (3) Preparation of cost estimates for pollution control systems being developed for EPA. (4) Process research. (5) Evaluation of energy conservation potential of new pollution control technologies. (6) Engineering analysis of major EPA program elements. (7) Assessment of R and D programs in coal conversion, coal extraction, and coal reclamation. (8) Surveys of process emissions and pollution control technology. (9) Identification of new environmentally acceptable power systems offering improved utilization of fossil fuels. (10) Technical services including site planning recommendations, process equipment design, report preparation, data compilation, preparation of technical symposia, and related services. (11) Assistance to EPA regional offices in the areas listed above.
PROJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: SUPPORT SERVICES;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;ECONOMIC IMPACT;PROCESS CONTROL;ENERGY CONSERVATION;ENERGY CONSUMPTION;COAL GASIFICATION;COAL LIQUEFACTION;COAL MINING;LAND RECLAMATION;FOSSIL FUELS;POWER GENERATION;ENVIRONMENT;RESEARCH PROGRAMS

<071392>
TITLE: Engineering Services in Support of Environmental Protection Agency Specific Work Assignments
PROJECT NUMBER: P-624-A-80
PRINCIPAL INVESTIGATOR: Dyer, H.
ADDRESS: P.O. Box 3965, San Francisco, CA 94119
AFFILIATION: Bechtel Corp., San Francisco, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2616
77 FUNDING: Environmental Protection Agency FY77:$110,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All pollutants (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This contract provides for engineering and technical services in support of various projects as may be assigned by EPA or other related government entities. Specific projects that are performed will fall within the following category titles: (1) Assessment of environmental and economic impact of the pollution control systems as they become commercially available to the user industries. (2) Process Analysis. (3) Providing detailed cost estimates for the pollution control systems that are being developed by EPA. (4) Process Research. (5) Evaluating the energy conservation potential of new pollution control technologies with the emphasis placed on near-term payoff systems. (6) Engineering Analysis. (7) Assessing R and D programs in coal liquefaction, low, medium, and high BTU gasification: advanced combination research; and improved coal extraction and reclamation techniques. (8) Process Emissions and Control Technology Survey. (9) Identifying new environmentally acceptable power systems that can provide cleaner more efficient utilization of fossil fuels. (10) Associated Technical Services. (11) Regional Assistance and State Implementation Planning.
PROJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: US EPA;RESEARCH PROGRAMS;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;COAL LIQUEFACTION;COAL GASIFICATION;LAND RECLAMATION;POWER GENERATION;IMPLEMENTATION;POLLUTION REGULATIONS;ENGINEERING

<071393>
TITLE: Non-Personal, Quick Reaction Engineering and Technical Services
PROJECT NUMBER: P-624-A-81
PRINCIPAL INVESTIGATOR: Suprenant, N.P.
ADDRESS: Burlington Road, Bedford, MA 01730
AFFILIATION: GCA Corp., Bedford, Mass. (USA). GCA Technology Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2607
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All pollutants (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The work to be performed under this contract is in support of the technical functions carried out by the Environmental Protection Agency. Specific work assignments will be for work in the following areas: (1) Assessment of environmental and economic impact of the pollution control systems as they become commercially available to the user industries. (2) Process analysis. (3) Providing detailed cost estimates for pollution control systems that are being developed by the EPA. (4) Process research. (5) Evaluating the energy conservation potential of new pollution control technologies with the emphasis placed on near term payoff systems. (6) Engineering analysis. (7) Assessing R/D programs in coal liquefaction, low, medium, and high BTU gasification; advanced combustion research; and improved coal extraction and reclamation techniques. (8) Process emissions and control technology survey. (9) Identifying new environmentally acceptable power systems that can provide cleaner, more efficient utilization of fossil fuels. (10) Associated technical services. (11) Regional assistance and state implementation planning.
PROJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: US EPA;RESEARCH PROGRAMS;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;POLLUTION REGULATIONS;IMPLEMENTATION;POWER GENERATION;LAND RECLAMATION;COAL GASIFICATION;COAL LIQUEFACTION

<071394>
TITLE: Non-Personal, Quick Reaction Engineering and Technical Services
PROJECT NUMBER: P-624-A-32
PRINCIPAL INVESTIGATOR: Weisenberg, M.I.
ADDRESS: 1930 14th Street, Santa Monica, CA 90404
AFFILIATION: Pacific Environmental Services, Inc., Santa Monica, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-2606
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Pacific Environmental Services, Inc. (PES) will perform on a work assignment basis

studies in the following areas: (1) Assessment of environmental and economic impact of the pollution control systems as they become commercially available to the user industries; (2) Process Analysis; (3) Providing detailed cost estimates for the pollution control systems that are being developed by EPA; (4) Process Research; (5) Evaluating the energy conservation potential of new pollution control technologies with the emphasis placed on near-term payoff systems; (6) Engineering Analysis; (7) Assessing R and D programs in coal liquefaction, low, medium, and high BTU gasification; advanced combination research; and improved coal extraction and reclamation techniques; (8) Process emissions and Control Technology Survey; (9) Identifying new environmentally acceptable power systems that can provide cleaner more efficient utilization of fossil fuels; (10) Associated Technical Services, (11) Regional Assistance and State Implementation Planning.
PROJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: US EPA;RESEARCH PROGRAMS;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;POLLUTION REGULATIONS;IMPLEMENTATION;POWER GENERATION;LAND RECLAMATION;COAL GASIFICATION;COAL LIQUEFACTION

<071395>
TITLE: Non-Personal, Quick Reaction Engineering and Technical Services
PROJECT NUMBER: F-624A-83
PRINCIPAL INVESTIGATOR: Gerstle, R.W.
ADDRESS: 11499 Chester Road, Cincinnati, OH 45246
AFFILIATION: PEDCO-Environmental, Cincinnati, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2603
77 FUNDING: Environmental Protection Agency FY77:$270,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The work to be performed under this contract is in support of the technical functions carried out by the Environmental Protection Agency. Specific work assignments will be for work in the following areas: (1) Assessment of environmental and economic impact of the pollution control systems as they become commercially available to the user industries. (2) Process analysis. (3) Providing detailed cost estimates for pollution control systems that are being developed by the EPA. (4) Process research. (5) Evaluating the energy conservation potential of new pollution control technologies with the emphasis placed on near term pay off systems. (6) Engineering analysis. (7) Assessing R/D programs in coal liquefaction, low, medium, and high BTU gasification; advanced combustion research; and improved coal extraction and reclamation techniques. (8) Process emissions and control technology survey. (9) Identifying new environmentally acceptable power systems that can provide cleaner, more efficient utilization of fossil fuels. (10) Associated technical services. (11) Regional assistance and state implementation planning.
PROJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: US EPA;RESEARCH PROGRAMS;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;POLLUTION REGULATIONS;IMPLEMENTATION;POWER GENERATION;LAND RECLAMATION;COAL GASIFICATION;COAL LIQUEFACTION

<071396>
TITLE: Non-Personal, Quick Reaction Engineering and Technical Services
PROJECT NUMBER: F-624A-84
PRINCIPAL INVESTIGATOR: Talbert, W.M.
ADDRESS: 1300 Three Greenway Plaza East, Houston, TX 77046
AFFILIATION: Pullman Kellogg, Houston, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2619
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: An EPA contracting officer will issue specific tasks of work which will fall into one of the following categories: (1) Assessment of the environmental and economic impact of pollution control systems. (2) Process analysis of early stage research results. (3) Cost estimates for the pollution control systems being developed by the EPA. (4) Engaging in process research. (5) Evaluation of the energy conservation potential of new pollution control technologies. (6) Determine the environmental impacts that result from air pollution control processes and systems. (7) Assessment of R and D programs in coal liquefaction; low-, medium-, and high-Btu gasification; advanced combustion research; and improved coal extraction and reclamation techniques. (8) Survey process emissions and control technology of designated industrial sources to define research development, and demonstration requirements. (9) Identify new environmentally acceptable fossil fuel power systems. (10) Provide technical services in the areas of site planning, configuration of power plant process layouts, process equipment design, preparation of engineering reports such as computation of emission by process and source, and other engineering studies. (11) Assist regional EPA offices and state pollution control agencies in control implementation planning. The majority of work assignments will be completed by Pullman
OJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
YWORDS: US EPA;RESEARCH PROGRAMS;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;POLLUTION REGULATIONS;IMPLEMENTATION;POWER GENERATION;LAND RECLAMATION;COAL GASIFICATION;COAL LIQUEFACTION

<071397>
TITLE: Quick Response Non-Personal Technical and Engineering Services
PROJECT NUMBER: P-624-A-85
PRINCIPAL INVESTIGATOR: Wells
ADDRESS: Shoal Creek Road, Austin, TX 78766
AFFILIATION: Radian Corp., Austin, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2608
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The plan will support the technical functions of EPA in the following areas: (1) Assessment of environmental and economic impact of pollution control systems as they become commercially available to the user industries. (2) Process analysis. (3) Providing detailed cost estimates for pollution control systems being developed by EPA. (4) Process research. (5) Evaluating the energy conservation potential of new pollution control technologies with the emphasis placed on near-term payoff systems. (6) Engineering analysis. (7) Assessing R and D programs in coal liquefaction, coal gasification, advanced combination research, and improved coal extraction and reclamation techniques. (8) Surveying process emissions and control technology. (9) Identifying new environmentally acceptable power systems that can provide cleaner, more efficient utilizatin of fossil fuels. (10) Associated technical services. (11) Specific work assignments will be made by the issuance of individual work assignments.
PROJECT MILESTONES: (1) 77/3 Contract award. (2) 79/3 Estimated contract completion date.
KEYWORDS: SUPPORT SERVICES;POLLUTION CONTROL EQUIPMENT;ECONOMIC IMPACT;ENVIRONMENTAL IMPACTS;ENERGY CONSERVATION;ENVIRONMENT;POLLUTION CONTROL;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;ENVIRONMENTAL ENGINEERING

<071398>
TITLE: Non-Personal, Quick Reaction Engineering and Technical Services
PROJECT NUMBER: P-624A-86
PRINCIPAL INVESTIGATOR: Oglesby, S.
ADDRESS: 2000 Ninth Avenue S., Birmingham, AL 35205
AFFILIATION: Southern Research Inst., Birmingham, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2610
77 FUNDING: Environmental Protection Agency FY77:$78,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Southern Research Institute will furnish the necessary personnel, materials, services, equipment, facilities and otherwise do all things necessary for or incident to the support of the EPA in the functions stated below: (1) Assessment of environmental and economic impact of pollution control systems as they become available to industry. (2) Process analysis. (3) Provide detailed cost estimates for pollution control systems being developed by EPA. (4) Process research. (5) Evaluate the energy conservation potential of new pollution control technologies with the emphasis placed on near-term payoff systems. (6) Engineering analysis. (7) Assess R and D programs in coal liquefaction, low, medium, and high Btu gasification; advanced combination research and improved coal extraction and reclamation techniques. (8) Process emissions and control technology survey. (9) Identify new environmentally acceptable power systems that can provide cleaner more efficient utilization of fossil fuels. (10) Associated technical services. (11) Regional assistance and state implementation planning.
PROJECT MILESTONES: (1) 3/77 Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: US EPA;RESEARCH PROGRAMS;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;POLLUTION REGULATIONS;IMPLEMENTATION;POWER GENERATION;LAND RECLAMATION;COAL LIQUEFACTION;COAL GASIFICATION

<071399>
TITLE: Non-Personal, Quick Reaction Engineering and Technical Services
PROJECT NUMBER: P-624A-87
PRINCIPAL INVESTIGATOR: Zuckerman, I.
ADDRESS: One Space Park, Redondo Beach, CA 90278
AFFILIATION: TRW, Inc., Redondo Beach, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.A.
TYPE OF FUNDING: Contract No.-68-02-2613
77 FUNDING: Environmental Protection Agency FY77:$270,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The work to be performed under this contract involves support of the technical functions carried out by the Environmental Protection Agency. Specific work assignments will be made by issuance of individual task orders. The Contractor shall supply the necessary labor, materials, and facilities

required for performance of each individual task order for work in the areas delineated below: (1) Assessment of environmental and economic impact of the pollution control systems. (2) Process analysis of research results to determine technical feasibility, recommend supplemental research, and to recommend design and operating conditions for larger scale systems. (3) Development of detailed cost estimates for the pollution control systems that are being developed by EPA. (4) Process research including process chemistry, reaction kinetics, or other phenomena; development of analytical methods; and chemical analyses of process materials. (5) Evaluation of the energy conservation potential of new pollution control techniques. (6) Assessment of R and D programs in coal liquefaction; coal gasification; advanced combustion research; and improved coal extraction and reclamation techniques. (7) Process emissions and control technology surveys of designated industrial sources. (8) Identification of new environmentally acceptable power systems that can provide cleaner, more efficient utilization of fossil
PROJECT MILESTONES: (1) Contract award. (2) 3/79 Estimated contract completion date.
KEYWORDS: US EPA;RESEARCH PROGRAMS;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;POLLUTION REGULATIONS;IMPLEMENTATION;LAND RECLAMATION;POWER GENERATION;COAL GASIFICATION;COAL LIQUEFACTION

<071400>
TITLE: Operation of IERL-RTP Test Facilities
PROJECT NUMBER: P-624A-88
PRINCIPAL INVESTIGATOR: Blann, D.R.
ADDRESS: 485 Clyde Avenue, Mountain View, CA 94042
AFFILIATION: Acurex Corp., Mountain View, Calif. (USA). Aerotherm Div.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Briscoe, C. Victor
TYPE OF FUNDING: Contract No.-68-02-2646
77 FUNDING: Environmental Protection Agency FY77:$390,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To operate and maintain Industrial and Environmental Research Laboratory test facilities located and based at Wing G of the ERC, RTP. These facilities include two pilot model SO2 scrubbers, one operating in the lime/limestone mode and the other utilizing the double-alkali process, a mobile fabric filter, mobile wet scrubber, mobile electrostatic precipitator, and aerodynamic test chamber, a mobile analytical laboratory trailer, a mobile analytical laboratory van, a fluidized bed combustor test rig, and the EPA Van for Clean Energy.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;SULFUR DIOXIDE;SCRUBBERS;OPERATION;LIME-LIMESTONE WET SCRUBBING PROCESSES;LIMESTONE;AIR FILTERS;TEXTILES;MOBILITY;TECHNOLOGY ASSESSMENT;COMPARATIVE EVALUATIONS;FLUIDIZED-BED COMBUSTORS;PAPER INDUSTRY;CEMENTS;METAL INDUSTRY;AEROSOLS

<071401>
TITLE: Measurement and Evaluation Procedures for Environmental R and D
PROJECT NUMBER: P-624A-89
PRINCIPAL INVESTIGATOR: Farquhar, P.H.
ADDRESS: 619 Clark Street, Evanston, IL 60201
AFFILIATION: Northwestern Univ., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Sharig, S.S.
TYPE OF FUNDING: Grant No.-R805356-01
77 FUNDING: Environmental Protection Agency FY77:$136,500
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: As part of its efforts in promoting both improved environmental assessments and pollution control technologies for industrial processes and energy production, IERL-RTP carries out five basic activities: (1) the assessment of areas where control technologies are likely to have significant environmental impact, (2) the translation of such assessments into specific R and D work units and the allocation of funds needed to carry out this work, (3) the identification of projects and funding of contractors to accomplish the work units planned, (4) the monitoring and evaluation of the progress and performance on various R and D projects, and (5) the dissemination of results from R and D projects to potential users. The primary goal of the proposed research is to support these basic activities at IERL-RTP by providing effective methods to: (1) identify the technological, environmental, and related goals needed to determine high impact areas for R and D planning, (2) establish priorities among sub-objectives and work units so that rational budget allocation decisions can be made, (3) help improve the decision/budgeting process at various organizational levels at IERL-RTP and at different points in the planning cycle, and (4) investigate the end-uses of R and D work and establish a system for information dissemination outside the laboratory consistent with the mission and resources of IERL-RTP.
PROJECT MILESTONES: 6/78 Phase I Final Report: recommendations on measurement and evaluation procedures for environment R and D.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;TECHNOLOGY ASSESSMENT;POLLUTION CONTROL EQUIPMENT;ENVIRONMENTAL IMPACTS;DATA ANALYSIS;TECHNOLOGY UTILIZATION;PLANNING;EVALUATION

<071402>
TITLE: Project Definition Phase Study for an Integrated Assessment of Coal-Based Energy Technology
PROJECT NUMBER: P624A-74
PRINCIPAL INVESTIGATOR: Davidson, R.S.
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hansen, R.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)

PROJECT DESCRIPTION: This Project, Phase I--Definition Phase, will include the following objectives: (1) a methodology for integrating the results ot completed and ongoing EPA/IERL ''environmental assessments'' of coal based energy and environmental quality control technologies; (2) a methodology for conducting a comparative assessment of the environmental, social, economic, and energy impacts of coal based energy technologies, supply systems, and end uses; (3) a methodology for assessing national impacts for all components of coal energy supply systems, extraction, fuel stock transportation, processing, conversion, energy product transportation, and end use; (4) approaches to identifying, analyzing, and comparing technological and institutional methods of avoiding, or mitigating undesirable consequences of coal energy development; (5) propose ways of identifying and comparing the effects of alternative energy related environmental policies and policy implementation strategies.
APPROACH: Battelle's Columbus laboratories will prepare a workplan for conducting a full scale assessment of coal-based technology and develop a cost proposal. The subject area of the workplan will have as its scope: coal production, preparation, transportation, conversion, and utilization. The boundaries for the full assessment are to be chosen in the Project Definition Phase. Forecasting of the total coal demand as well as the demand for other fuels will be included in the analysis. For any level of coal demand impacts will be forecast, and tradeoffs between different coal utilization systems will be covered.
PROJECT MILESTONES: (1) 01/77 Contract award--competitive. (2) 07/77 Phase I (work plan and proposal for Phase II)--completed.
KEYWORDS: COAL INDUSTRY;ENVIRONMENTAL IMPACTS;TECHNOLOGY ASSESSMENT;QUALITY CONTROL;SOCIAL IMPACT;ECONOMIC IMPACT;ENERGY MODELS;SOCIO-ECONOMIC FACTORS;ENVIRONMENTAL POLICY;IMPLEMENTATION;DECISION MAKING;ENERGY DEMAND;FORECASTING;TECHNOLOGY UTILIZATION

<0714O3>
TITLE: Integrated Assessment of Coal-Based Energy Technologies--Project Definition Phase
PROJECT NUMBER: P624A-75
PRINCIPAL INVESTIGATOR: Stuart, J.D.
AFFILIATION: Radian Corp., Austin, Tex. (USA); Texas Univ., Austin (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hansen, R.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: Develop methodology and formulate a work plan for a two and one half year program: (1) to collect and integrate the results of (a) EPA's on-going efforts at assessing the environmental, energy, and economic impact of conventional coal-based systems, (b) the recently initiated environmental assessments of emerging coal-based energy technologies sponsored by EPA, and (c) other studies by other organizations (other than EPA) on related topics; (2) to identify, describe, and quantify the range and magnitude of biophysical, socioeconomic, and energy impacts associated with each coal-based technology; (3) tc identify, describe, compare, and quantify where possible the range and magnitude of biophysical, socioeconomic, and energy impacts of alternative mixes, rates, levels, and timing of the development and deployment of coal-based energy technologies, supply systems, and end uses; (4) to identify and comparatively analyze technological and institutional methods of avoiding or mitigating undesirable impacts. Particular attention will be given to the responsibilities of the Environmental Protection Agency as specified by relevant laws, directions, orders, etc.
PROJECT MILESTONES: (1) 01/77 Contract award--competitive. (2) 07/77 Phase I (work plan and proposal for Phase II)--completed.
KEYWORDS: COAL INDUSTRY;ENVIRONMENTAL IMPACTS;TECHNOLOGY ASSESSMENT;TECHNOLOGY UTILIZATION;SOCIAL IMPACT;ECONOMIC IMPACT;ENERGY SOURCE DEVELOPMENT;POLLUTION ABATEMENT;PLANNING;POLLUTION REGULATIONS;FINANCING;US EPA;GOVERNMENT POLICIES;ENVIRONMENTAL POLICY;ENERGY POLICY

<0714O4>
TITLE: Integrated Assessment of Coal Based Energy Technology--Project Definition Phase
PROJECT NUMBER: P624A-76
PRINCIPAL INVESTIGATOR: Dickson, E.M.
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hansen, R.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The Project Definition Phase of this study consists of efforts to explicitly scope the subsequent assessment work; establish procedures to select the most relevant technologies; identify and assemble relevant literature and data; delineate methodologies to uncover and analyze both the direct and indirect environmental, economic, social, institutional, and legal impacts of deploying these technologies; define methodologies for comparing the impacts of the various technologies; and develop policy alternatives for the development of coal-based technologies. A plan to package the results in a form that will be useful to environmental and energy policy decisionmakers will also be developed. The product of the Project Definition Phase will, in effect, be a detailed proposal for the conduct of the actual assessment itself which would be done in the subsequent Integrated Assessment Phase.
PROJECT MILESTONES: (1) 01/77 Contract award--competitive. (2) 07/77 Phase I (work plan and proposal for Phase II) completed.
KEYWORDS: COAL INDUSTRY;TECHNOLOGY ASSESSMENT;ENVIRONMENTAL IMPACTS;POLLUTION ABATEMENT;ENVIRONMENTAL POLICY;SOCIAL IMPACT;ECONOMIC IMPACT;LEGAL ASPECTS

<0714O5>
TITLE: Activated Carbon for Control of Service Station Gasoline Emissions
PROJECT NUMBER: P604B-3
PRINCIPAL INVESTIGATOR: Kelly, W.C.;Manos, M.J.
AFFILIATION: Scott Environmental Technology, Inc., San Bernardino, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-2655
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);CONSERVATION/General (50%)
PROJECT DESCRIPTION: To complete the laboratory work and conduct field trials; high surface area carbon meets the need for a practical adsorbent bed in the control of gasoline vapor emission in service stations.
APPROACH: Work will be based on the recently completed laboratory study showing activated carbon has

excellent promise for use in control of gasoline vapor emissions from service stations, especially as applicable to emissions caused in filling automobile gasoline tanks. The preliminary study will be extended to quantification of variables determining carbon performance and engineering design for use under conditions to be encountered in service stations. Field tests will be conducted to confirm laboratory results and demonstrate in-use utility.
RESULTS: A technical report will be issued covering the performance and engineering design parameters determining the utility of activated carbon in adsorption-desorption control of gasoline vapor emissions at service stations. The report will include results of in-use tests to demonstrate performance under actual service conditions. A literature search will be conducted and issued to assist in application of developed technology to the general problem of solvent emissions control.
PROJECT MILESTONES: (1) 09/77 Develop test matrix. (2) 09/77 Issue program work plan. (3) 10/77 Reassemble and calibrate apparatus. (4) 01/78 Conduct parameter effects tests. (5) 01/78 Analyze data. (6) 02/78 Project results to service stations. (7) 02/78 Complete field working capacity tests. (8) 03/78 Complete information search on applicability of technology. (9) 03/78 Issue assessment report. (10) 04/78 Final report draft.
KEYWORDS: ACTIVATED CARBON;GASOLINE;VAPORS;AIR POLLUTION CONTROL;SORPTIVE PROPERTIES;ENVIRONMENTAL IMPACTS;PETROLEUM INDUSTRY;HYDROCARBONS

<071406>
TITLE: Providing Quick Reaction Engineering and Technical Services
PROJECT NUMBER: P604B-4
PRINCIPAL INVESTIGATOR: Boscak, V.G.;Yocom, J.S.
AFFILIATION: Research Corp. of New England, Wethersfield, Conn. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McSorley, J.
TYPE OF FUNDING: Contract No.-68-02-2615
77 FUNDING: Environmental Protection Agency FY77:$33,900
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: Provide Engineering and Technical Services to EPA's Industrial Environmental Research Laboratory (RTP) and the Office of Air Quality Planning and Standards in the following areas: (1) Assess environmental and economic impact of pollution control systems as they become available; (2) Process Analysis; (3) Cost analysis of EPA-developed pollution control systems; (4) Process Research; (5) Evaluation of energy conservation potential of new pollution control technology; (6) Engineering Analysis; (7) Assess R and D programs in coal utilization techniques; (8) Process Emissions and Control Technology Survey; (9) Identifying more efficient and environmentally acceptable fuel-based power systems; (10) Associated Technical Services; (11) Assistance to EPA Regions and State Programs.
APPROACH: Work will be performed on a task order basis.
PROJECT MILESTONES: (1) 03/77 Contract award. (2) 03/79 Estimated contract completion date.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;US EPA;AIR QUALITY;STANDARDS;PLANNING;POLLUTION REGULATIONS;TECHNOLOGY ASSESSMENT;SOCIO-ECONOMIC FACTORS;PROCESS CONTROL;COST;ENERGY CONSERVATION;POLLUTION CONTROL EQUIPMENT;ENVIRONMENTAL ENGINEERING;COAL INDUSTRY;STATE GOVERNMENT;GOVERNMENT POLICIES;ENVIRONMENTAL POLICY;ENERGY POLICY

<071407>
TITLE: Guidelines for Application of Coke Oven Pollution Control Systems
PROJECT NUMBER: F604C-10
PRINCIPAL INVESTIGATOR: Bee, R.W.
AFFILIATION: Mitre Corp., McLean, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McCrillis, R.C.
77 FUNDING: Environmental Protection Agency FY77:$15,200
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Develop guidelines for application of demonstrated coke battery air pollution control technology to existing and new coke batteries.
APPROACH: Specific control technologies to be examined are the AISI/EPA Smokeless Coke Oven Charging System, the Enclosed Coke Pushing and Quenching System, the Smokeless Coke Pushing System, staged charging (industrial development), Koppers Co. Erie car, Bethlehem Steel Corp. one-spot traveling hood, U.S. Steel Corp. ''silver streak'', and the Osterfeld system installed at Armco Steel-Middletown. The guidelines will examine characteristics of the control system that are important in design, construction, and operation and relate these characteristics to application of the control systems to U.S. coke batteries based upon examination of their characteristics and requirements.
RESULTS: The Final Report will be used by coke producers in planning the application of control technology and by regulatory officials in specifying air pollution control strategies and enforcement actions.
PROJECT MILESTONES: (1) 07/76 Project start. (2) 02/78 Publish final report.
KEYWORDS: COKE OVENS;POLLUTION CONTROL EQUIPMENT;RECOMMENDATIONS;AIR POLLUTION CONTROL;TECHNOLOGY ASSESSMENT;DESIGN;CONSTRUCTION;OPERATION;ENFORCEMENT;POLLUTION CONTROL AGENCIES;DOORS;METAL INDUSTRY

<071408>
TITLE: Sampling and Analysis of Emissions from Coke Oven Doors
PROJECT NUMBER: F604C-3
PRINCIPAL INVESTIGATOR: Barrett, R.;Jones, P.;Strupp, P.
AFFILIATION: Mitre Corp., McLean, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-1409
77 FUNDING: Environmental Protection Agency FY77:$10,100
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ROJECT DESCRIPTION: Evaluate the performance of the coke oven door emission sampling system by executing a complete sampling program over the coking cycles on one oven. Perform detailed elemental, organic, and bioassay analyses on the samples thus obtained.
APPROACH: All emissions are contained within an enclosure around the door. Purging this enclosure maintains the door at its natural conditions. Samples were taken throughout the cycle of the exiting purge stream. The collected emission samples will be subjected to rigorous analysis utilizing various techniques such as GC-MS, high resolution MS and biological evaluations. These samples, as well as coal and coke samples, will also be subjected to spark source MS for element identification.

RESULTS: The final result will be published in a public report. It will provide detailed information concerning the sampling equipment, procedures, and analyses.
PROJECT MILESTONES: (1) 08/75 Project start. (2) 09/77 Publish final report.
KEYWORDS: COKE OVENS;ENVIRONMENTAL IMPACTS;AIR POLLUTION;SAMPLING;CHEMICAL ANALYSIS;BIOASSAY;ELEMENTS;ORGANIC COMPOUNDS;MONITORING;COAL;COKE;AIR POLLUTION MONITORS;MEASURING METHODS;AIR SAMPLERS

<071409>
TITLE: Blast Furnace Cast House Emission Control Technology
PROJECT NUMBER: P604C-4
PRINCIPAL INVESTIGATOR: Lindsay, D.;May, W.P.
AFFILIATION: Betz Environmental Engineers, Inc., Plymouth Meeting, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McCrillis, R.C.
77 FUNDING: Environmental Protection Agency FY77:$31,200
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Develop feasible emission controls for new and existing blast furnace cast houses, considering capital costs, potential emission reductions, operating costs, impact on cast house operating procedures and total energy requirements.
APPROACH: Conduct a world-wide survey of state-of-the-art emission controls; investigating design details of installation and compatibility with, and impact upon, each producer's operating procedures and practices. Review literature and design technology of proposed foreign and domestic installations. Categorize the significant parameters and factors to determine model classifications of cast houses to be considered. For each model category, perform total cost analysis including cost or effects on hot metal production. Define benefits and detrimental effects faced by implementing each system and determine criteria to be considered in optimizing both retrofitted and integrated cast house emission control system.
RESULTS: A formal report will be published detailing the findings, analyses, and conclusions. Cast house emission control system combinations will be suggested for each major category of cast house for both retrofit and new furnaces. Areas of technological uncertainty will be identified and suggest development programs outlined.
PROJECT MILESTONES: (1) 09/75 Project start. (2) 09/77 Publish final report.
KEYWORDS: BLAST FURNACES;EMISSION;POLLUTION CONTROL EQUIPMENT;AIR POLLUTION CONTROL;ECONOMICS;ENERGY CONSUMPTION;TECHNOLOGY ASSESSMENT

<071410>
TITLE: Development and Demonstration of Concepts for Improving Coke Oven Door Seals
PROJECT NUMBER: P604C-5
PRINCIPAL INVESTIGATOR: Lownie, H.W.;Hoffman, A.O.;Forry, D.;Mesloh, R.;Grimm, J.;Hopper, A.;Paul, R.
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: McCrillis, R.C.
TYPE OF FUNDING: Contract No.-68-02-2173
77 FUNDING: Environmental Protection Agency FY77:$62,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Advance the state of the art of coke oven end door sealing significantly beyond that which is currently available.
APPROACH: Conduct a scientific and engineering program based on the recommendations and findings of Contract 68-02-1439, ''A Study of Concepts for Minimizing Emissions from Coke Oven Door Seals'', to design and develop at least one new system that will be proven in the field (in an optional project) to be retrofitable to existing coke ovens as well as applicable to new construction, mechanically and physically suitable for commercial use in steel plants, and highly effective in containing and controlling emissions from the ends of ovens. Mathematical modelling, physical modelling and field data collection tasks will be completed concurrently. Analysis and recommendations will be completed subsequently. Development and evaluation of the selected design(s) will culminate in the decisions required to initiate the demonstration work in the Optional Scope of Work. If this option is exercised the contract will be extended an additional 16 months to December 1979.
RESULTS: Complete, detailed design and manufacturing data for the demonstrated system backed up by the full scale field tests. Manuals will also be prepared describing in detail construction, installation, operation, and maintenance procedures.
PROJECT MILESTONES: (1) 08/76 Project start. (2) 02/78 Interim report--full scale design recommendations. (3) 08/78 Decision point to proceed with full scale demonstrations. (4) 02/80 Issue final report.
KEYWORDS: COKE OVENS;DOORS;AIR POLLUTION;ENVIRONMENTAL IMPACTS;GASKETS;DESIGN;DEMONSTRATION PROGRAMS;MATHEMATICAL MODELS;METAL INDUSTRY;DATA COMPILATION;MANUALS

<071411>
TITLE: Organic Emissions from Sinter Plants--Determination of Causes and Methods of Abatement
PROJECT NUMBER: P604C-7
PRINCIPAL INVESTIGATOR: Stoehr, R.A.
AFFILIATION: Pittsburgh Univ., Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Plaks, N.
TYPE OF FUNDING: Grant No.-R805304
77 FUNDING: Environmental Protection Agency FY77:$9,400
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Provide basic data on the mechanisms and potential control of organics and hydrocarbons from sintering in the steelmaking industry.
APPROACH: This work will systematically evaluate at bench-scale approaches to eliminating organic and hydrocarbon emissions from sintering by: (a) recycle of gases through a second sinter bed; (b) elimination of previously identified organics and hydrocarbons from the sinter charge; (c) control of combustion conditions to achieve more complete oxidation of the organics and hydrocarbons; and (d) periodic reversal

of air flow through the bed.
RESULTS: The output will be a final report.
PROJECT MILESTONES: (1) 07/77 Start grant. (2) 07/78 Complete grant.
KEYWORDS: SINTERING;ORGANIC COMPOUNDS;HYDROCARBONS;METAL INDUSTRY;ENVIRONMENTAL IMPACTS;AIR POLLUTION ABATEMENT;MONITORING;RECYCLING;GASEOUS WASTES;COMBUSTION;PROCESS CONTROL

<071412>
TITLE: Treatment of Gaseous Emissions from Steel Plants Containing Small Concentrations of Hydrocarbon Vapors
PROJECT NUMBER: P604C-8
PRINCIPAL INVESTIGATOR: Szekely, J.
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Plaks, N.
TYPE OF FUNDING: Grant No.-R805311
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Develop technology for the selective adsorption of steelmaking processes such as sinter plants, cokemaking, etc.
APPROACH: The project proceeds in a logical manner by first developing adsorption equilibrium for several adsorbents and hydrocarbons and then by systematically trying to increase the specificity of adsorption for hydrocarbons. Simultaneously, data will be developed on regeneration of the adsorbents. The controlling mechanisms for the process, mass transfer, pore diffusion, or adsorption kinetics, will be determined for use in scale-up purposes.
RESULTS: The output will be a final report.
PROJECT MILESTONES: (1) 07/77 Start grant. (2) 07/78 Complete grant.
KEYWORDS: METAL INDUSTRY;STEELS;GASEOUS WASTES;HYDROCARBONS;VAPORS;SINTERING;COKING;AIR POLLUTION CONTROL;ADSORBENTS;REGENERATION;CHEMICAL REACTION KINETICS;WASTE MANAGEMENT;POINT POLLUTANT SOURCES

<071413>
TITLE: Kinetics of Evolution of Sulfur-Bearing Gases from Blast Furnace Slags
PROJECT NUMBER: P610B-1
PRINCIPAL INVESTIGATOR: Elliott, J.F.
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Plaks, N.
TYPE OF FUNDING: Grant No.-R805338-01
77 FUNDING: Environmental Protection Agency FY77:$12,100
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Investigate the fundamental physico-chemical factors affecting the formation of SO2 and/or H2S from a reaction with hot blast furnace slag and desulfurization residues.
APPROACH: Investigate the fundamental factors affecting the formation of SO2 and H2S from reaction with hot blast furnace slags and desulfurization residues. If these reactions are better understood, one can develop means to control the evolution of sulfur bearing gases into the atmosphere from this source. Included is the study of the effects of the composition of the slag on the kinetic processes. If the study is successful, the practicality of process control as a means of eliminating sulfur emissions from hot slag can be ascertained.
RESULTS: The output of this grant will be a final report.
PROJECT MILESTONES: (1) 07/77 Start grant. (2) 07/78 Complete grant.
KEYWORDS: METAL INDUSTRY;FURNACES;POINT POLLUTANT SOURCES;SLAGS;SULFUR DIOXIDE;CHEMICAL REACTION KINETICS;DESULFURIZATION;ENVIRONMENTAL IMPACTS;GASEOUS WASTES;AIR POLLUTION CONTROL;PROCESS CONTROL;AIR POLLUTION ABATEMENT

<071414>
TITLE: Source Assessment Program
PROJECT NUMBER: P610B-9
PRINCIPAL INVESTIGATOR: Binning, R.
AFFILIATION: Monsanto Co., St. Louis, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Denny, D.A.
TYPE OF FUNDING: Contract No.-68-02-1874
77 FUNDING: Environmental Protection Agency FY77:$989,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The project objectives are to quantify and verify discharges to the environment from a variety of industrial sources. The discharge concentrations are compared to estimated risk levels in the environment. Source Assessment is a problem definition activity. Stationary sources in this category have been ranked in order of priority based on their potential for environmental damage. This potential is tested for validity for each of the source types in order of priority. For any given source a representative facility is defined in terms of process parameters. Discharge data are confirmed within known limits of error by the most appropriate means available. Actual field sampling is a last resort because of expense. Once discharge levels are known for the representative facility, statistical projections are made for the rest of the sources of the given type. The discharge levels are compared to quantitative measures of risk, either by biological testing or by extrapolation from known adverse effects levels. When the discharge levels exceed the estimated risk levels the problem is qualitatively identified. The extent to which the discharges exceed the estimated risk levels provides a quantitative measure of the degree of control needed and is a basis for objectives in the control program. Industry participation is encouraged. They provide effluent and process data and review reports. Interested parties in Government as well as industry are invited to participate in the program to ensure the results will be of use to all parties. Products are emissions reports which can be used by various groups. Emissions-Environmental risk comparisons can be used to judge the need to reduce the emissions to acceptable levels.
PROJECT MILESTONES: (1) 07/77 Assessment reports--Beef feed lots--Harvesting of grain. (2) 08/77 Assessment reports--Harvesting of cotton--Agricultural open burn. (3) 09/77 Assessment reports--Acrylonitrile. (4) 10/77 Assessment reports--Carbon black--Textile woven fabric finish. (5) 11/77 Assessment reports--Ammonia

production--Urea manufacture. (6) 12/77 Assessment reports--Phosphate fertilizer. (7) 01/78--Assessment reports--Residential coal heating.
KEYWORDS: POINT POLLUTANT SOURCES;INDUSTRY;ENVIRONMENTAL IMPACTS;HOUSES;COAL;COMBUSTION;SPACE HEATING;AGRICULTURAL WASTES;CEREALS;SEEDS;AMMONIA;INDUSTRIAL WASTES;FERTILIZERS;COAL INDUSTRY;COTTON;AIR POLLUTION;RISK ASSESSMENT;STATIONARY POLLUTANT SOURCES;INVENTORIES;AIR POLLUTION CONTROL;PROCESS CONTROL

<071415>
TITLE: Multi-Media Environmental Assessment of Ferrous Metallurgical Processes-Related Pollution Control Technologies
PROJECT NUMBER: P604C-06
PRINCIPAL INVESTIGATOR: Carpenter, B.H.
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Hendriks, R.V.
77 FUNDING: Environmental Protection Agency FY77:$138,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The Research Triangle Institute proposes to conduct its best level of effort multi-media environmental assessment of eight major processes: (1) Coke By-Product Recovery Plant; (2) Blast Furnaces; (3) Iron Foundries; (4) Sinter Plants; (5) Basic Oxygen Steelmaking; (6) Electric Arc Steelmaking; (7) Hot Forming; and (8) Ferroalloy Production.
APPROACH: The Institute will collect existing data relevant to evaluation of pollutant sources, control efficiency, and environmental acceptability of these processes. RTI will then identify any needs for further information and design a program to obtain it. Acting either alone or through other EPA contractors, RTI will apply the plans to develop the information to the extent the scope of work permits and then complete the environmental assessment.
RESULTS: The results to be expected for each process assessment are: (1) A symposium to discuss the results and on-going effort; (2) A capsule report highlighting exemplary technology; (3) A delineation of information needed to conduct a complete assessment; (4) An informal briefing conference to present and review the assessment; (5) A final report documenting the work of assessment, the recommendations and conclusions.
PROJECT MILESTONES: (1) 03/77 Project start. (2) 11/77 Report on by-product recovery. (3) 12/77 Report on iron foundries.
KEYWORDS: METAL INDUSTRY;IRON ALLOYS;STEELS;MATERIALS RECOVERY;FOUNDRIES;POLLUTION CONTROL;TECHNOLOGY ASSESSMENT;COKING;BY-PRODUCTS;PROCESS CONTROL;SINTERING;HOT WORKING;ENVIRONMENTAL IMPACTS

<071701>
TITLE: Invariant Modeling of Atmospheric Turbulence and Diffusion
PROJECT NUMBER: G-601B-CA-02
ADDRESS: 50 Washington Road, Princeton, NJ 08540
AFFILIATION: Aeronautical Research Associates of Princeton, Inc., N.J. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Science Research Laboratory
MONITOR: Demes, J.
TYPE OF FUNDING: Contract No.-68-02-2285
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);SPECIFIED OTHER POLLUTANTS/Multiple pollutants (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To allow further development of the mathematical model, so as to include the effect of the dispersion of an effluent with internal momentum; i.e., buoyant plumes, and plumes with high stack exit velocities. In addition, the model will be used to calculate gaseous dispersion under conditions for which empirical data are very costly and difficult to obtain.
APPROACH: This is continued development of a mathematical model of atmospheric turbulence and diffusion that has resulted from several years of previous work by this contractor (ARAP).
RESULTS: The additional work is urgently required as a basis for improved prediction of urban air quality.
PROJECT MILESTONES: 1978 Final Report.
KEYWORDS: CHEMICAL EFFLUENTS;GASEOUS WASTES;ENVIRONMENTAL TRANSPORT;METEOROLOGY;WIND;VELOCITY;TURBULENCE;AIR POLLUTION;MATHEMATICAL MODELS;STACK DISPOSAL;PLUMES

<071702>
TITLE: Formation of Atmospheric Aerosols
PROJECT NUMBER: G-601B-CA-8
PRINCIPAL INVESTIGATOR: Whitby, K.T.
ADDRESS: Dept. of Mechanical Engineering, Minneapolis, MN 55455
AFFILIATION: Minnesota Univ., Minneapolis (USA). Dept. of Mechanical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Environmental Science Research Laboratory
MONITOR: Wilson, W.
TYPE OF FUNDING: Grant No.-R803851-03
77 FUNDING: Environmental Protection Agency FY77:$225,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: Aerosol size distributions have been measured in the St. Louis area as part of EPA's Project MISST using aircraft and ground based self contained mobile laboratories.
APPROACH: These measurements were made with a group of collaborators such that a complete array of chemical, physical, and meteorological measurements were obtained on a coal fired power plant plume. The University of Minnesota's portion of the project included aerosol measurements aboard an aircraft and the operation of a mobile van on the ground under the plumes. This mobile van was also operated on freeways in the Los

Angeles area during October 1976 as part of an EPA sponsored project to study sulfur aerosols on roadways.
RESULTS: Much of the work during the next project year will be analysis and reporting of the large amount of data obtained during the past several years. Analysis is being directed toward obtaining aerosol growth rates in the plumes, aerosol nucleation rates in the plumes and surrounding atmosphere, and toward better descriptions of the aerosol size distributions. Laboratory work toward the development of a continuous instrument for the measurement of aerosol sulfur is also being partially supported by this project.
PROJECT MILESTONES: 3/77 Data Report.
KEYWORDS: AEROSOL MONITORING;MISSOURI;AIR POLLUTION;AERIAL MONITORING;URBAN AREAS;CHEMICAL EFFLUENTS;PLUMES;LABORATORY EQUIPMENT;MOBILITY;FOSSIL-FUEL POWER PLANTS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;SULFUR COMPOUNDS;ENVIRONMENTAL EFFECTS

<071703>
TITLE: Development and Evaluation of a Prototype Device to Analyze Ambient Sulfuric Acid
PROJECT NUMBER: G-601B-CA-11
PRINCIPAL INVESTIGATOR: Snyder, R.E.
ADDRESS: 5390 Cherokee Ave., Alexandria, VA 22314
AFFILIATION: Atlantic Research Nuclear Corp., Alexandria, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Industrial Science Research Laboratory
MONITOR: Krost, K.
TYPE OF FUNDING: Contract No.-68-02-2467
77 FUNDING: Environmental Protection Agency FY77:$61,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: The objective of this program is to develop and evaluate a prototype device for the selective analysis of sulfuric acid in the range of 0.25 to 50 mu g/m3.
APPROACH: The success of this program necessitates the development of a satisfactory method for collecting and fixing sulfuric acid aerosol from ambient air. The fixed sulfuric acid aerosol (adduct) will be chemically more stable than the unfixed acid aerosol and thus will eliminate negative interferences due to surface reactions during the collection procedure. However, the acid aerosol must be stabilized in a form capable of quantitatively releasing the original acid or some stoichiometrically related reagent, derivative or byproduct for measurement. It is anticipated that positive interferences can be eliminated by forming an adduct that exhibits selective decomposition or selective solubility in the presence of interfering sulfates. Additional analytical specificity will be accomplished by use of a sulfur measuring flame photometric detector.
RESULTS: Current plans are to examine the compounds diethylamine, diethylhydroxylamine and acetaldoxime for use as potential sulfuric acid fixing reagents. These and chemically similar compounds will be used to form sulfuric acid adducts which will be evaluated, utilizing the techniques and methodology discussed above, for interferences, accuracy and precision.
PROJECT MILESTONES: 6/77 Final Report.
KEYWORDS: SULFURIC ACID;AEROSOLS;AIR POLLUTION MONITORS;PERFORMANCE TESTING;AIR POLLUTION

<071704>
TITLE: Development of a Continuous SO2 Monitor for Mobile Sources
PROJECT NUMBER: G-601B-CA-15
PRINCIPAL INVESTIGATOR: Burch, D.
ADDRESS: Ford Rd., Newport Beach, CA 92663
AFFILIATION: Aeronutronic Ford Corp., Newport Beach, Calif. (USA). Aeronutronic Div.
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
TYPE OF FUNDING: Contract No.-68-02-2448
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: A continuous SO2 monitor for mobile sources is to be designed, constructed, tested and delivered to the Environmental Protection Agency.
APPROACH: The monitor makes use of the ultraviolet absorption by SO2 for its sensitivity and discrimination against other gas species normally present in the exhaust of internal combustion engines.
RESULTS: The minimum detectable concentration of SO2 is to be less than 0.1 parts per million; the maximum measurable concentration is to be greater than 1000 ppm. Included with the instrument are the pumps, filters, valves and other gas-handling equipment required to transfer continuously the exhaust gas to the sampling chamber.
PROJECT MILESTONES: 1978 Final Report.
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;SULFUR DIOXIDE;EXHAUST GASES;AUTOMOBILES;MONITORING;AEROSOLS

<071705>
TITLE: The Continuous Monitoring of Particulate Sulfur Compounds by Flame Photometry
PROJECT NUMBER: G-601-B-CA-21
PRINCIPAL INVESTIGATOR: Huntzicker, J.J.
ADDRESS: 19600 N.W. Walker Road, Beaverton, OR 97005
AFFILIATION: Oregon Graduate Center, Beaverton (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Reutter, Dennis J.
TYPE OF FUNDING: Grant No.-R804750-02
77 FUNDING: Environmental Protection Agency FY77:$29,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)

POLLUTANTS: NOXIOUS GAS/Sulfates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To make a detailed study of the use of a flame photometric detector for the continuous, in situ measurement of total particulate sulfur and the selective measurement of individual sulfur compounds.
APPROACH: The technique is based on coupling a ''diffusion tube'' scrubber to a very sensitive flame photometric detector. The diffusion tube scrubber serves two purposes: First, all gaseous sulfur compounds are reacted out to permit measurement of particulate sulfur only in the flame photometric detector. Second, by heating the aerosol upstream of the diffusion tube, individual sulfur compounds can be vaporized or decomposed to gases which are subsequently removed by the diffusion tube. This results in a decrease in the flame photometer output over a temperature range which is specific to the sulfur compound being vaporized or decomposed. A detection limit of approximately 2 mu g/m/sup 3/ sulfur is achieved by electronic signal averaging the detector output.
RESULTS: Preliminary studies on flash volatilization at several sulfate compounds are nearing completion. It is expected that these studies will show the feasibility at measuring volatile sulfate concentrations by heating droplets quickly with a platinum wire and monitoring resultant SO2 with an FPD. Several diffusion scrubbers have been fabricated and are now being evaluated for their ability to remove SO2, H2S, CH3SH, and CH3SSCH3. The final aspect of this work is the design, fabrication and testing of prototype monitors for both total and individual particulate sulfur compounds.
PROJECT MILESTONES: (1) 10/77 Procure components. (2) 10/77 Assemble Instruments.
KEYWORDS: AIR POLLUTION MONITORS;PHOTOMETERS;SULFUR COMPOUNDS;SCRUBBERS;SEPARATION PROCESSES;AIR SAMPLERS;AIR POLLUTION;PERFORMANCE TESTING

<071706>
TITLE: Sulfuric Acid Monitor
PROJECT NUMBER: G-601-B-CA-23
PRINCIPAL INVESTIGATOR: Fowler, P.
ADDRESS: Concord Road, Billerica, MA 01821
AFFILIATION: Cabot Corp., Billerica, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Reutter, Dennis J.
TYPE OF FUNDING: Contract No.-68-02-2402
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates;NOXIOUS GAS/Sulfur oxides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Fabricate, test and deliver automated sulfuric acid samplers, sampler-calibrators and analyzers to EPA.
APPROACH: The samplers are designed to collect sulfuric acid with a minimum of acid neutralization from coarse basic particles and gaseous ammonia. The acid aerosol is run through a diffusion scrubber for removal of NH3 and then a dichotomous sampler so only the fine aerosol fraction is collected on 1/2 mu m unbacked fluoropore filters. Built in calibrators on same samplers allow for internal quality control of sampler and filter transport procedures. The analyzer is designed to separate H_2SO_4 from other sulfur compounds on the filter by low temperature volatilization and to detect the sulfur with a sensitive FPD.
RESULTS: The first three samplers calibrators have been fabricated and are being tested and delivered to the branches which requested them. Preliminary tests in our laboratory indicate the manufacturer has met design specifications. Problems with the analyzer have thrown all production behind schedule. We have decided to go ahead with delivery of the samplers and calibrators waiting on fabrication of the analyzers until technical problems are worked out. We are confident that moderate design changes in the volatilization vapor transfer assembly will minimize current problems and allow delivery of acceptable analyzers by mid summer.
PROJECT MILESTONES: 9/77 Complete delivery of units.
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;AUTOMATION;SULFURIC ACID;MONITORING;SURFACE AIR;AEROSOLS;GASES;AMMONIA;AIR SAMPLERS;CALIBRATION;SEPARATION PROCESSES;PERFORMANCE TESTING

<071707>
TITLE: Mobile Aerosol Laboratory
PROJECT NUMBER: G-601-B-CA-26
PRINCIPAL INVESTIGATOR: Langen, L.
ADDRESS: 215 Leidesdorff Street, San Francisco, CA 94111
AFFILIATION: Environmental Measurements, Inc., San Francisco, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Courtney, W.J.
TYPE OF FUNDING: Contract No.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: One mobile aerosol laboratory is to be fabricated and delivered to the Environmental Sciences Research Laboratory of the Environmental Protecion Agency. The laboratory is to be optimized to perform (a) as a mobile laboratory designed to make measurements while moving at speeds up to normal highway speeds, and (b) as a fixed site instrument evaluation/measurement platform.
APPROACH: The laboratory is to consist of a self-propelled van equipped with air conditioning, two 6 KW motor generators, seats, washroom facilities, insulation, a government furnished data acquisition/navigation

system, and both gas and aerosol sampling manifolds.
RESULTS: Acquisition of a 26 foot long General Motors Corp. motor home as the basic van is anticipated. Interior design and fabrication of custom equipment to meet contract specifications is to be carried out.
PROJECT MILESTONES: 77 Deliver Van.
KEYWORDS: AIR POLLUTION;AEROSOL MONITORING;LABORATORY EQUIPMENT;MOBILITY;VEHICLES;DUSTS;AEROSOLS;PARTICLES

<071708>
TITLE: Rural and Urban Background Measurements of SO2, H2S, NO/sub x/ and NH3
PROJECT NUMBER: G-601-B-CA-32
PRINCIPAL INVESTIGATOR: Langen, L.
ADDRESS: San Francisco, CA 94111
AFFILIATION: Environmental Measurements, Inc., San Francisco, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Baumgardner, Ralph
TYPE OF FUNDING: Contract No.-68-02-2484
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/ (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project was to determine background measurement, their capabilities of recently developed monitors for SO2, NO2, and NH3 and to determine if background measurements could be made using a moving van traveling across the United States equipped with these monitors and a special data logging system.
APPROACH: The Contractor using a mobile van equipped with a mapping and data acquisition system, measurement instrumentation for SO2, NO2, NH3 and H2S and calibration system would leave Los Angeles, California in early November 1976 and proceed across the Southern United States measuring background concentrations in rural areas and urban data in 5 cities along the route. Rural measurements would also be made at fixed sites along the route. Data from the measurement instrumentation would be plotted as a function of location and concentration.
RESULTS: The study was performed as planned using the described instrumentation. Considerable data were gathered as to background concentrations of the gases of interest as well as the pollution islands formed by the urban areas. Performance characteristics of measurement and instrumentation and data system were also obtained. The data being reduced and a final report written at this time.
PROJECT MILESTONES: 6/77 Final Report.
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;SULFUR DIOXIDE;NITROGEN DIOXIDE;AMMONIA;MOBILITY;MONITORING;USA;AIR POLLUTION;DATA COMPILATION;SURFACE AIR;URBAN AREAS;RURAL AREAS;VEHICLES

<071709>
TITLE: Develop Sulfuric Acid Generator for Ultrafine Particles
PROJECT NUMBER: G-601-B-CA-35
PRINCIPAL INVESTIGATOR: Liv, B.Y.H.
ADDRESS: Department of Mechanical Engineering, Minneapolis, MN 55455
AFFILIATION: Minnesota Univ., Minneapolis (USA). Dept. of Mechanical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Dzubay, T.G.
TYPE OF FUNDING: Grant No.-R801301-05S2
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SO;NOXIOUS GAS/NO;NOXIOUS GAS/Sulfates (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: Develop generator for sulfuric acid particles in the 0.02 to 0.5 mu m size range. The aerosol generator is to be designed for use in animal test chamber studies to simulate exposures to sulfuric acid from catalyst equipped vehicles.
APPROACH: Introduce sulfuric acid into an air flow stream using a syringe pump. The air stream is heated and then cooled to cause evaporation of the original droplets and condensation into smaller ones. Particle size is controlled by adjusting the amount of dilution and the residence time.
RESULTS: The sulfuric acid is being installed in a 0.33 m/sup 3/ animal exposure chamber, where its performance will be evaluated. Particular care will be taken to limit the concentration and residence time for particles in the 0.02--0.05 mu m range to prevent change of particle size by coagulation.
PROJECT MILESTONES: 6/78 Delivery of Generator.
KEYWORDS: AEROSOL GENERATORS;DESIGN;SULFURIC ACID;AEROSOLS;PARTICLE SIZE

<071710>
TITLE: Research in Air Pollution Meteorology
PROJECT NUMBER: G-603-A-AA-01
PRINCIPAL INVESTIGATOR: Niemeyer, L.E.
ADDRESS: National Oceanographic and Atmospheric Administration, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Interagency agreement-IAG-D7-0305
77 FUNDING: Environmental Protection Agency FY77:$170,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The research effort includes the continuing development, evaluation, and validation of air quality simulation models, both for inert and reactive pollutants.
APPROACH: Users will be provided access to these models through the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP). New concepts and technologies will be developed and adapted for improving the weakest components of existing models, with emphasis on the effects of topography, pollutan removal and conversion processes, and complex sources. Other activities will be directed toward the determination and definition of the effects of pollutant emissions on visibility, weather, and climate. Further studies will be conducted in air pollution potential climatology.
RESULTS: Participation will continue in the Regional Air Pollution Study (RAPS). The field portion of the study will terminate in Spring 1977, and analysis and use of the data for model evaluation and verification will be initiated.
PROJECT MILESTONES: (1) 77/Spring Field portion of the study (terminates). (2) 77/Spring Analysis/use of data for model evaluation/verification.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;MONITORING;ENVIRONMENTAL TRANSPORT;GASEOUS WASTES;MATHEMATICAL MODELS;COMPUTER CALCULATIONS;REGIONAL ANALYSIS;AIR QUALITY;TOPOGRAPHY;METEOROLOGY;DATA COMPILATION

<071711>
TITLE: Research in Air Pollution Meteorology
PROJECT NUMBER: G-603-A-AB-01
PRINCIPAL INVESTIGATOR: Niemeyer, L.E.
ADDRESS: National Oceanographic and Atmospheric Administration, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Interagency agreement-IAG-D7-0305
77 FUNDING: Environmental Protection Agency FY77:$632,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (25%);PARTICULATES (25%);ORGANICS (25%);VISUAL AESTHETICS (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The research effort includes the continuing development, evaluation, and validation of air quality simulation models, both for inert and reactive pollutants.
APPROACH: Users will be provided access to these models through the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP). New concepts and technologies will be developed and adapted for improving the weakest components of existing models, with emphasis on the effects of topography, pollutant removal and conversion processes, and complex sources. Other activities will be directed toward the determination and definition of the effects of pollutant emissions on visibility, weather, and climate. Further studies will be conducted in air pollution potential climatology.
RESULTS: Participation will continue in the Regional Air Pollution Study (RAPS). The field portion of the study will terminate in Spring 1977, and analysis and use of the data for model evaluation and verification will be initiated.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;MONITORING;ENVIRONMENTAL TRANSPORT;GASEOUS WASTES;MATHEMATICAL MODELS;COMPUTER CALCULATIONS;REGIONAL ANALYSIS;TOPOGRAPHY;METEOROLOGY;AIR QUALITY;DATA COMPILATION

<071712>
TITLE: Mechanisms of Photochemical Reactions in Urban Air
PROJECT NUMBER: G-603-A-AC-01
PRINCIPAL INVESTIGATOR: Pitts, J.H.
ADDRESS: Department of Chemistry, Riverside, CA 92502
AFFILIATION: California Univ., Riverside (USA). Dept. of Chemistry
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dodge, Marcia
TYPE OF FUNDING: Grant No.-R800649-18
77 FUNDING: Environmental Protection Agency FY77:$117,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Nitrates (50%);SPECIFIED OTHER POLLUTANTS/Multiple (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Our smog chamber and laboratory studies continue to provide data necessary for the development of experimentally validated kinetic computer models of chemical and physical transformations in polluted atmospheres, which can be incorporated into urban airshed models. The latter are used in developing and evaluating emission control strategies and health warning systems for photochemical air pollution.
APPROACH: Specifically, the SAPRC smog chamber facility continues to be used in an experimental program designed to provide accurate and extensive data for computer model validation. Thus, the photochemistry program conducted in the 5800-liter evacuable chamber includes irradiations, under simulated atmospheric conditions, of NO/sub x/-hydrocarbon systems in the ppb-ppm concentration range beginning with a single hydrocarbon and building through systems of six-component hydrocarbon mixtures of alkenes, alkanes, and aromatics. Studies of the effects on these systems of aldehydes and species such as HONO are included. In addition to extensive gas chromatographic analyses of hydrocarbons at the ppb detection level, a Fourier interferometer long-path infrared (LPIR) system and an off-line combined gas chromatograph-mass spectrometer system will be used for the characterization of additional trace products.
RESULTS: The laboratory program will continue to provide detailed product, mechanistic, and kinetic data that will support the chamber experiments and lead to the development of more accurate computer models. The laboratory studies this year will be (a) a quantitative investigation of the products formed in the reactions of OH radicals with benzene, toluene and possibly other selected aromatics in the presence of oxygen, and at atmospheric pressure, and (b) the determination of relative quantum yields for the formation of H atoms from formaldehyde over the wavelength region 270-350 nm.
PROJECT MILESTONES: (1) 4/77 Deliver Smog Chamber data to ESRL and EPA. (2) 7/77 Deliver Smog Chamber data to

ESRL and EPA. (3) 9/77 Deliver Smog Chamber data to ESRL and EPA. (4) 12/77 Deliver Smog Chamber data to ESRL and EPA.
KEYWORDS: URBAN AREAS;AIR QUALITY;AIR POLLUTION;MATHEMATICAL MODELS;COMPUTER CALCULATIONS;REGIONAL ANALYSIS;PHOTOCHEMICAL OXIDANTS;HEALTH HAZARDS;HUMAN POPULATIONS;ALARM SYSTEMS;NITROGEN OXIDES;HYDROCARBONS;PHOTOCHEMICAL REACTIONS;SMOG;EARTH ATMOSPHERE

<071713>
TITLE: Research in Air Pollution Meteorology
PROJECT NUMBER: G-603-A-AG-01
PRINCIPAL INVESTIGATOR: Niemeyer, L.E.
ADDRESS: Environmental Research Laboratories, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA). Environmental Research Labs.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Talley, Wilson K.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$292,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/General (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The research effort includes the continuing development, evaluation, and validation of air quality simulation models, both for inert and reactive pollutants.
APPROACH: Users will be provided access to these models through the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP). New concepts and technologies will be developed and adapted for improving the weakest components of existing models, with emphasis on the effects of topography, pollutant removal and conversion processes, and complex sources. Other activities will be directed toward the determination and definition of the effects of pollutant emissions on visibility, weather, and climate. Further studies will be conducted in air pollution potential climatology.
RESULTS: Participation will continue in the Regional Air Pollution Study (RAPS). The field portion of the study will terminate in Spring 1977, and analysis and use of the data for model evaluation and verification will be initiated.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;REGIONAL ANALYSIS;METEOROLOGY;AIR QUALITY;ENVIRONMENTAL EFFECTS;WEATHER;CLIMATES;ENVIRONMENTAL TRANSPORT;GASEOUS WASTES;MATHEMATICAL MODELS;COMPUTER CALCULATIONS

<071714>
TITLE: Oxidant/Precursor Relationships
PROJECT NUMBER: G-603-A-AJ-01
PRINCIPAL INVESTIGATOR: Stephens, E.R.
ADDRESS: Department of Environmental Sciences, Riverside, CA 92502
AFFILIATION: California Univ., Riverside (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.J.
TYPE OF FUNDING: Grant No.-R80379902
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Nitrates (70%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (30%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this project is to develop, demonstrate, and use methods and procedures for clarifying the relationship between oxidant precursors (specifically hydrocarbon and oxides of nitrogen) and oxidant (ozone) based on studies of ambient air. Understanding of this relationship is vital to sound development of control strategy, air quality standards, and emission standards. In photochemical smog the major health hazard (ozone) is a secondary product of a very complex reaction of primary pollutants (hydrocarbons and nitric oxide) which are not themselves highly toxic.
APPROACH: A new gas chromatographic procedure has been devised which permits direct measurement of ambient concentrations of methane, ethane, ethene, acetylene and total C3/sup +/ hydrocarbons. This procedure is automated to provide repetitive samples around the clock. These data will be compared with NO/sub x/ data and oxidant levels to better define the relationship between oxidant and its precursors, hydrocarbon and nitrogen oxides. The intensive data collection phase of the project is just beginning.
PROJECT MILESTONES: 6/77 Final Report.
KEYWORDS: AIR POLLUTION;MONITORING;SMOG;PHOTOCHEMICAL REACTIONS;NITROGEN OXIDES;HYDROCARBONS;OZONE;HEALTH HAZARDS;PHOTOCHEMICAL OXIDANTS;CHEMICAL EFFLUENTS;HUMAN POPULATIONS;CHROMATOGRAPHY

<071715>
TITLE: Research in Air Pollution Meteorology
PROJECT NUMBER: G-603A-AA-02
PRINCIPAL INVESTIGATOR: Niemeyer, L.E.
ADDRESS: National Oceanographic and Atmospheric Administration, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Interagency agreement-IAG-D7-0305
77 FUNDING: Environmental Protection Agency FY77:$34,000
TECHNOLOGY: GENERAL SCIENCE (100%)
)LLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
!ARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The research effort includes the continuing development, evaluation, and validation of air quality simulation models, both for inert and reactive pollutants.

APPROACH: Users will be provided access to these models through the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP). New concepts and technologies will be developed and adapted for improving the weakest components of existing models, with emphasis on the effects of topography, pollutant removal and conversion processes, and complex sources. Other activities will be directed toward the determination and definition of the effects of pollutant emissions on visibility, weather, and climate. Further studies will be conducted in air pollution potential climatology.
RESULTS: Participation will continue in the Regional Air Pollution Study (RAPS). The field portion of the study will terminate in Spring, 1977, and analysis and use of the data for model evaluation and verification will be initiated.
PROJECT MILESTONES: (1) Spring 77 Field portion of the study (terminates). (2) Spring 77 Analysis of use of data for model evaluation/verification.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;METEOROLOGY;MATHEMATICAL MODELS;REGIONAL ANALYSIS;DATA COMPILATION

<0771716>
TITLE: Mechanisms of Photochemical Reactions in Urban Air
PROJECT NUMBER: G-603A-AE-02
PRINCIPAL INVESTIGATOR: Pitts, J.N.
ADDRESS: Department of Chemistry, Riverside, CA 92502
AFFILIATION: California Univ., Riverside (USA). Dept. of Chemistry
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
TYPE OF FUNDING: Grant No.-R800649-18
77 FUNDING: Environmental Protection Agency FY77:$57,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Nitrates;NOXIOUS GAS/Oxidants (60%);SPECIFIED OTHER POLLUTANTS/Multiple (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: Our smog chamber and laboratory studies continue to provide data necessary for the development of experimentally validated kinetic computer models of chemical and physical transformations in polluted atmospheres, which can be incorporated into urban airshed models. The latter are used in developing and evaluating emission control strategies and health warning systems for photochemical air pollution.
APPROACH: Specifically, the SAPRC smog chamber facility continues to be used in an experimental program designed to provide accurate and extensive data for computer model validation. Thus, the photochemistry program conducted in the 5800-liter evacuable chamber includes irradiations, under simulated atmospheric conditions, of NO/sub x/-hydrocarbon systems in the ppB-ppM concentration range beginning with a single hydrocarbon and building through systems of six-component hydrocarbon mixtures of alkenes, alkanes, and aromatics. Studies of the effects on these systems of aldehydes and species such as HONO are included. In addition to extensive gas chromatographic analyses of hydrocarbons at the ppB detection level, a Fourier interferometer long-path infrared (LPIR) system and an off-line combined gas chromatograph-mass spectrometer system will be used for the characterization of additional trace products.
RESULTS: The laboratory program will continue to provide detailed product, mechanistic, and kinetic data that will support the chamber experiments and lead to the development of more accurate computer models. The laboratory studies this year will be (a) a quantitative investigation of the products formed in the reactions of OH radicals with benzene, toluene and possibly other selected aromatics in the presence of oxygen, and at atmospheric pressure, and (b) the determination of relative quantum yields for the formation of H atoms from formaldehyde over the wavelength region 270 to 350 nm.
PROJECT MILESTONES: 6/78 Report on rate constant and products of cresol reactions.
KEYWORDS: URBAN AREAS;AIR QUALITY;AIR POLLUTION CONTROL;AIR POLLUTION;HEALTH HAZARDS;COMPUTER CALCULATIONS;MATHEMATICAL MODELS;NITROGEN OXIDES;HYDROCARBONS;SMOG;HUMAN POPULATIONS;ALARM SYSTEMS;POLYCYCLIC AROMATIC HYDROCARBONS;PHOTOCHEMICAL REACTIONS

<0771717>
TITLE: Deposition Model
PROJECT NUMBER: G-603-A-AP-03
PRINCIPAL INVESTIGATOR: Shreffer, J.H.
ADDRESS: Meteorology Division, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$7,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (90%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: A numerical model is being developed to define the parameters controlling the dry deposition of gaseous pollutants, particularly SO2, on vegetative canopies.
APPROACH: This model is one dimensional and divides the transfer from the free atmosphere to the ultimate sink into four processes: turbulent transfer above the canopy, within the canopy, molecular diffusion near the leaf surface, and finally diffusion through stomata to the interior of the leaf.
RESULTS: The basic model has been tested against wind tunnel data with considerable success. Investigations are now proceeding to model canopies typical of deciduous and coniferous forests and grasslands.
PROJECT MILESTONES: 5/78 Final report.
KEYWORDS: SULFUR DIOXIDE;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;PLANTS;LEAVES;FOLIAR UPTAKE;COMPUTER CALCULATIONS;MATHEMATICAL MODELS;FORESTS;FORAGE

<0717l8>
TITLE: Formation of Atmospheric Aerosols
PROJECT NUMBER: G-603A-AH-03
PRINCIPAL INVESTIGATOR: Whitby, K.T.
ADDRESS: Department of Mechanical Engineering, Minneapolis, MN 55455
AFFILIATION: Minnesota Univ., Minneapolis (USA). Dept. of Mechanical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, William E.
TYPE OF FUNDING: Grant No.-R803851-03
77 FUNDING: Environmental Protection Agency FY77:$151,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
APPROACH: Aerosol size distributions have been measured in the St. Louis area as part of EPA's Project MISST using aircraft and ground based self contained mobile laboratories. These measurements were made with a group of collaborators such that a complete array of chemical, physical, and meteorological measurements were obtained on a coal fired power plant plume. The University of Minnesota's portion of the project included aerosol measurements aboard an aircraft and the operation of a mobile van on the ground under the plumes. This mobile van was also operated on freeways in the Los Angeles area during October 1976 as part of an EPA sponsored project to study sulfur aerosols on roadways.
RESULTS: Much of the work during the next project year will be analysis and reporting of the large amount of data obtained during the past several years. Analysis is being directed toward obtaining aerosol growth rates in the plumes, aerosol nucleation rates in the plumes and surrounding atmosphere, and toward better descriptions of the aerosol size distributions. Laboratory work toward the development of a continuous instrument for the measurement of aerosol sulfur is also being partially supported by this project.
PROJECT MILESTONES: 4/79 Final report.
KEYWORDS: MISSOURI;URBAN AREAS;AIR POLLUTION;MONITORING;AERIAL MONITORING;LABORATORY EQUIPMENT;MOBILITY;VEHICLES;FOSSIL-FUEL POWER PLANTS;PLUMES;ENVIRONMENTAL TRANSPORT;CHEMICAL EFFLUENTS;GASEOUS WASTES;SULFUR COMPOUNDS;AEROSOLS;PARTICLE SIZE;METEOROLOGY;ENVIRONMENTAL EFFECTS

<0717l9>
TITLE: Application of Fourier Transform Spectroscopy to Air Pollution Problems
PROJECT NUMBER: G-603A-AI-03
PRINCIPAL INVESTIGATOR: Shaw, J.H.
ADDRESS: 1314 Kinnear Road, Columbus, OH 43212
AFFILIATION: Ohio State Univ. Research Foundation, Columbus (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Spence, John
TYPE OF FUNDING: Grant No.-R803868-03
77 FUNDING: Environmental Protection Agency FY77:$95,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Photochemical oxidants (33%);ORGANICS (33%);SPECIFIED OTHER POLLUTANTS/Multiple (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: The development of infrared Fourier Transform Spectroscopic techniques to characterize certain key air pollutants, their precursors and reaction products and to establish quantitative kinetic and mechanistic details of the interrelationships between these pollutants both in simulated and real atmospheres is the primary objective of this proposed work.
APPROACH: In particular, FTS techniques will be used to obtain long path length atmospheric spectra to aid in the identification of trace atmospheric constituents, to study some aspects of the natural removal mechanisms of freons from the atmosphere and of their influence on atmospheric ozone, and to study some key reactions of importance in photochemical smog formation.
PROJECT MILESTONES: 6/78 Final report.
KEYWORDS: AIR POLLUTION;MONITORING;SPECTROPHOTOMETRY;TRACE AMOUNTS;CHEMICAL EFFLUENTS;FREONS;OZONE;SMOG;PHOTOCHEMICAL REACTIONS

<0717l20>
TITLE: Rural Oxidant Studies and the Role of NO/sub x/ in Rural Oxidant Formation
PROJECT NUMBER: G-603-A-AJ-03
PRINCIPAL INVESTIGATOR: Westberg, H.
ADDRESS: Department of Chemistry, Pullman, WA 99164
AFFILIATION: Washington State Univ., Pullman (USA). Dept. of Chemistry
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lonneman, William
TYPE OF FUNDING: Grant No.-R805343-01
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Oxidant (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The purpose of this research study is to investigate the source of high oxidant levels in rural areas. Specific goals include monitoring individual hydrocarbons in the C2 - C10 molecular weight range, NO/sub x/ and ozone in non-urban areas of the western and midwestern United States.
APPROACH: The study will involve both ground based and aircraft monitoring. We also plan to conduct a number of natural sunlight irradiation experiments designed to provide information about how fresh inputs of

NO/sub x/ affect photochemical behavior of rural air masses.
RESULTS: The field portion of this study is scheduled for July and August of 1977.
PROJECT MILESTONES: (1) 6/77 Report on reactivity of natural emissions.
KEYWORDS: AIR POLLUTION;RURAL AREAS;AERIAL MONITORING;SURFACE AIR;MONITORING;NITROGEN OXIDES;PHOTOCHEMICAL REACTIONS;HYDROCARBONS;PHOTOCHEMICAL OXIDANTS;AIR POLLUTION MONITORS;PERFORMANCE TESTING;OZONE

<071721>
TITLE: Outdoor Simulation of Air Pollution Control Strategies
PROJECT NUMBER: G-603-A-AC-05
PRINCIPAL INVESTIGATOR: Jeffries, H.
ADDRESS: School of Public Health, Chapel Hill, NC 27514
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bugalini, J.J.
TYPE OF FUNDING: Grant No.-R800916-05
77 FUNDING: Environmental Protection Agency FY77:$114,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/Oxidants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: It is our hope that current and continued refinements in our photochemical model will make it possible to better quantify the most important regions of hydrocarbon NO/sub x/-oxidant control strategy diagrams.
APPROACH: Some of the major improvements in the model will come from the results of our proposed smog experiments which will isolate the influence of nitric and nitrous acid, aldehyde, PAN, carbon monoxide, aeromatics and less reactive hydrocarbon materials on smog systems. Since most of this work will be done on static smog chamber systems, continued effort will be made to simulate real atmospheric smog conditions by using sophisticated patterns of continued injection and dilution in the chamber.
RESULTS: Static analog experiments will be conducted with these very complex experiments. This information will then be used to reconstruct modeling results so that the derived control strategy relationships will have implicit atmospheric relevance.
PROJECT MILESTONES: (1) 5/77 Report-effects of dilution. (2) 10/78 Report-temperature effects on photochemical smog.
KEYWORDS: AIR POLLUTION ABATEMENT;POLLUTION CONTROL EQUIPMENT;HYDROCARBONS;NITROGEN COMPOUNDS;PERFORMANCE TESTING;CHEMICAL EFFLUENTS;SMOG;AIR POLLUTION;MATHEMATICAL MODELS;CONTROLLED ATMOSPHERES;ANALOG SYSTEMS;PHOTOCHEMICAL REACTIONS

<071722>
TITLE: Experimental Determination of ''Dry Deposition'' Rates
PROJECT NUMBER: G-603A-AP-05
PRINCIPAL INVESTIGATOR: Robinson, E.
ADDRESS: Department of Chemical Engineering, Pullman, WA 99164
AFFILIATION: Washington State Univ., Pullman (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lonneman, William
TYPE OF FUNDING: Grant No.-R805342-01
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/Nitrates;NOXIOUS GAS/Oxidants (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The goal of this research effort is to measure dry deposition rates for pollutants related to photochemical air pollution in typical field situations.
APPROACH: A field measurement facility for monitoring the deposition velocity of such pollutants as SO2, O3, and NO/sub x/ will be assembled. A portable tower with pollutant sampling and meteorological sensors at four levels between the top of the underlying vegetation and a height of 10 m above this surface vegetation will be used to obtain profile measurements in the boundary layer. The results of these experiments should lead to a better understanding of the factors affecting dry deposition and to improved modeling procedures.
PROJECT MILESTONES: (1) 6/78 Progress report. (2) 12/79 Report on life times of pollutants.
KEYWORDS: AIR POLLUTION;AEROSOLS;DEPOSITION;PHOTOCHEMICAL OXIDANTS;SULFUR DIOXIDE;OZONE;NITROGEN OXIDES;ENVIRONMENTAL TRANSPORT;MONITORING;SURFACE AIR;BOUNDARY LAYERS;MATHEMATICAL MODELS;PLANTS;AIR POLLUTION MONITORS;PERFORMANCE TESTING

<071723>
TITLE: Computer Modeling of Simulated Photochemical Smog
PROJECT NUMBER: G-603A-AC-06
PRINCIPAL INVESTIGATOR: Whitten, G.Z.
ADDRESS: 950 Northgate Drive, San Rafael, CA 94903
AFFILIATION: Systems Applications, Inc., San Rafael, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dodge, Marcia
TYPE OF FUNDING: Contract No.-68-02-2428
77 FUNDING: Environmental Protection Agency FY77:$71,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/Oxidants (50%);PARTICULATES/Dust (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Using the technique of computer modeling in a previous contract with EPA (No.

68-02-0580) Systems Applications, Inc. developed chemical oxidation mechanisms for the hydrocarbons propylene and butane based on elementary chemical reactions to simulate smog chamber experiments performed at the University of California at Riverside (UCR). A new condensed photochemical smog mechanism was proposed at the end of that work based on the propylene/butane airshed models.
APPROACH: The present contract (No. 68-02-2428) extends both the explicit and condensed chemistry by computer modeling of recent smog chamber experiments using groups of various hydrocarbons. Also an addendem to the new contract has been granted to model similar propylene experiments performed in 10 different smog chambers in order to elucidate and eliminate any systematic errors present in the mechanisms caused by the walls of smog chambers.
PROJECT MILESTONES: (1) 9/77 Interim Report. (2) 9/78 Final Report.
KEYWORDS: AIR POLLUTION;HYDROCARBONS;SMOG;PROPYLENE;BUTANE;OXIDATION;PHOTOCHEMICAL REACTIONS;MATHEMATICAL MODELS;COMPUTER CALCULATIONS;PHOTOCHEMICAL OXIDANTS;TESTING;CONTROLLED ATMOSPHERES;AEROSOLS;CHEMICAL EFFLUENTS;DUSTS;PARTICLE SIZE

<071724>
TITLE: Kinetic Study of Simulated SO2, NO/sub x/, RH-Polluted Atmospheres
PROJECT NUMBER: G-603A-AE-06
PRINCIPAL INVESTIGATOR: Calvert, J.
ADDRESS: College of Mathematics and Physical Science, Columbus, OH 43210
AFFILIATION: Ohio State Univ., Columbus (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.T.
TYPE OF FUNDING: Grant No.-R804348-02
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Kinetic and mechanistic studies are undertaken in order to characterize several reactions that are important in polluted atmospheres. These include alkyl peroxy and hydroperoxy radical reactions with SO2, NO, and NO2.
APPROACH: Kinetic flash spectroscopy, steady state photochemical systems, and flow systems are employed to follow the kinetics of RO2 reactions. Identification and characterization of the initial reactants and reactive products will be attempted by the use of infrared, visible and U.V. spectroscopy, mass spectroscopy, and the conventional wet chemical methods.
RESULTS: The kinetic information obtained in this study will be applied directly to the development of a realistic computer model for simulating SO2, NO/sub x/, and HC removal in the atmosphere.
PROJECT MILESTONES: 12/78 Final Report.
KEYWORDS: AIR POLLUTION;SULFUR DIOXIDE;NITROGEN OXIDES;CHEMICAL REACTIONS;PEROXY RADICALS;PHOTOCHEMICAL REACTIONS;HYDROCARBONS;AIR POLLUTION MONITORS;AIR POLLUTION ABATEMENT;PERFORMANCE TESTING;SPECTROSCOPY

<071725>
TITLE: Fate of NO/sub x/ and Transport of Oxidant
PROJECT NUMBER: G-603-A-AJ-07
PRINCIPAL INVESTIGATOR: Spicer, C.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lonneman, W.A.
TYPE OF FUNDING: Contract No.-68-02-2439
77 FUNDING: Environmental Protection Agency FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/ (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this program is two-fold; to determine the distribution and relationships among atmospheric nitrogen compounds and to determine the propensity of air masses to generate and transport oxidant beyond urban areas.
APPROACH: To achieve these objectives, an experimental program was conducted in the fall of 1976. During this study period chemical and meteorological data were obtained from three instrumental ground stations and an instrumental twin-engine aircraft.
RESULTS: In 1977, a study will be undertaken in the midwestern part of the U.S. Similar measurements will be taken. These include PAN, O3, NO, NO2, CO, C1-C2, hydrocarbon, halocarbons, solar intensity, temperature, etc.
PROJECT MILESTONES: (1) 3/78 Progress Report. (2) 3/79 Progress Report.
KEYWORDS: AIR POLLUTION;NITROGEN OXIDES;ENVIRONMENTAL TRANSPORT;HYDROCARBONS;METEOROLOGY;CHEMICAL EFFLUENTS;URBAN AREAS;MONITORING;AERIAL MONITORING;OZONE;CARBON MONOXIDE;PHOTOCHEMICAL OXIDANTS

<071726>
TITLE: Aerosol Modeling
PROJECT NUMBER: G-603A-AH-06
PRINCIPAL INVESTIGATOR: Brown, G.R.
ADDRESS: 240 Chestnut Street SW, Atlanta, GA 30314
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, William E.
TYPE OF FUNDING: Grant No.-R809470-01
77 FUNDING: Environmental Protection Agency FY77:$6,500
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (40%);PARTICULATES/Dust (40%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (20%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Coordinate programs to develop sub-models for chemical and physical processes of aerosols in the atmosphere.
APPROACH: Combine numerical sub-models for processes including nucleation, condensation, gas-aerosol chemical reactions, coagulation, dry deposition and dispersion.
RESULTS: Extramural work has produced a model that incorporates these processes. Calculations have been performed for the transport of sulfuric acid generated by catalyst-equipped automobiles and the transport of dust in a southwestern city. Refinements to the model are to be made as chemical rate data for gas-aerosol reactions become available.
PROJECT MILESTONES: (1) 6/78 Report on gas aerosol reactive rates.
KEYWORDS: AEROSOLS;CHEMICAL EFFLUENTS;GASEOUS WASTES;AIR POLLUTION;MATHEMATICAL MODELS;CHEMICAL REACTIONS;SURFACE AIR;DEPOSITION;NUCLEATION;VAPOR CONDENSATION;DISPERSIONS;ENVIRONMENTAL TRANSPORT;SULFUR COMPOUNDS;DUSTS;PARTICLE SIZE

<071727>
TITLE: Matrix Isolation Studies Involving the Oxidation of Sulfur Dioxide
PROJECT NUMBER: G-603A-AE-07
PRINCIPAL INVESTIGATOR: Hunter, C.E.
ADDRESS: Hampton, VA 23668
AFFILIATION: Hampton Inst., Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, Joseph
TYPE OF FUNDING: Grant No.-R803516-02
77 FUNDING: Environmental Protection Agency FY77:$29,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/Sulfates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: It is proposed to study the oxidation of sulfur dioxide in the atmosphere using the techniques of matrix-isolation and molecular fragmentation.
APPROACH: Reactions of olefins and ozone and the subsequent oxidation of SO2 will be monitored with a Model 12-A Fourier Transform Interferometer. Spectra of mixture of ethylene and ozone suggest the formation of at least two reaction intermediates. Argon diluted samples of sulfur dioxide and isotopic ozone revealed appreciable 18 oxygen exchange only after the sample was allowed to stand for two days. Detection of the reactive species provides the kinetic and structural data necessary to elucidate the oxidative mechanism of SO2 and other pollutants such as the nitrogen oxides and vinyl chlorides.
PROJECT MILESTONES: 11/77 Report on SO2 oxidation.
KEYWORDS: SULFUR DIOXIDE;OXIDATION;AIR POLLUTION MONITORS;ALKENES;OZONE;CHEMICAL REACTIONS;EARTH ATMOSPHERE;PERFORMANCE TESTING;NITROGEN OXIDES;VINYL RADICALS;CHLORINE COMPOUNDS;PHOTOCHEMICAL OXIDANTS;PHOTOCHEMICAL REACTIONS

<071728>
TITLE: Chemical Reactions of Atmospheric Halogenated Species
PROJECT NUMBER: G-603-A-AI-07
PRINCIPAL INVESTIGATOR: Molina, M.J.
ADDRESS: Department of Chemistry, Irvine, CA 92717
AFFILIATION: California Univ., Irvine (USA). Dept. of Chemistry
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nanst, Philip
TYPE OF FUNDING: Grant No.
77 FUNDING: Environmental Protection Agency FY77:$84,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Nitrates;NOXIOUS GAS/Oxidants (70%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The purpose of this research is the understanding of the various atmospheric chemical and photochemical reactions involving halogenated species. These include the halocarbon compounds in current technology, the intermediate halogenated radicals released during their atmospheric decomposition, and compounds formed in situ by atmospheric reactions.
APPROACH: The ultraviolet absorption spectra of brominated molecules often extend into the 2900-3100A region near the atmospheric cut-off of stratospheric ozone. Long-path u.v. absorption spectra will be measured for various brominated species (e.g., CBr2F2) to determine which molecules can undergo appreciable tropospheric solar photodecomposition. The chemical reaction mechanisms of important ''semi-stable'' molecules formed in the atmosphere will be studied. Flash photolysis will be used to determine whether the halogenated species released in the photodecomposition of chlorine nitrate is ClO, ClONO, Cl or ClNO. Flash photolysis will be used to determine whether ClONO2 is the sole product from the reaction of ClO with NO2. Peroxynitric acid (HO2NO2) will be synthesized and its u.v. absorption spectrum will be measured. Radioactive tracer techniques will be applied to the determination of the chemical fate of halogenated radicals reacting with air. These tracer radicals can effectively simulate the very low concentrations of organic species in the actual atmosphere. The possible formation of aldehydes from the oxidation of halo radicals will be investigated, e.g., for CH3CCl3, the formation 14-CH3CClO from 14-CH3CCl2 + O2. The reactions of the residual radicals from CH3Br decomposition will be traced using radioactively-labeled CH2-82-Br.
PROJECT MILESTONES: (1) 10/77 Annual Report. (2) 10/78 Annual Report. (3) 10/79 Final Report.
KEYWORDS: AIR POLLUTION;HYDROCARBONS;SURFACE AIR;STRATOSPHERE;BOUNDARY LAYERS;OZONE;HALOGEN COMPOUNDS;CHEMICAL REACTIONS;PHOTOCHEMICAL REACTIONS;NITROGEN COMPOUNDS

<071729>
TITLE: Development and Evaluation of a Mesoscale Photochemical Air Quality Model
PROJECT NUMBER: G-603-A-AB-08
PRINCIPAL INVESTIGATOR: Liu, M.
ADDRESS: 950 Northgate Drive, San Rafael, CA 94903
AFFILIATION: Systems Applications, Inc., San Rafael, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian
TYPE OF FUNDING: Contract No.-68-02-2706
77 FUNDING: Environmental Protection Agency FY77:$61,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/ oxidants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: As a result of transport of ozone and its precursors over long distances, elevated oxidant concentrations have been observed in many rural areas in the continental United States. In order to assess the impact of long-range transport on regional control strategies, a meso-scale photochemical air quality model is being developed under this project.
APPROACH: The modeling region will be approximately 1000 km by 1000 km. The major component of this model will be a multiple-layer grid model that invokes the atmospheric diffusion equation. Other key components include a kinetic model and a pollutant-depletion model. The kinetic model will follow photochemical reactions between hydrocarbons, oxides of nitrogen and sulfur, ozone, and other species. The pollutant-depletion model will treat the removal of gaseous and particulate pollutants due to dry or wet deposition processes.
RESULTS: Emissions from both anthropogenic and natural sources will be considered in this model.
PROJECT MILESTONES: 9/79 Final Report.
KEYWORDS: RURAL AREAS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;REGIONAL ANALYSIS;OZONE;PHOTOCHEMICAL OXIDANTS;AIR QUALITY;MATHEMATICAL MODELS;HYDROCARBONS;NITROGEN OXIDES;SULFUR OXIDES;AEROSOLS;GASEOUS WASTES;DEPOSITION;PRECIPITATION SCAVENGING;PHOTOCHEMICAL REACTIONS;AIR QUALITY;MATHEMATICAL MODELS;COMPUTER CALCULATIONS

<071730>
TITLE: Rural Oxidant Studies and the Role of NOx in Rural Oxidant Formation
PROJECT NUMBER: G-603-A-AC-08
PRINCIPAL INVESTIGATOR: Westberg, H.
ADDRESS: College of Engineering, Pullman, WA 99164
AFFILIATION: Washington State Univ., Pullman (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lonneman, Win
TYPE OF FUNDING: Grant No.-R805343-01
77 FUNDING: Environmental Protection Agency FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/Oxidants;NOXIOUS GAS/HC (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this research study is to investigate the source of high oxidant levels in rural areas. Specific goals include monitoring individual hydrocarbons in the C2 to C10 molecular weight range, NOx and ozone in non-urban areas of the western and midwestern United States.
APPROACH: The study will involve both ground based and aircraft monitoring. We also plan to conduct a number of natural sunlight irradiation experiments designed to provide information about how fresh inputs of NOx affect photochemical behavior of rural air masses. The field portion of this study is scheduled for July and August of 1977.
PROJECT MILESTONES: 10/78 Final report.
KEYWORDS: AIR POLLUTION;RURAL AREAS;AERIAL MONITORING;SURFACE AIR;MONITORING;NITROGEN OXIDES;HYDROCARBONS;OZONE;PHOTOCHEMICAL OXIDANTS;AIR POLLUTION MONITORS;PERFORMANCE TESTING

<071731>
TITLE: Research in Air Pollution Meteorology
PROJECT NUMBER: G-603A-AA-09
PRINCIPAL INVESTIGATOR: Niemeyer, L.E.
ADDRESS: National Oceanic and Atmospheric Administration, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Interagency agreement-IAG-D7-0305
77 FUNDING: Environmental Protection Agency FY77:$16,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The research effort includes the continuing development, evaluation, and validation of air quality simulation models, both for inert and reactive pollutants.
ROACH: Users will be provided access to these models through the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP). New concepts and technologies will be developed and adapted for improving the weakest components of existing models, with emphasis on the effects of topography, pollutant removal and conversion processes, and complex sources. Other activities will be directed toward the determination and definition of the effects of pollutant emissions on visibility, weather, and climate. Further studies will be conducted in air pollution potential climatology.
RESULTS: Participation will continue in the Regional Air Pollution Study (RAPS). The field portion of the

study will terminate in Spring, 1977, and analysis and use of the data for model evaluation and verification will be initiated.
PROJECT MILESTONES: (1) 10/76 Begin fall studies. (2) 11/76 End fall studies.
KEYWORDS: AIR QUALITY;MATHEMATICAL MODELS;AIR POLLUTION;REGIONAL ANALYSIS;METEOROLOGY;ENVIRONMENTAL EFFECTS;CLIMATES;COMPUTER CALCULATIONS

<071732>
TITLE: Investigation of the Dependence of Ambient NO2 on Precursor Emissions
PROJECT NUMBER: G-603A-AC-09
PRINCIPAL INVESTIGATOR: Trijonis, J.
ADDRESS: 2811 Wilshire Boulevard, Santa Monica, CA 90403
AFFILIATION: Technology Service Corp., Santa Monica, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dimitriades
TYPE OF FUNDING: Contract No.-68-02-2299
77 FUNDING: Environmental Protection Agency FY77:$34,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO2;NOXIOUS GAS/NOx (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Investigation of the dependence of ambient NO2 on precursor emissions.
APPROACH: EPA is considering establishing a short-term (one-hour) standard for NO2 to complement the existing annual mean standard. To support regulations concerning NO2 standards, empirical analyses will be conducted by TSC on ambient monitoring data. A statistical analysis will be performed with nationwide ambient NO2 data to characterize the relationship between yearly one-hour maximum and annual mean NO2 concentrations. This analysis will identify regions that may exceed the annual standard. It will also be determined if the annual standard or a proposed one hour standard is the binding constraint for control strategy formulation in various areas. An empirical modeling project will also be carried out to provide a better understanding of the relationship of NO2 concentrations to precursors. Although it is generally agreed that NO2 concentrations should be proportional to NOx concentrations with all other factors held constant, there is substantial uncertainty concerning the impact of hydrocarbon and oxidant reductions on NO2 levels. Empirical models will be applied to ambient NO2 and precursor data from Los Angeles, Texas, and CAMP sites in order to determine the dependence of max one hour NO2 and annual mean NO2 on precursors.
PROJECT MILESTONES: 9/78 Final report.
KEYWORDS: AIR POLLUTION;NITROGEN OXIDES;MAXIMUM PERMISSIBLE CONCENTRATION;SURFACE AIR;STANDARDS;CHEMICAL EFFLUENTS;GASEOUS WASTES;ENVIRONMENTAL TRANSPORT

<071733>
TITLE: Aerosol Dynamics
PROJECT NUMBER: G-603A-AE-09
PRINCIPAL INVESTIGATOR: Brock, J.R.
ADDRESS: Department of Chemical Engineering, Austin, TX 78712
AFFILIATION: Texas Univ., Austin (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Durham, Jack
TYPE OF FUNDING: Grant No.-R803660-03
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Objective of study is the correlation of observations of aerosol size and composition distrubitions in the atmosphere and in smog chambers with the theory of aerosol dynamics through mathematical descriptions and numerical simulation of the basic growth processes of particulate matter.
APPROACH: Currently simulation has been achieved of urban pollutant episode conditions using K theory for particulate matter.
RESULTS: Work is under way to include simulation of chemical processes occurring in the atmosphere.
PROJECT MILESTONES: 9/80 Report on development of aerosol formation and growth model.
KEYWORDS: AIR POLLUTION;AEROSOLS;ENVIRONMENTAL TRANSPORT;PARTICLE SIZE;CHEMICAL COMPOSITION;MATHEMATICAL MODELS;URBAN AREAS;CHEMICAL EFFLUENTS;DUSTS;SMOG;AERODYNAMICS

<071734>
TITLE: Complex Terrain (Fluid Model Study)
PROJECT NUMBER: G-603A-AB-10
PRINCIPAL INVESTIGATOR: Snyder, W.H.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
APPROACH: Dispersion from sources upwind of two- and three-dimensional rounded hills will be performed in the stably-stratified towing tank. For conditions of mild stability, where turbulence is not completely

damped, the effect of stability on flow separation and turbulence over the model hill will be investigated. The position of separation determines much of the flow over a hill and, therefore, the dispersion. For strongly stratified conditions, it will be of interest to study how an initially turbulent plume is converted into a laminar plume. Previous experimental data indicated that the turbulence decays but the plume remains well-mixed by means of internal shearing motions in the plume caused by its initial bending over. This study is highly relevant to the current dilemma over the ''EPA Topographical Model.''
PROJECT MILESTONES: 9/79 Description of stably stratified flow in complex terrain.
KEYWORDS: AIR POLLUTION;PLUMES;AERODYNAMICS;METEOROLOGY;WIND;TURBULENCE;VELOCITY;TOPOGRAPHY;VARIATIONS;MATHEMATICAL MODELS;CHEMICAL EFFLUENTS;GASEOUS WASTES;ENVIRONMENTAL TRANSPORT;DIFFUSION

<071735>
TITLE: Optical Effects of Atmospheric Aerosol
PROJECT NUMBER: G-603A-AG-11
PRINCIPAL INVESTIGATOR: Waggoner, A.P.
ADDRESS: Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Ellestad, Thomas
TYPE OF FUNDING: Grant No.-R800665-13-0
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);VISUAL AESTHETICS (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
APPROACH: This continues our past studies relating aerosol sources, physical and chemical properties of the particles, effects of relative humidity to atmospheric optical properties such as radiative climate and visibility. Included will be studies of the relationships of particle properties and synoptic scale transport.
PROJECT MILESTONES: 6/78 Report on anthropogenic contribution to visibility reduction in selected areas.
KEYWORDS: AIR POLLUTION;AEROSOLS;CHEMICAL COMPOSITION;PARTICLE SIZE;ENVIRONMENTAL EFFECTS;HUMIDITY;CLIMATES;OPTICAL PROPERTIES;ENVIRONMENTAL TRANSPORT;REGIONAL ANALYSIS;AERODYNAMICS;DUSTS;METEOROLOGY

<071736>
TITLE: Gas-Aerosol Interaction Study
PROJECT NUMBER: G-603A-AH-11
PRINCIPAL INVESTIGATOR: Durham, J.L.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, William E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SOx (70%);PARTICULATES/Dust (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Develop a quantitative, physical and chemical kinetic technique and required mechanistic and rate data to calculate the rate of reaction of pollutant gases such as sulfur dioxide, nitrogen dioxide, ozone and ammonia with dry and solution aerosols in the atmosphere.
APPROACH: Use chemical reactors on the bulk scale to investigate gas-solid and gas-solution chemical reactions. Use this information with aerosol dynamics theory to predict gas-aerosol reaction rates in the atmosphere.
RESULTS: Experiments have begun to measure sulfur dioxide transport and reaction rates in solutions of transition metal ions. The mass transfer resistance of ammonia reacting with sulfuric acid aerosol is also being investigated.
PROJECT MILESTONES: (1) 6/79 Final report. (2) 6/80 Report on development of aerosol formation and growth model.
KEYWORDS: AIR POLLUTION;GASEOUS WASTES;CHEMICAL REACTIONS;EARTH ATMOSPHERE;SULFUR DIOXIDE;NITROGEN DIOXIDE;AMMONIA;OZONE;AEROSOLS;AERODYNAMICS;ENVIRONMENTAL TRANSPORT;PHOTOCHEMICAL OXIDANTS

<071737>
TITLE: Long Range Transport Modeling
PROJECT NUMBER: G-603A-AB-12
PRINCIPAL INVESTIGATOR: Eskridge, R.E.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
FUNDING: Environmental Protection Agency FY77:$36,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT

PROJECT DESCRIPTION: The purpose of this model development is the simulation of the transport, dispersion, and chemical transformation of species over large time and distance scales.
APPROACH: The winds, temperature, eddy diffusion coefficients and other meteorological parameters will be furnish by a boundary layer model being developed by NOAA. Emissions will be calculated from the NEDS data base and will include plume rise. The model will calculate transport of pollutants using a flux-corrected advection scheme (SHASTA), while diffusion will be calculated using an implicit approximation. The model will also include deposition at the surface via boundary conditions.
RESULTS: The program has been tested using fictitious data to test the advection and diffusion schemes used. It is expected that testing of sulfur chemistry using fictitious meteorology and real emissions will be completed by June '77.
PROJECT MILESTONES: 6/78 Report on model evaluation.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;CHEMICAL REACTIONS;EARTH ATMOSPHERE;METEOROLOGY;WIND;VELOCITY;TURBULENCE;TEMPERATURE EFFECTS;BOUNDARY LAYERS;MATHEMATICAL MODELS;COMPUTER CALCULATIONS;DEPOSITION;DIFFUSION;AEROSOLS;AERODYNAMICS

<071738>
TITLE: Mesoscale Sulfur Balance Studies
PROJECT NUMBER: G-603A-AH-12
PRINCIPAL INVESTIGATOR: Winchester, J.W.
ADDRESS: Department of Oceanography, Tallahassee, FL 32306
AFFILIATION: Florida State Univ., Tallahassee (USA). Dept. of Oceanography
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, William
TYPE OF FUNDING: Grant No.-R803887-02
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates (40%);PARTICULATES (30%);VISUAL AESTHETICS (30%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: A comprehensive study is being conducted to characterize the occurrence of sulfur in aerosol particles at sampling stations in 14 locations between the mid-continent and eastern seaboard of continental U.S.A. Additional remote stations in marine and continental areas are also being operated to provide important background information. Emphasis is being placed on the concentrations of sulfur in relation to other elements present in the aerosol and on the time variability of these concentrations with a time resolution of 2 hours.
APPROACH: Sampling is being carried out continuously at heights from ground level to 30 meters by a unique time sequence filter sampler which has been developed at Florida State University. Additional samples are planned to be taken during intensive periods during the year by cascade impactors at about five of the filter sampling sites, using cascade impactors for determination of the particle size distribution of sulfur and related elements. Elemental analysis is performed using proton induced X-ray emission, a highly sensitive technique permitting both the extremely short 2-hour time resolution on a continuous basis for filter samples as well as the size resolution of particles as small as 0.25 mu m diameter by cascade impactors. By means of the combination of sampling techniques, the impact of fossil fuel combustion and other anthropogenic sources of sulfur on the natural characteristics of the atmosphere may be precisely determined.
PROJECT MILESTONES: 12/80 Final report.
KEYWORDS: SULFUR DIOXIDE;SULFATES;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;AEROSOLS;GLOBAL ASPECTS;CASCADE IMPACTORS;FOSSIL FUELS;COMBUSTION;ENVIRONMENTAL IMPACTS

<071739>
TITLE: Northrop Support Services
PROJECT NUMBER: G-603A-AG-13
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Drive, P.O. Box 1484, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, Marijon
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);VISUAL AESTHETICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The contractor, Northrop Services, Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research, (2) stationary source emissions research, (3) gas kinetics and physics research, (4) special techniques research, (5) aerosol research, (6) air instrumentation development and testing, (7) fluid modeling facility operation and testing, and (8) sampling and analysis methods research.
PROJECT MILESTONES: 12/77 Data report on generation of mixed sulfate/organic aerosol at varying relative humidities.
KEYWORDS: DUSTS;AEROSOLS;PARTICLE SIZE;AIR POLLUTION;MONITORING;MATHEMATICAL MODELS;SAMPLING;ENVIRONMENTAL TRANSPORT;INVENTORIES;SULFATES;EARTH ATMOSPHERE;CHEMICAL REACTION KINETICS

<071740>
TITLE: Aerosol Analysis for Regional Air Pollution Study
ECT NUMBER: G-603A-AA-14
CIPAL INVESTIGATOR: Goulding, F.S.
DDRESS: Lawrence Berkeley Laboratory, Univ. of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dzubay, Tom
TYPE OF FUNDING: Contract No.-I AG-D6-0377/0070
77 FUNDING: Environmental Protection Agency FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates (40%);METALS/Heavy (30%);SPECIFIED OTHER POLLUTANTS/Multiple (30%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);FULL SCALE DEMONSTRATION (50%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The project involves the completion of the x-ray fluorescence analysis of the air particulate samples collected in the St. Louis Regional Air Pollution Study (RAPS).
APPROACH: Preliminary analyses of the data base will be presented in the form of plots, averages of concentrations over selected time periods, and correlations of the elemental concentration among themselves and with other variables measured in the RAPS study. A detailed report describing the sampling, analysis, and validation methods will also be prepared. Upon completion of the sampling program in St. Louis, the samplers will be returned to Lawrence Berkeley Laboratory for modifications before returning to the field.
RESULTS: Following the analysis of the last of the 30,000 samples collected, the data will be analyzed, sorted, and arranged in a data base according to station number and time of sample acquisition.
PROJECT MILESTONES: 3/78 Final report
KEYWORDS: AEROSOLS;REGIONAL ANALYSIS;CHEMICAL ANALYSIS;AIR POLLUTION;SULFATES;METALS;CHEMICAL EFFLUENTS;X-RAY FLUORESCENCE ANALYSIS;PARTICLES;MISSOURI;AIR QUALITY;SAMPLING;DATA ANALYSIS;NITROGEN;QUALITY ASSURANCE

<071741>
TITLE: Experimental Study of Aerosol Formation Mechanisms in a Controlled Atmosphere
PROJECT NUMBER: G-603A-AC-14
PRINCIPAL INVESTIGATOR: Fox, D.L.
ADDRESS: School of Public Health, Chapel Hill, NC 27514
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Durham, Jack
TYPE OF FUNDING: Grant No.-R802472 03
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This program has designed and built an outdoor chamber facility for the investigation of aerosol formation processes similar to those occurring in the ambient atmosphere. During the second budget period, experimental methods and procedures were developed or adapted for this project and an experimental program is now in progress. The overall objectives of this budget period will be to investigate gas to particle conversion processes.
APPROACH: This will be accomplished by conducting chamber experiments in three areas: sulfate aerosol formation in hydrocarbon-NO/sub x/ systems, SO2-NO/sub x/ plume systems and systems containing metallic seed nuclei. During this coming period, additional experiments will be conducted on this system. Aerosol parameters to be obtained include condensation nuclei count, size distributions by electric aerosol analyzer and filter samples for sulfate analysis by x-ray fluorescence and flash vaporization flame photometric detection. The hydrocarbon-NO/sub x/-SO2 system is an analog of aerosol formation in urban areas with multiple sources of pollution, stationary and mobile. the second area of research involves the SO2-NO/sub x/ system as an analog of the processes occurring in a power plant plume. A series of experiments with various initial concentrations of SO2, NO, NO2 and water vapor will be conducted. The third major area of research will be generation of aerosols in the presence of seed nuclei. Existing aerosols provide an alternate oxidation process for conversion of SO2 to sulfate. Metallic nuclei will be introduced into the chamber and the size distribution will be determined, then SO2 will be introduced and evolution of the aerosol will be measured.
PROJECT MILESTONES: 6/78 Laboratory data for test of integrated chemical and physical model of aerosol dynamics.
KEYWORDS: AEROSOLS;NITROGEN OXIDES;SULFUR DIOXIDE;NITRATES;ENVIRONMENTAL TRANSPORT;CHEMICAL REACTION KINETICS;GASES;PLUMES;HYDROCARBONS;PARTICLE SIZE;THERMAL POWER PLANTS;SULFATES;MATHEMATICAL MODELS

<071742>
TITLE: Interpretation of Data from Biogenic Sulfur Field Studies/MISTT Support
PROJECT NUMBER: G-603A-AH-15
ADDRESS: 225 South Meramec, Suite 112 IT, Clayton, MO 63105
AFFILIATION: Environmental Quality Research, Inc., Clayton, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
TYPE OF FUNDING: Grant No.-68-02-2500
77 FUNDING: Environmental Protection Agency FY77:$13,000
CHNOLOGY: FOSSIL FUEL/General (100%)
ERGY CYCLE: COMBUSTION OR END USE (100%)
LLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/Sulfates (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: During the contract period the contractor will provide technical services as directed by the Project Officer through task orders.

APPROACH: Such services will include but are not limited to: (1) prediction of size, shape and direction of power plant and urban plumes, (2) planning assistance (site selection and experimental design), (3) surface and vertical profile measurements (pilot balloons, radiosondes, helicopter flights, tower measurements), (4) measurement of vertical fluxes of pollutants, (5) calculation of wind fields and trajectories, and (6) preparation of appropriate data and interpretive reports.
RESULTS: These services are expected to require approximately 700 man-hours during the contract period, but the contract should provide for the purchase of additional services in increments of 235 man-hours if they are needed. The contractor shall provide equipment, materials, and travel that may be required to perform assigned tasks.
KEYWORDS: SULFUR DIOXIDE;CHEMICAL EFFLUENTS;SULFATES;AIR POLLUTION;PLUMES;DIFFUSION;MATHEMATICAL MODELS;SITE SELECTION;THERMAL POWER PLANTS;METEOROLOGY;ENVIRONMENTAL TRANSPORT;AERIAL MONITORING;AEROSOL MONITORING;WIND;PLANNING

<071743>
TITLE: Modification and Documentation of Air Quality Simulation Models
PROJECT NUMBER: G-603-AB-16
PRINCIPAL INVESTIGATOR: Turner, B.D.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To modify current models for maximum user utility, to document these models and make them available through the Users Network for Applied Modeling of Air Pollution (UNAMAP).
APPROACH: Current models (to date of the Gaussian type) are modified to be of practical use to the greatest number of users. Such modification is primarily aimed at arrangement of additional output useful for air quality management, although input modifications may also be accomplished to accept routinely available information.
RESULTS: Two models: RAM, a short term (1-hour to 24-hour) urban model and PAL, a point, area, and line source model, are being documented in the form of users guides. Additional models, such as MX24SP, a single plant model to estimate maximum 24-hour concentrations, and CDM(36), a climatological model accepting wind input for 36 points, as well as products from the Atmospheric Modeling and Assessment Branch will be modified, documented, and made available.
PROJECT MILESTONES: 5/77 User's guide for MX24SP. Model users.
KEYWORDS: AIR QUALITY;SIMULATION;MATHEMATICAL MODELS;ENVIRONMENTAL TRANSPORT;MANAGEMENT;TECHNOLOGY UTILIZATION;AIR POLLUTION;URBAN AREAS;CLIMATES;EARTH ATMOSPHERE;DOCUMENTATION;COMPUTER CODES;METEOROLOGY

<071744>
TITLE: Reactions of Dissolved Pollutants in Aqueous Solutions
PROJECT NUMBER: G-603-A-AH-16
PRINCIPAL INVESTIGATOR: Kuo, C.
ADDRESS: P.O. Drawer CN, State College, MS 39762
AFFILIATION: Mississippi State Univ., State College (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Durham, Jack
TYPE OF FUNDING: Grant No.-R805253-01
77 FUNDING: Environmental Protection Agency FY77:$9,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Nitrates;NOXIOUS GAS/Sulfates (60%);PARTICULATES/Dust (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objectives of the proposed research are to determine mechanisms and rate of sulfuric acid and sulfates formation from catalytic oxidation of sulfur dioxide, to investigate the effects of catalytic iron salts and organic compounds on conversion of sulfur dioxide in aqueous solutions and to assess the role of liquid phase oxidation in the formation of sulfates aerosols in ambient and polluted atmosphere.
APPROACH: Kinetic experiments will be carried out in liquid phase using stopped-flow technique. Mechanisms and rate of oxidation of sulfur dioxide by oxygen and ozone in aqueous solutions will be determined utilizing the kinetic data. Catalytic effects of iron salts and influences of organic compounds on the reactions will be investigated.
RESULTS: The proposed research will be divided into several subsystems to study the kinetics of oxidation with or without catalytic agents and organic compounds. The experiments will be conducted at temperatures ranging from 10 to 30 degrees C in aqueous solutions with pH ranging from 2 to 11. Absorbances and, in turn, concentrations of the solutions during reactions will be measured and analyzed to determine the reaction kinetics.
PROJECT MILESTONES: 7/78 Final report.
KEYWORDS: AQUEOUS SOLUTIONS;NITRATES;SULFATES;DUSTS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION;AEROSOLS;EARTH ATMOSPHERE;CHEMICAL REACTION KINETICS;PHOTOCHEMICAL OXIDANTS;SYNERGISM;OZONE

<071745>
E: Determination of Confidence Limits and Accuracy of Available Air Quality Simulation Models
ECT NUMBER: G-G03A-AB-17
PRINCIPAL INVESTIGATOR: Turner, B.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To test Air Quality Simulation Models against available data bases and determine accuracy.
APPROACH: The Environmental Applications Branch has been participating in the Practical Demonstration of Urban Air Quality Simulation Models as part of activities of the NATO/CCMS Panel on Modeling.
RESULTS: Two models, CDM(36) and SCAM (Sampled Chronological Air-Quality Model), have been described and applied to the NATO Common Data Base for Frankfurt. This has resulted in four short reports. (Two describing the models and two giving the resulting calculations.) Additional calculations and an additional report describing the calculations have been made using additional meteorological data. Upon receipt of the measured concentrations for Frankfurt, comparisons will be made with model estimates. A final report on using the Frankfurt data will be completed.
PROJECT MILESTONES: 9/77 Report on participation in NATO/CCMS evaluations. Model users.
KEYWORDS: AIR QUALITY;SIMULATION;MATHEMATICAL MODELS;RELIABILITY;ACCURACY;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;AIR POLLUTION;TESTING;COMPUTER CODES

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<071746>
TITLE: Residence Time of Anthropogenic Pollutants and Long-Range Transport
PROJECT NUMBER: G-603A-AD-17
PRINCIPAL INVESTIGATOR: Reiter, E.R.
ADDRESS: Colorado State University, Solar Village, Solar House No. 3, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Holzworth, George
TYPE OF FUNDING: Grant No.-R805271-01
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Our objectives in this study are: (1) Refinement of the Lagrangian trajectory model, including chemical transformation terms and improving precipitation scavenging terms based on a cloud-modeling study; (2) cloud-modeling study to investigate the vertical transport of pollutants by convective clouds and the distribution of pollutants in cloud air and cloud water droplets; (3) incorporation into our model of pollution transport by ''dry'' convection into the layers above the mean mixing layer height.
APPROACH: A long-range transport model suitable to keep track of pollutants at distances from 100 to 1000 km downstream of large industrial complexes is under development. It is the purpose of this research proposal to make our transport model more comprehensive and to study vertical transport processes of pollutants.
PROJECT MILESTONES: (1) 5/78 Progress report. (2) 5/79 Final report.
KEYWORDS: AIR POLLUTION;ENVIRONMENTAL TRANSPORT;AGE DEPENDENCE;MATHEMATICAL MODELS;PRECIPITATION SCAVENGING;CLOUDS;METEOROLOGY;EARTH ATMOSPHERE

<071747>
TITLE: Sulfur Budget in Large Plumes
PROJECT NUMBER: G-603A-AG-17
PRINCIPAL INVESTIGATOR: Husar, R.
ADDRESS: Lindell and Skinker Blvds., St. Louis, MO 63130
AFFILIATION: Washington Univ., St. Louis, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Plusen, Rudely
TYPE OF FUNDING: Grant No.-R83896-0256
77 FUNDING: Environmental Protection Agency FY77:$262,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: VISUAL AESTHETICS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The three main objectives of this study are: (1) establish and document by field easurements the sulfur budget in large single plumes, (2) identify the major physical and chemical echanisms and parameters which govern the sulfur budget, (3) formulate and test a ispersion-transformation-removal model for SO2 and aerosol.
APPROACH: Instrumented aircraft and surface vehicles will be used for the detailed plume mapping of fixed distances from the source outward to 100 km. Using wind field data from pilot balloon measurements, the horizontal sulfur flux will be measured in the gas and aerosol phase. The aerosol mass and sulfur content will be measured by a high resolution beta-gauge and vaporization-flame photometric method, respectively.
RESULTS: These data will be utilized to establish the amounts of SO2 converted to aerosol and its rate and

the amount of sulfur removed by dry deposition. The data will be used for the improvements and extension of dispersion-transformation-removal models.
PROJECT MILESTONES: 9/78 Report on statistical relationship between visibility and pollutant concentration.
KEYWORDS: SULFUR DIOXIDE;PLUMES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;REMOVAL;DIFFUSION;AEROSOLS;DEPOSITION;STATISTICAL MODELS;EARTH ATMOSPHERE

<071748>
TITLE: Computer Modeling of Simulated Photochemical Smog
PROJECT NUMBER: G-603A-AC-20
PRINCIPAL INVESTIGATOR: Hendry, D.
ADDRESS: Ravenswood Ave., Menlo Park, CA 94025
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dodge, M.
TYPE OF FUNDING: Contract No.-68-02-2427
77 FUNDING: Environmental Protection Agency FY77:$78,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/Oxidants;NOXIOUS GAS/HC (80%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this program is to refine and update existing kinetic mechanisms that describe the formation of photochemical smog.
APPROACH: To meet this objective, we will test and modify these mechanisms by comparing computed concentration-time dependence of various reactants and products with those observed experimentally in the smog chamber facility at the Statewide Air Pollution Research Center (SAPRC), Riverside, California. Individual kinetic models will be developed in conjunction with data for the hydrocarbons, ethylene, propene, butene-1, trans-2-butene, n-butane, 2,3-dimethyl-butane, and toluene.
RESULTS: The models will be combined and tested in conjunction with smog chamber data for mixtures of hydrocarbons that mimick hydrocarbon reactivity in various urban atmospheres.
PROJECT MILESTONES: 9/78 Final report.
KEYWORDS: PHOTOCHEMICAL OXIDANTS;SMOG;MATHEMATICAL MODELS;SIMULATION;EARTH ATMOSPHERE;AIR POLLUTION;HYDROCARBONS;COMPUTER CODES;NITROGEN OXIDES;SULFUR DIOXIDE

<071749>
TITLE: Smog Chamber Study of Conversion of SO2 as a Function of Reactant Concentration
PROJECT NUMBER: G-603-A-AA-29
PRINCIPAL INVESTIGATOR: Miller
ADDRESS: Columbus Laboratories, 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dimitrides
TYPE OF FUNDING: Contract No.-68-02-1720
77 FUNDING: Environmental Protection Agency FY77:$11,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/Nitrates (50%);PARTICULATES/Smog (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The purpose of this contract activity is to obtain experimental evidence on the effects of various controllable factors, such as concentrations of reactant hydrocarbon, NO/sub x/, and SO2, under various ambient conditions, and in the presence of other atmospheric constituents. This contract effort focusses on the area-wide atmospheric process; other contract effort is addressed to the process prevailing in roadway atmospheres.
APPROACH: The experimental work includes measurement of rate of SO2 oxidation under conditions that approach as closely as possible those prevailing in the real atmosphere above an urban center. Such conditions can be approximated to some degree in the laboratory and to a much greater degree in smog chambers filled with real atmosphere air and irradiated by natural sunlight. This contract activity is intended to provide the requisite experimental data following both approaches, namely, the in-laboratory simulation approach.
RESULTS: Results will be used by EPA to estimate the degree to which SO2 is converted (into SO4/super -2/) in the atmosphere through the homogeneous gas-phase photooxidation process, and to assess the relative effects of the SO2, HC, and NO/sub x/ reactants on this process.
PROJECT MILESTONES: 9/77 Final report.
KEYWORDS: AIR POLLUTION;MONITORING;URBAN AREAS;CHEMICAL EFFLUENTS;EXHAUST GASES;AUTOMOBILES;HYDROCARBONS;NITROGEN OXIDES;SULFUR DIOXIDE;PHOTOCHEMISTRY;PHOTOCHEMICAL OXIDANTS;SURFACE AIR;OXIDATION;SMOG;METEOROLOGY;ENVIRONMENTAL TRANSPORT

<071750>
TITLE: Clinch River Model Study (Fluid Modeling Study)
PROJECT NUMBER: G-603-A-AB-30
PRINCIPAL INVESTIGATOR: Snyder, W.H.
ADDRESS: Environmental Science Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)

CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
CT DESCRIPTION: A large amount of field data is being collected on contract to EPA on the dispersion of
llutants from the Clinch River Power Station in West Virginia, which is located in complex terrain.
ACH: In the current study a terrain model will be run in the EPA Meteorological Wind Tunnel to provide
preliminary data for the development of mathematical models and, by comparison of wind tunnel data with
field data, to determine the validity of wind tunnel modeling of flow and diffusion in complex terrain.
PROJECT MILESTONES: (1) 9/78 Progress report. (2) 9/79 Final report.
KEYWORDS: AIR POLLUTION;FOSSIL-FUEL POWER PLANTS;CHEMICAL EFFLUENTS;GASEOUS WASTES;ENVIRONMENTAL
TRANSPORT;TOPOGRAPHY;WEST VIRGINIA;DIFFUSION;MATHEMATICAL MODELS;AERODYNAMICS;WIND
TUNNELS;MONITORING;COMPARATIVE EVALUATIONS;ENVIRONMENTAL EFFECTS;METEOROLOGY;COMPUTER CALCULATIONS

<071751>
TITLE: Development of Methods and Analysis of Dichotomous Particulate Sampler Data from RAMS
PROJECT NUMBER: G-603-A-AA-33
PRINCIPAL INVESTIGATOR: Parsons, E.A.
ADDRESS: P.O. Box 2345, Chapel Hill, NC 27514
AFFILIATION: System Sciences, Inc., Chapel Hill, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dznbay
TYPE OF FUNDING: Contract No.-68-02-2495
77 FUNDING: Environmental Protection Agency FY77:$29,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ Sulfates (70%);METALS/Heavy (30%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND
MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Methodology will be developed and implemented for presentation and analysis of
dichotomous particulate sampler data collected at 10 EPA Regional Air Monitoring Sites (RAMS).
APPROACH: Work will include but necessarily not be limited to analyzing correlations among elements found in
both fine and coarse fractions at each of the 10 sites, summarizing the maximum percentage of sulfur found
at each site which may be chemically bound with the elements monitored, and providing, in graphical
format, time series presentations of mass concentrations of sulfur and lead as well as frequency
distributions of the ratio of fine and coarse sulfur and lead concentrations for various time periods.
PROJECT MILESTONES: 3/78 Interim report.
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;AEROSOL MONITORING;SULFUR COMPOUNDS;LEAD;PARTICLE
SIZE;ENVIRONMENTAL TRANSPORT;AEROSOLS;TIME DEPENDENCE

<071752>
TITLE: Meteorological Sub-Models for AQSMS: Wind and Temperature Profiles
PROJECT NUMBER: G-603-A-AB-33
PRINCIPAL INVESTIGATOR: Binkowski, F.S.
ADDRESS: Meteorology Division Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences
Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Hiemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$8,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOISE, VIBRATION (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective is to develop a model of the profiles of wind and temperature in the
planetary boundary layer based upon climatological information.
APPROACH: The model uses as its basis an existing model for the wind profile given the geostrophic and
thermal winds, a temperature profile, and the time of day. The model will be extended to include a
convectively mixed layer in the day time. Temperature profiles in the mixed layer will also be modeled.
RESULTS: The model is undergoing tests and development at present. Comparisons with RAPS data are planned.
PROJECT MILESTONES: (1) 9/77 Progress report. (2) 9/78 Final report.
KEYWORDS: METEOROLOGY;EARTH ATMOSPHERE;BOUNDARY LAYERS;WIND;VELOCITY;TURBULENCE;TEMPERATURE
MEASUREMENT;CLIMATES;DAILY VARIATIONS;MATHEMATICAL MODELS;NOISE

<071753>
TITLE: Develop Performance Criteria and Specifications for Particulate Monitors
PROJECT NUMBER: G-605-DA-02
PRINCIPAL INVESTIGATOR: Nader, J.S.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences
Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, John S.
OF FUNDING: Agency in-house effort
UNDING: Environmental Protection Agency FY77:$6,000
NOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT

PROJECT DESCRIPTION: The objective of this task is to develop performance specifications which will provide a technical base in support of regulations that require monitoring of particulate emissions from selected industries.
APPROACH: Performance specifications and test procedures will be considered for commercially available monitors that operate on specific physical principles, namely, optical, electrical and nuclear. Development of performance specifications will be contingent upon demonstrated capability of monitors commercially implemented to perform adequately in applications to selected industrial emissions.
RESULTS: Current evaluation of commercially available monitors applied to coal-fired power plants is underway for optical, nuclear and electrical type systems. Optical monitors, to date, offer adequate performance. Performance specifications for these optical monitors will be developed.
PROJECT MILESTONES: 6/78 Proposal specifications applied to smelters and steel industry.
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;SPECIFICATIONS;INDUSTRY;FOSSIL-FUEL POWER PLANTS;ECOSYSTEMS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;CHEMICAL EFFLUENTS;GASEOUS WASTES;ENVIRONMENTAL TRANSPORT

<071754>
TITLE: Independent Performance Audits on RAMS Station Sensors
PROJECT NUMBER: G-605-DA-07
PRINCIPAL INVESTIGATOR: Smith, F.
ADDRESS: P.O. Box 12194, Research Triangle Park, NC 27709
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, John S.
TYPE OF FUNDING: Contract No.-68-02-2407
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/NOx;NOXIOUS GAS/Nitrates;NOXIOUS GAS/CO (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: (1) To assess and document the current precision and accuracy of both air quality and meteorological data presently obtained from the 25 RAMS stations. (2) To identify sensors/analyzers not satisfying acceptable performance criteria to allow for timely corrective action by RAMS. (3) To define and evaluate the capabilities of the RAMS/RAPS data acquisition system and data validation procedures. (4) To develop, demonstrate, and recommend statistical edit/validation procedures specific to each measured parameter, both air quality and meteorological.
APPROACH: Performance audits of the air quality analyzers for NO, NOx, NO2, SO2, CO, CH4 and THC will be made using compressed gas cylinders of each pollutant at the levels to be audited. For example, cylinders of SO2 at or near 50 ppB and 180 ppB will be used to audit the TS analyzers on the 0 to 200 ppB range. All audit standards/devices are built around NBS SRMs or their traceability to NBS SRMs or other accepted standard established prior to the audit. Statistical data validation procedures will be developed by personnel experienced in making air quality and meteorological measurements, air chemists, and meteorologists.
RESULTS: Two performance audits are scheduled for June and September, 1976. Recommendations for data validation procedures will be completed 2 months after requested RAMS data becomes available to RTI.
PROJECT MILESTONES: 10/77 Final report.
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;METEOROLOGY;DATA ACQUISITION SYSTEMS;AIR POLLUTION;EVALUATION;STATISTICAL MODELS;SULFUR COMPOUNDS;NITROGEN COMPOUNDS;HYDROCARBONS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;MONITORING

<071755>
TITLE: Performance Criteria for Opacity Measurements in Oil-Fired Power Plants and Portland Cement Plants
PROJECT NUMBER: G-605-DA-05
PRINCIPAL INVESTIGATOR: Conner, W.D.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Theoretical (40%);DEVELOPMENT/Laboratory scale (30%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this task is to determine criteria for opacity measurements at oil-fired power plants and Portland cement plants.
APPROACH: Performance and design specifications for in-stack transmissometers for measurement of the opacity of emissions from oil-fired power plants and Portland cement plants are evaluated. The study involves experimental and theoretical evaluation of the effects of the emissions and instrument design specifications on transmissometer performance.
RESULTS: The study has been completed and a draft report has been prepared and is being reviewed.
PROJECT MILESTONES: 11/76 Report.
KEYWORDS: AIR POLLUTION;MONITORING;STACKS;CHEMICAL EFFLUENTS;AIR POLLUTION ABATEMENT;FUEL OILS;COMBUSTION;THERMAL POWER PLANTS;PORTLAND CEMENT;INDUSTRIAL PLANTS;GASEOUS WASTES;OPACITY;AIR POLLUTION MONITORS;PERFORMANCE TESTING

<071756>
TITLE: Identification and Measurement of Inorganic Compound Emissions
PROJECT NUMBER: G-625B-EB-01
PRINCIPAL INVESTIGATOR: Henry
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Knapp
TYPE OF FUNDING: Contract No.-68-02-2296
77 FUNDING: Environmental Protection Agency FY77:$171,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Nonmetal inorganics (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The Contractor shall review methods and develop procedures for the collection, identification, and measurement of the amounts of inorganic compounds emitted from sources using fossil fuels.
APPROACH: Laboratory evaluation and field testing at sources using or processing fossil fuel (fossil fuel power plant, oil refinery, and coal conversion) of the methods shall be conducted to obtain emission characterization data. This report shall be performed in three (3) distinct phases.
PROJECT MILESTONES: 01/79 Final report.
KEYWORDS: NONMETAL ORGANICS;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;CHEMICAL EFFLUENTS;GASEOUS WASTES;ENVIRONMENTAL TRANSPORT;PETROLEUM REFINERIES;COAL GASIFICATION PLANTS;COAL LIQUEFACTION PLANTS;PETROLEUM PRODUCTS;CONTROLLED ATMOSPHERES;TESTING;ENVIRONMENTAL TRANSPORT;MONITORING

<071757>
TITLE: Kinetic Study of Simulated SO2, NO/sub x/, RH-Polluted Atmospheres
PROJECT NUMBER: G-625B-EA-02
PRINCIPAL INVESTIGATOR: Calvert, J.G.
ADDRESS: Dept. of Chemistry, Columbus, OH 43212
AFFILIATION: Ohio State Univ. Research Foundation, Columbus (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bugolini, J.J.
TYPE OF FUNDING: Grant No.-R80 4384 02
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Kinetic and mechanistic studies will be made to recognize and to quantitatively characterize the several reaction pathways which result in the chemical transformation and removal of SO2, NO, and NO2 in the polluted atmosphere.
APPROACH: In one phase of the work the seemingly important reactions of the alkyl peroxy and hydroperoxy radicals with SO2, NO, and NO2 are being investigated. Kinetic flash spectroscopy, steady state photochemical systems, and studies in flow systems are employed to follow the kinetics of the RO2 reactions. The identification and kinetic characterization of the initial reactive products of these reactions will be attempted using infrared, visible, ultraviolet spectroscopy, mass spectroscopy, and more conventional chemical methods. In other phases of this work we plan to study the reaction pathways which involve the reactions of the electronically excited SO2 with atmospheric components and the reactions of the HO-radical with SO2, NO, NO2, and other atmospheric pollutants of special interest.
RESULTS: The mechanism and kinetic information obtained in the study will be applied directly to the development of a more realistic computer simulation scheme for the prediction of traces of SO2 and NO/sub x/ removal reactions and the nature of the initial ''sulfate'' and other unidentified and recognized products of the sunlight-irradiated, NO/sub x/, SO2, RH-polluted atmospheres.
PROJECT MILESTONES: 12/78 Report on chemical kinetic SO2 submodel.
KEYWORDS: AIR POLLUTION;SULFUR DIOXIDE;NITROGEN OXIDES;ENVIRONMENTAL TRANSPORT;CHEMICAL REACTIONS;PEROXY RADICALS;SPECTROSCOPY;COMPUTER CALCULATIONS;MATHEMATICAL MODELS;PHOTOCHEMICAL OXIDANTS;CHEMICAL EFFLUENTS;AIR POLLUTION MONITORS;PERFORMANCE TESTING

<071758>
TITLE: Theoretical Data Base for Quantitative Analysis of Empirical Data on Molecular Composition of Particles by Raman Scattering
PROJECT NUMBER: G-625B-E8-03
PRINCIPAL INVESTIGATOR: Kerker, M.
ADDRESS: Potsdam, NY 13676
AFFILIATION: Clarkson Coll. of Tech., Potsdam, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, John
TYPE OF FUNDING: Grant No.-R804659-0151
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
UTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES/Dust (50%);ORGANICS (10%)
ACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The investigator proposes to perform calculations using a recently developed theory to estimate the effect of particle size and refractive index on the Raman scattering cross-sections for molecules comprising all or a constituent part of small particles.

APPROACH: These calculations will be coordinated with experimental work at the National Bureau of Standards directed towards the analysis of molecular species contained in small particles. The NBS work is being supported by EPA through an Interagency Agreement. The investigator will undertake theoretical studies to extend the present theory to nonspherical particles and to nonuniform light sources. The numerical studie will permit extension of the present technique for qualitative analysis for particulates to a more quantitative basis. To this time no theory has been available to predict the dependence of the total Rama.. signal in particle size, shape, refractive index and orientation with respect to the directions of illumination and collection. Calculations to elucidate these dependencies may also lead to estimates of the distribution of the molecular species within the particle (i.e., uniform distribution throughout the particle or concentration in a surface layer). If the theory can be extended to nonspherical particles, then computations can be made to include more real world particles other than simply spherical particles. The theoretical computations and the experimental study will be complementary and will provide a more complete assessment of Raman scattering as a nondestructive analytical technique for determining molecular composition of small particles.
PROJECT MILESTONES: 77/6 Interim Report.
KEYWORDS: AIR POLLUTION;AEROSOLS;ENVIRONMENTAL TRANSPORT;PARTICLE SIZE;MOLECULAR STRUCTURE;REFRACTIVITY;OPTICAL PROPERTIES;CHEMICAL COMPOSITION;RAMAN SPECTRA;NONDESTRUCTIVE ANALYSIS;MONITORING;SULFUR COMPOUNDS;NITROGEN COMPOUNDS;PARTICLES

<071759>
TITLE: Development of a Model of SO2 Oxidation in Smog
PROJECT NUMBER: G-625-EA-04
PRINCIPAL INVESTIGATOR: Miller, D.F.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.J.
TYPE OF FUNDING: Grant No.-R805335-01
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The immediate objective of this study is to provide a new and more comprehensive body of data useful in evaluating current theories for the gas-phase oxidation of SO2 in polluted air. The ultimate goal of the program is to develop and validate a model which will be useful in predicting SO2 oxidation rates for a variety of atmospheric conditions, including those for plumes from combustion sources, urban core smog and urban plumes, and long-range transport of large air masses.
APPROACH: Experiments of SO2 oxidation will be conducted with three smog systems: propylene, a surrogate mixture of urban hydrocarbons, and early-morning air in Columbus, Ohio. Comparative data from these three systems will be used to assess the adequacy of existing kinetic models for SO2 oxidation and to formulate more unique models where necessary.
PROJECT MILESTONES: 6/78 Final Report.
KEYWORDS: AIR POLLUTION;MONITORING;AEROSOLS;ENVIRONMENTAL TRANSPORT;SULFUR COMPOUNDS;SULFUR DIOXIDE;OXIDATION;PLUMES;URBAN AREAS;METEOROLOGY;MATHEMATICAL MODELS;SMOG;PHOTOCHEMICAL OXIDANTS;PHOTOCHEMICAL REACTIONS

<071760>
TITLE: Transformation and Transport of Air Pollutants
PROJECT NUMBER: G-625-B-EA-05
PRINCIPAL INVESTIGATOR: Wilson, W.E.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, William E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determine the rates of formation and removal of secondary pollutants, such as sulfates, nitrates, and organic aerosols, during transport distances from ten to hundreds of kilometers. Determine which parameters influence the rates of formation and removal and their frequency of occurrence.
APPROACH: Use aircraft at mobile ground units to measure pertinent parameters in plumes from point and area sources and stagnant air masses (hazy blobs). Determine mass flow rates of pollutants under various conditions and infer reaction rates and mechanisms.
RESULTS: Measurements were made in coal-fired power plant plumes and urban plumes during the summer of 1974, 1975, and 1976, in a hazy blob in August 1976, and in an oil-fired power plant plume in February 1977. Preliminary reports have been made at APCA and ACS meetings. The use of SF6 tracers and continuous sulfate instruments will be tested in spring 1977. In FY78 and later, measurements will be made in additional areas of the U.S. Data analyses and interpretations are continuing wth data presentations planned for RTP (June or July 1977), Dubrovnik (September 1977) and a regional meeting early in 1978. Rates of conversion of SO2 to sulfate and rates of removal of SO2 have been measured under summer conditions. Background air composition, background ozone and water vapor concentrations, and extent of plume mixing are parameters

influencing reaction rates. Conversion is observed both during daylight and nighttime hours.
PROJECT MILESTONES: (1) 9/76 Final Report. (2) 12/77 Final Report. (3) 9/78 Final Report.
KEYWORDS: AIR POLLUTION;AEROSOLS;PLUMES;ENVIRONMENTAL TRANSPORT;MONITORING;AERIAL MONITORING;POINT POLLUTANT SOURCES;URBAN AREAS;FOSSIL-FUEL POWER PLANTS;CHEMICAL EFFLUENTS;SULFUR COMPOUNDS;METEOROLOGY;DAILY VARIATIONS;AIR POLLUTION MONITORS;PERFORMANCE TESTING

<071761>
TITLE: Sulfur Budget in Large Plumes
PROJECT NUMBER: G-625B-EA-06
PRINCIPAL INVESTIGATOR: Husar, R.B.
ADDRESS: Department of Mechanical Engineering, St. Louis, MO 63130
AFFILIATION: Washington Univ., St. Louis, Mo. (USA). Dept. of Mechanical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, William
TYPE OF FUNDING: Grant No.-R803896-02
77 FUNDING: Environmental Protection Agency FY77:$230,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust;PARTICULATES/Sulfates (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this program as a part of project MISTT (Midwest Interstate Sulfur Transformation and Transport) is the quantitative determination of the fate of atmospheric sulfur, i.e., the rate of sulfate formation and the rate of SO2 removal to the ground.
APPROACH: Large plumes emitted from the elevated (power plant) and low level sources (urban) were studied on the regional scale. Airborne measurements in the plumes and background air outside the plume were carried out for SO2 O3 NO/sub x/, b/sub scat/, aerosol charge, particulate sulfur concentration and supported by extensive meteorological measurements.
RESULTS: Sulfur budgets of well defined plumes were assessed. Transport of pollutants in plumes was characterized in terms of horizontal ''long range transport'' and vertical transport. The importance of dry removal for different types of plumes and meteorological conditions was assessed. SO2 to particulate sulfate conversion rates were determined for the coal-fired Labadie power plant plume and the diurnal variability (1 to 4 percent per hour for noon hours and 0.5 percent per hour for night hours) was determined.
PROJECT MILESTONES: (1) 9/76 Final Report. (2) 12/77 Final Report. (3) 9/78 Final Report.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;AEROSOLS;PLUMES;ENVIRONMENTAL TRANSPORT;URBAN AREAS;FOSSIL-FUEL POWER PLANTS;STACK DISPOSAL;METEOROLOGY;SULFUR COMPOUNDS;PARTICLE SIZE;NITROGEN COMPOUNDS;OXYGEN COMPOUNDS;MONITORING;DAILY VARIATIONS;AIR POLLUTION MONITORS;PERFORMANCE TESTING;PARTICLES

<071762>
TITLE: Aircraft Measurements in Support of Project MISTT, Midwest Interstate Sulfur Transformation and Transport
PROJECT NUMBER: G-625-B-EA-07
ADDRESS: 464 West Woodbury Road, Altadena, CA 91001
AFFILIATION: Meteorology Research, Inc., Altadena, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Durham, Jack
TYPE OF FUNDING: Contract No.-68-02-2411
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (60%);PARTICULATES/Dust;PARTICULATES/Sulfates (40%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The purpose of the 1976 MISTT study is to extend the results of previous studies to cover larger distances from the sources and obtain more detailed knowledge of the chemical processes occurring in polluted air. The aerosol formation processes as well as gaseous plume chemistry will be the subject of continued study.
APPROACH: Conversion rates and mechanisms identified earlier need to be verified under a variety of meteorological conditions. The aerosol chemistry of the urban and power plant plumes will be examined using new techniques which will yield information on substances other than sulfate. In addition to refining our understanding of the chemical processes, the 1976 program will attempt to better define the regional transport and accumulation mechanisms at work in the Eastern United States.
RESULTS: The project will be expanded from the immediate St. Louis area to include the study of pollutant accumulation and transport in synoptic scale, slow moving, stable air masses.
PROJECT MILESTONES: 12/77 Final report.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;AEROSOLS;PLUMES;ENVIRONMENTAL TRANSPORT;GASEOUS WASTES;METEOROLOGY;CHEMICAL COMPOSITION;URBAN AREAS;THERMAL POWER PLANTS;MISSOURI;DUSTS;AIR POLLUTION MONITORS;PERFORMANCE TESTING;MONITORING;SULFUR COMPOUNDS;STACK DISPOSAL

<071763>
TITLE: Formation of Atmospheric Aerosols
PROJECT NUMBER: G-625B-EA-08
PRINCIPAL INVESTIGATOR: Whitby, K.T.
ADDRESS: Mechanical Engineering Dept., Minneapolis, MN 55455
AFFILIATION: Minnesota Univ., Minneapolis (USA). Dept. of Mechanical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, William
TYPE OF FUNDING: Grant No.-R803851-03
77 FUNDING: Environmental Protection Agency FY77:$735,000

TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Aerosol size distributions have been measured in the St. Louis area as part of EPA's Project MISST using aircraft and ground based self contained mobile laboratories. These measurements were made with a group of collaborators such that a complete array of chemical, physical, and meteorological measurements were obtained on a coal fired power plant plume. The University of Minnesota's portion of the project included aerosol measurements aboard an aircraft and the operation of a mobile van on the ground under the plumes.
APPROACH: Much of the work during the next project year will be analysis and reporting of the large amount of data obtained during the past several years. Analysis is being directed toward obtaining aerosol growth rates in the plumes, aerosol nucleation rates in the plumes and surrounding atmosphere, and toward better descriptions of the aerosol size distributions. Laboratory work toward the development of a continuous instrument for the measurement of aerosol sulfur is also being partially supported by this project.
RESULTS: This mobile van was also operated on freeways in the Los Angeles area during October 1976 as part of an EPA sponsored project to study sulfur aerosols on roadways.
PROJECT MILESTONES: (1) 9/76 Final report. (2) 12/77 Final report. (3) 9/78 Final report.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;PLUMES;ENVIRONMENTAL TRANSPORT;MISSOURI;URBAN AREAS;AERIAL MONITORING;AEROSOLS;METEOROLOGY;QUANTITATIVE CHEMICAL ANALYSIS;EARTH ATMOSPHERE;FOSSIL-FUEL POWER PLANTS;FLUE GAS

<0717&4>
TITLE: Technique for the Measurement of Aerosol Size Distribution and Carbon and Sulfate Content
PROJECT NUMBER: G-625B-EB-08
PRINCIPAL INVESTIGATOR: Macias, E.S.;Husar, R.B.
ADDRESS: Lindell and Srinker Streets, St. Louis, MO 63130
AFFILIATION: Washington Univ., St. Louis, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Sawicki, Carole
TYPE OF FUNDING: Grant No.-R803-115-03
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To pursue work in three distinct areas of aerosol instrumentation and characterization. These include development of (a) a shape sensitive aerosol particle size spectrometer, (b) a nuclear gamma-ray Lethod to measure the concentrations of light elements such as carbon, nitrogen, oxygen and sulfur and (c) a particulate sulfur analyzer.
RESULTS: During the current period the device and techniques to measure particle size have been documented with laboratory aerosols. Additional measurements on atmospheric aerosols will be made in the upcoming period. In this period the nuclear gamma-ray method was brought into routine operation for all elements except oxygen, and this analytical technique will be developed in the next period. Some work has also been done on the in-situ analysis of sulfate aerosols using thermal analysis techniques. A Malloy FPD Sulfur Analyzer was obtained and laboratory tested and calibrated and will be field tested under a variety of conditions in the next year.
PROJECT MILESTONES: 11/79 Final report.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;AEROSOLS;SULFUR COMPOUNDS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;PERFORMANCE TESTING;PARTICLE SIZE;CONFIGURATION;CARBON COMPOUNDS;NITROGEN COMPOUNDS;OXYGEN COMPOUNDS;CHEMICAL COMPOSITION;MEASURING METHODS;GAMMA SPECTROSCOPY;THERMAL ANALYSIS;QUANTITATIVE CHEMICAL ANALYSIS;MONITORING

<0717&5>
TITLE: Study of the Identity and Sources of Denver's Aerosols
PROJECT NUMBER: G-625B-EA-09
PRINCIPAL INVESTIGATOR: Draftz, R.G.
ADDRESS: 10 West 35th Street, Chicago, IL 60616
AFFILIATION: IIT Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Durham, Jack
TYPE OF FUNDING: Grant No.-R803078
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The goals of this current proposed study is to trace the sources of aerosol particles collected by the EPA and other agencies at a network of sampling stations, by identifying the types of particles and comparing them to reference samples.
APPROACH: The particles will be characterized and identified by polarized light microscopy supplemented with scanning electron microscopy and mass spectrometry. The data from these analyses will be correlated with meteorological and aerosol data to discover the impact of individual sources in producing haze.
RESULTS: The City of Denver experiences over 200 atmospheric inversions each year which produce haze and decreased visibility over significant portions of Denver. In 1973, the U.S. EPA began a research study to determine the cause and sources of this pollution problem. One important aspect of the study involves the

identification of aerosols collected from the atmosphere. In a previous preliminary study (1972), polarized light microscopy was used successfully to identify many of the aerosol particles.
PROJECT MILESTONES: (1) 9/76 Final report. (2) 12/77 Final report. (3) 9/78 Final report.
---WORDS: COLORADO;URBAN AREAS;AIR POLLUTION;MONITORING;AEROSOLS;ENVIRONMENTAL TRANSPORT;CHEMICAL EFFLUENTS;MICROSCOPY;MASS SPECTROSCOPY;CHEMICAL COMPOSITION;QUANTITATIVE CHEMICAL ANALYSIS

<071766>
TITLE: Intercomparison of Methods to Collect and Analyze Aerosols
PROJECT NUMBER: G-625B-EB-09
PRINCIPAL INVESTIGATOR: Camp, D.C.;Loo, B.W.
ADDRESS: Lawrence Livermore Laboratory, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dzubay, T.G.
TYPE OF FUNDING: Interagency agreement-IAG-D6-0800
77 FUNDING: Environmental Protection Agency FY77:$22,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Determine the ability of recently developed and previously available aerosol instrumentation to quantitatively determine the concentration of the total mass, sulfate, lead, and other chemical species in the atmosphere.
APPROACH: Conduct an intermethod comparison in which representative samplers of each type are included.
RESULTS: Conduct an 8 day intercomparison in Charleston, West Virginia, during May of 1977. The sampler types to be included are manual dichotomous, automated dichotomous, streaker, Batelle impactor, filters in series, hi vol, Two Mass, diffusion battery, and Lundgren impactor. The participants will return the samples to the laboratory and perform the analyses. The results from each participant representing each method will be intercompared using appropriate statistical techniques.
PROJECT MILESTONES: 6/78 Final report.
KEYWORDS: AIR POLLUTION;MONITORING;AEROSOLS;ENVIRONMENTAL TRANSPORT;CHEMICAL EFFLUENTS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS;AIR POLLUTION MONITORS;PERFORMANCE TESTING;MONITORING

<071767>
TITLE: Interpretation of Data from Biogenic Sulfur Field Studies/MISTT Technical Support
PROJECT NUMBER: G-625B-EA-13
ADDRESS: 225 South Meramec, Suite 112 IT, Clayton, MO 63105
AFFILIATION: Environmental Quality Research, Inc., Clayton, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-2500
77 FUNDING: Environmental Protection Agency FY77:$34,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: During the contract period the contractor will provide technical services as directed by the Project Officer through task orders.
APPROACH: Such services will include but are not limited to: (1) prediction of size, shape and direction of power plant and urban plumes, (2) planning assistance (site selection and experimental design), (3) surface and vertical profile measurements (pilot balloons, radiosondes, helicopter flights, tower measurements), (4) measurement of vertical fluxes of pollutants, (5) calculation of wind fields and trajectories, and (6) preparation of appropriate data and interpretive reports. These services are expected to require approximately 700 man-hours during the contract period, but the contract should provide for the purchase of additional services in increments of 235 man-hours if they are needed. The contractor shall provide equipment, materials, and travel that may be required to perform assigned tasks.
PROJECT MILESTONES: 1/77 Prepare technical service contract.
KEYWORDS: AIR POLLUTION;AERIAL MONITORING;CHEMICAL EFFLUENTS;AEROSOLS;ENVIRONMENTAL TRANSPORT;HEIGHT;METEOROLOGY;PLUMES;WIND;VELOCITY;AIR POLLUTION MONITORS

<071768>
TITLE: Northrop Support Services
PROJECT NUMBER: G-625B-EB-13
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Drive, P.O. Box 1484, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, Marijon
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$86,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1)

Mobile source emissions reaearch; (2) Stationary source emissions research; (3) Gas kinetics and physics research; (4) Special techniques research; (5) Aerosol research; (6) Air instrumentation development and testing; (7) Fluid modeling facility operation and testing; and (8) Sampling and analysis methods research.
KEYWORDS: US EPA;RESEARCH PROGRAMS;AIR POLLUTION;AEROSOLS;ENVIRONMENTAL TRANSPORT;AIR SAMPLERS;PERFORMANCE TESTING;METEOROLOGY;SULFUR COMPOUNDS;NITROGEN COMPOUNDS;HYDROCARBONS;MONITORING;CHEMICAL EFFLUENTS

<071769>
TITLE: Mesoscale Sulfur Balance Studies
PROJECT NUMBER: G-625-EA-14
PRINCIPAL INVESTIGATOR: Winchester, J.W.
ADDRESS: Department of Oceanography, Tallahassee, FL 32306
AFFILIATION: Florida State Univ., Tallahassee (USA). Dept. of Oceanography
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Patterson, Ron
TYPE OF FUNDING: Grant No.-R803887-02
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: A comprehensive study is being conducted to characterize the occurrence of sulfur in aerosol particles at sampling stations in 14 locations between the mid-continent and eastern seaboard of continental U.S.A. Additional remote stations in marine and continental areas are also being operated to provide important background information.
APPROACH: Emphasis is being placed on the concentrations of sulfur in relation to other elements present in the aerosol and on the time variability of these concentrations with a time resolution of 2 hours. Sampling is being carried out continuously at heights from ground level to 30 meters by a unique time sequence filter sampler which has been developed at Florida State University. Additional samples are planned to be taken during intensive periods during the year by cascade impactors at about five of the filter sampling sites, using cascade impactors for determination of the particle size distribution of sulfur and related elements. Elemental analysis is performed using proton induced X-ray emission, a highly sensitive technique permitting both the extremely short 2-hour time resolution on a continuous basis for filter samples as well as the size resolution of particles as small as 0.25 micron diameter by cascade impactors.
RESULTS: By means of the combination of sampling techniques, the impact of fossil fuel combustion and ther anthropogenic sources of sulfur on the natural characteristics of the atmosphere may be precisely determined.
PROJECT MILESTONES: 12/78 Final report.
KEYWORDS: AEROSOLS;SULFUR COMPOUNDS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;SURFACE AIR;SAMPLING;AIR POLLUTION MONITORS;PERFORMANCE TESTING;CHEMICAL EFFLUENTS;MONITORING;PARTICLES

<071770>
TITLE: Northrop Support Services
PROJECT NUMBER: G-625-B-EB-14
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Drive, P.O. Box 1484, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, Marijon
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and testing; (7) fluid modeling facility operation and testing; and (8) sampling and analysis methods research.
KEYWORDS: US EPA;RESEARCH PROGRAMS;AIR POLLUTION;AEROSOLS;ENVIRONMENTAL TRANSPORT;AIR SAMPLERS;PERFORMANCE TESTING;METEOROLOGY;SULFUR COMPOUNDS;NITROGEN COMPOUNDS;HYDROCARBONS;MONITORING;CHEMICAL EFFLUENTS;CHEMICAL REACTION KINETICS;GASES

<071771>
TITLE: Halocarbon Analysis in the St. Louis, Missouri, Metropolitan Area
PROJECT NUMBER: G-625-EA17
PRINCIPAL INVESTIGATOR: Rasmussen, R.A.
ADDRESS: Department of Chemical Engineering, Pullman, WA 99163
AFFILIATION: Washington State Univ., Pullman (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Ellestad
TYPE OF FUNDING: Contract No.-68-02-2421
77 FUNDING: Environmental Protection Agency FY77:$11,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
ECT DESCRIPTION: The research program has two objectives: (1) To analyze the halocarbons and hydrocarbons n air samples collected by the field studies in the St. Louis area. Particular emphasis will be placed on detailed C2 to C12 hydrocarbons measurements from both aircraft and ground sampling stations. In addition a complete analysis of the halocarbons will be accomplished especially the fluorocarbons 11 and 12 and the chlorocarbon cleaning solvents. (2) To provide future field support via an instrumented field laboratory, meteorological support for coordinating aircraft studies and interpreting stagnating anticlone weather situations.
RESULTS: The installation of specially programmed automated halocarbon instrumentation, and/or manually operated high resolution hydrocarbon instrumentation in government owned mobile aerosol laboratory will be accomplished at the request of the government.
PROJECT MILESTONES: 9/78 Final report.
KEYWORDS: MISSOURI;METEOROLOGY;AIR POLLUTION;SURFACE AIR;MONITORING;CARBON;HALOGEN COMPOUNDS;HYDROCARBONS;AEROSOLS;URBAN AREAS;AIR SAMPLERS;AERIAL MONITORING;SAMPLING;QUANTITATIVE CHEMICAL ANALYSIS;AUTOMATION;CHEMICAL EFFLUENTS

<071772>
TITLE: Development and Application of Multiple Tracer Techniques for the Study of Pollutant Transport and Dispersion in the Atmosphere
PROJECT NUMBER: G-625-EA-18
PRINCIPAL INVESTIGATOR: Shair, F.H.
ADDRESS: Department of Chemical Engineering, Pasadena, CA 91125
AFFILIATION: California Inst. of Tech., Pasadena (USA). Dept. of Chemical Engineering
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
MONITOR: Schiermeier
TYPE OF FUNDING: Grant No.-R804990-01
77 FUNDING: Environmental Protection Agency FY77:$13,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This study will support the further development and application of multiple atmospheric tracer techniques.
APPROACH: The analytical approach is to extend the use of electron capture gas chromatography. Recently, with the helpful suggestions given to us by Ray Dixon, we have developed systems which separate SF6, CBrF3, CCl2F2, O2, and CBr2F2 into sharp distinct peaks, the last of which elutes within 200 seconds from the time of injection. The rest of the system development is to develop the capability to accurately analyze at least 1000 air samples per day.
RESULTS: The first extended application of this multiple tracer technique would be to determine the transport and extent of dispersion associated with: (1) urban sources (emitted at low levels) and (2) rural power plant plumes emitted at high levels. Specific experiments are planned to accurately determine the extent of vertical dispersion associated with plumes traveling over rural regions and over urban regions.
PROJECT MILESTONES: 9/77 Data Report.
KEYWORDS: TRACER TECHNIQUES;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;ELECTRON CAPTURE;CHEMICAL ANALYSIS;POWER PLANTS;STACKS;HEIGHT;STACK DISPOSAL;FLUE GAS;PLUMES;ENVIRONMENTAL IMPACTS;GAS CHROMATOGRAPHY

<071773>
TITLE: Northern Support Services
PROJECT NUMBER: G-625-B-EB-18
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Drive, P.O. Box 1484, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, Marijon
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$13,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research, (2) stationary source emissions research, (3) gas kinetics and physics research, (4) special techniques research, (5) aerosol research, (6) air instrumentation development and testing, (7) fluid modeling facility operation and testing, (8) sampling and analysis methods research.
KEYWORDS: GAS KINETICS;US EPA;RESEARCH PROGRAMS;AIR POLLUTION;AIR POLLUTION;AIR POLLUTION MONITORS;PERFORMANCE TESTING;AEROSOLS;AERODYNAMICS;AIR SAMPLERS;CHEMICAL EFFLUENTS;DIFFUSION;SULFUR COMPOUNDS;NITROGEN COMPOUNDS

<071774>
TITLE: International Symposium on Sulfur in the Atmosphere, Dubrovnik, Yugoslavia
PROJECT NUMBER: G-625-B-EA-19
PRINCIPAL INVESTIGATOR: Husar, R.B.
ADDRESS: Lindell L. Skinker Blvd., St. Louis, MO 63130
AFFILIATION: Washington Univ., St. Louis, Mo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, W.E.
TYPE OF FUNDING: Grant No.-R805043-01
77 FUNDING: Environmental Protection Agency FY77:$23,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This Symposium should bring together American, European and other participants to report and discuss the current issues on the atmospheric sulfur problem.
APPROACH: It is estimated that the global emission from anthropogenic sources are of the same order of magnitude as emissions from natural sources. However, more than 90 percent of anthropogenic SO2 emissions are in the northern atmosphere. It has been recognized that the anthropogenic sulfur problem is a regional one on the spatial scale of thousands of kilometers. The horizontal and vertical dispersion mechanisms, removal rates by dry and wet deposition, SO2 oxidation rates and mechanisms, the particulate sulfur size distribution, spatio-temporal distribution and chemistry of aerosol sulfur compounds and associated measurement techniques will be discussed.
PROJECT MILESTONES: 3/78 Publication of Proceedings.
KEYWORDS: AIR POLLUTION;EARTH ATMOSPHERE;MEETINGS;SULFUR DIOXIDE;SULFATES;ENVIRONMENTAL TRANSPORT;GLOBAL ASPECTS;ECOLOGICAL CONCENTRATION;CHEMICAL REACTION KINETICS;AEROSOLS;PARTICLE SIZE;DEPOSITION;DIFFUSION;PRECIPITATION SCAVENGING;MEASURING METHODS;SAMPLING

<071775>
TITLE: Determine the Character and Origin of Aerosols and Development of Fine Particulate Methodologies
PROJECT NUMBER: G-625-EA-20
PRINCIPAL INVESTIGATOR: Heffelfinger, E.
ADDRESS: 505 King St., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-2454
77 FUNDING: Environmental Protection Agency FY77:$68,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust;PARTICULATES/Sulfates;PARTICULATES/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of the project is to provide the analytical chemistry and smog chamber studies support necessary to determine the character and origin of aerosols.
APPROACH: The approach is to apply all inorganic and organic analysis techniques necessary to characterize aerosols with regard to elements, ions, and compounds. In addition smog chamber studies will be carried out in order to elucidate the processes of formation of aerosols from gaseous products.
PROJECT MILESTONES: 6/78 Report on non-urban aerosol composition ESRL model.
KEYWORDS: AEROSOLS;CHEMICAL COMPOSITION;ENVIRONMENTAL TRANSPORT;PARTICLES;PARTICLE SIZE;MEASURING METHODS;MEASURING INSTRUMENTS;SAMPLING;MONITORING;DUSTS;SULFATES;NITRATES;AIR POLLUTION;GASEOUS WASTES;SMOG;CHEMICAL ANALYSIS

<071776>
TITLE: Structure and Reactivity of Adsorbed Oxides of Sulfur
PROJECT NUMBER: G-625-B-EA-21
PRINCIPAL INVESTIGATOR: Lunsford, J.H.
ADDRESS: P.O. Faculty Exchange H, College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA). Research Foundation
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Durham, Jack
TYPE OF FUNDING: Grant No.-R801136-06
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (60%);PARTICULATES/Dust (40%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The overall objective of this research is to determine the structure and reactivity of adsorbed oxides of sulfur. Results from such a study will be useful in identifying the photochemical and thermal reactions which take place on atmospheric aerosols. The specific goals during the current year were (a) to develop photoelectron infrared spectroscopy as a technique for studying oxides of sulfur on aerosols, (b) to determine the mechanism for the oxidation of SO2 to SO4 on surfaces, (c) to identify ions such as S2O- and H2S- which may be produced during the photochemical reaction of H2S with SO2 on magnesium oxide.

APPROACH: Emphasis in future work will be placed on the catalytic oxidation of SO2 in films of absorbed water.
PROJECT MILESTONES: 12/78 Final Report.
KEYWORDS: SULFUR OXIDES;ENVIRONMENTAL TRANSPORT;DUSTS;BASELINE ECOLOGY;EARTH ATMOSPHERE;AEROSOLS;PHOTOCHEMICAL OXIDANTS;INFRARED SPECTRA;CHEMICAL REACTION KINETICS;SULFUR DIOXIDE;SULFATES;HYDROGEN SULFIDES;MAGNESIUM OXIDES;OXIDATION

<071777>
TITLE: Reactions of Sulfur Dioxide in Aerosols
PROJECT NUMBER: G-625-B-EA-22
PRINCIPAL INVESTIGATOR: Himmelblau, D.M.
ADDRESS: Department of Chemical Engineering, Austin, TX 78712
AFFILIATION: Texas Univ., Austin (USA). Dept. of Chemical Engineering
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Durham, Jack
TYPE OF FUNDING: Grant No.-R803814-02
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (50%);PARTICULATES/Dust;PARTICULATES/Nitrates (50%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this study is to determine the rate and extent of reaction of sulfur dioxide and other air pollutants at ppm concentrations with aerosol droplets of the order of size of one micron.
APPROACH: In the initial experiments radioactive 35SO2 will be transferred to aerosols, and the total radioactive sulfur transferred counted. Models of the mass transfer and reaction will be fit by the experimental data, and used to elucidate the extent of reaction and oxidation to sulfate.
PROJECT MILESTONES: 6/78 Final Report.
KEYWORDS: AEROSOLS;SULFUR DIOXIDE;DUSTS;NITRATES;BASELINE ECOLOGY;ENVIRONMENTAL TRANSPORT;CHEMICAL REACTION KINETICS;MASS TRANSPER;SULFUR 35;LABELLED COMPOUNDS;MATHEMATICAL MODELS;CHEMICAL EFFLUENTS;GASEOUS WASTES

<071778>
TITLE: Northrop Support Services
PROJECT NUMBER: G-625-B-EH-30
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Dr., P. O. Box 1484, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Bufalini, Marijon
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research; (2) Stationary source emissions research; (3) Gas Kinetics and physics research; (4) Special techniques research; (5) Aerosol research; (6) Air instrumentation development and testing; (7) Fluid modeling facility operation and testing; (8) Sampling and analysis methods research.
KEYWORDS: US EPA;RESEARCH PROGRAMS;AIR POLLUTION;AIR POLLUTION MONITORS;PERFORMANCE TESTING;AEROSOLS;AIR SAMPLERS;CHEMICAL EFFLUENTS;DIFFUSION;SULFUR COMPOUNDS;NITROGEN COMPOUNDS;AERODYNAMICS

<071779>
TITLE: Northrop Support Services
PROJECT NUMBER: G-625-B-EH-31
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Dr., P.O. Box 1484, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source missions research. (2) Stationary source emissions research. (3) Gas Kinetic and pphysics research. (4) Special techniques research. (5) Aerosol research. (6) Air instrumentation development and testing. (7) Fluid modeling facility operation and testing. (8) Sampling and analysis methods reserch.
KEYWORDS: GAS KINETICS;US EPA;RESEARCH PROGRAMS;AIR POLLUTION;AIR POLLUTION MONITORS;PERFORMANCE TESTING;AEROSOLS;AERODYNAMICS;AIR SAMPLERS;CHEMICAL EFFLUENTS;DIFFUSION;SULFUR COMPOUNDS;NITROGEN COMPOUNDS

<071780>
TITLE: Aerometric Field Study in Vicinity of a Large Power Plant in Complex Terrain
PROJECT NUMBER: G-625-EA-25
PRINCIPAL INVESTIGATOR: Biggs, W.G.
ADDRESS: 15 Firstfield Rd., Gaithersburg, MD 20760
AFFILIATION: Geomet, Inc., Gaithersburg, Md. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Holzworth, George C.
TYPE OF FUNDING: Contract No.-68-02-2260
77 FUNDING: Environmental Protection Agency FY77:$255,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/ (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this field measurement program is to collect a set of reliable aerometric measurements in the vicinity of the Clinch River Power Plant in Russell County of southwestern Virginia.
APPROACH: Continuous measurements of SO2, NO, wind, and temperature are made at 8 fixed sites out to 30 km from the plant. An instrumented van routinely monitors air quality at likely receptor locations SO2 and NO are monitored continuously at the plant and pibal and temperature soundings are made daily.
RESULTS: After the field data are archived they will be analyzed to determine effects of complex terrain on transport and diffusion, and the aerometric data will be made available to others, analysts, modelers, etc.
PROJECT MILESTONES: 8/78 Report on field study of a power plant for complex terrain.
KEYWORDS: EMISSIONS;INSTRUMENTATION;FOSSIL-FUEL POWER PLANTS;ENVIRONMENT;AIR POLLUTION;CHEMICAL EFFLUENTS;GASEOUS WASTES;MONITORING;AERODYNAMICS;SULFUR DIOXIDE;NITROGEN OXIDES;METEOROLOGY;DIFFUSION;WIND;VELOCITY;TEMPERATURE MEASUREMENT;TOPOGRAPHY;VARIATIONS

<071781>
TITLE: Independent Audit of Clinch River Field Study
PROJECT NUMBER: G-625-EA-26
PRINCIPAL INVESTIGATOR: Wagoner, D.E.
ADDRESS: Research Triangle Park, NC 27709
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Holzworth, George C.
TYPE OF FUNDING: Contract No.-68-02-2156
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this work is to conduct an independent audit of the aerometric measurements in order to establish their reliability.
APPROACH: An audit of the systems (operating procedures) has indicated some potential problem areas, which have been corrected. An audit of the instrument measurements has been completed but not yet received. Another audit of instrument measurements will be conducted, probably in July, 1977.
PROJECT MILESTONES: 9/77 Final report.
KEYWORDS: ENVIRONMENT;AIR POLLUTION;CHEMICAL EFFLUENTS;MONITORING;AIR SAMPLERS;RELIABILITY;FOSSIL-FUEL POWER PLANTS;GASEOUS WASTES

<071782>
TITLE: Aircraft Measurements in Support of Aerosol Research Studies of Sulfur Transformation and Transports
PROJECT NUMBER: G-625-EA-36
PRINCIPAL INVESTIGATOR: Vaughan, W.
ADDRESS: 215 Leidesdorff St., San Francisco, CA 94111
AFFILIATION: Environmental Measurements, Inc., San Francisco, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-2709
77 FUNDING: Environmental Protection Agency FY77:$5,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (30%);PARTICULATES/Dust (30%);ORGANICS (40%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Environmental Measurements, Inc. (EMI) will organize and execute field programs for the measurement of power plant plume transport, using aircraft platforms and a variety of air quality instruments. The purposes of these field programs are to: (1) Obtain measurements of changes in plume chemistry of the same air parcel during its long-range transport away from a power plant; (2) Develop an EPA data base parallel and complementary to that obtained by others as part of such programs as the Sulfate Regional Experiment (SURE); (3) Test fly a new and innovative instrumentation.
APPROACH: An initial project will be in cooperation with the activities of the Atmospheric Dynamics and Chemistry Section of Battelle-Pacific Northwest Laboratories (BNW), as supported by the Electric Power Research Institute (EPRI). The work will take place in the vicinity of two power plants located in Michigan and Indiana in May 1977.
RESULTS: Measurements for the following parameters will be included: sulfates, SO2, submicron aerosols, SF6, b(scat). This work will be coordinated with other contractors to provide broad field measurements, data analyses and a final report.

PROJECT MILESTONES: 4/80 Final report.
KEYWORDS: THERMAL POWER PLANTS;GASEOUS WASTES;PLUMES;AERIAL MONITORING;CHEMICAL COMPOSITION;AIR POLLUTION;MONITORING;AEROSOLS;PARTICLE SIZE;SULFUR COMPOUNDS;QUANTITATIVE CHEMICAL ANALYSIS;SULFATES;SULFUR DIOXIDE;SULFUR FLUORIDES;AIR POLLUTION MONITORS;PERFORMANCE TESTING;SAMPLING;ORGANIC COMPOUNDS

<071783>
TITLE: Evaluation of Particulate Measurement Methods at Stationary Source Simulator and in the Field
PROJECT NUMBER: G-712-B-BA-01
PRINCIPAL INVESTIGATOR: Knapp, K.T.
ADDRESS: ESRL, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this task are to test and evaluate both manual methods and continuous monitors for particulate mass at the stationary source simulator (SSSF) under various conditions and in the field.
APPROACH: The SSSF is operated at predetermined conditions including velocity, temperature, and composition of the gas stream including particulate loading and composition. The instruments are tested over a range of operating conditions both at the SSSF and at appropriate field sites.
RESULTS: Currently, an optical particle mass monitor is being tested. Several additional monitors based on electrical properties will be tested.
PROJECT MILESTONES: 6/78 Report on optical mass monitor.
KEYWORDS: POINT POLLUTANT SOURCES;AIR POLLUTION;AEROSOLS;MONITORING;METEOROLOGY;WIND;VELOCITY;TEMPERATURE DEPENDENCE;GASEOUS WASTES;CHEMICAL COMPOSITION;PARTICLE SIZE;DIFFUSION

<071784>
TITLE: Atmospheric Analysis by Gas Chromatography and Infrared Spectroscopy
PROJECT NUMBER: G-712-B-BB-01
PRINCIPAL INVESTIGATOR: Hanst, P.L.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Hanst, Philip L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$3,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Identify and measure trace gases in air at concentrations on the parts-per-trillion level.
APPROACH: Concentrate trace gases in cryocondenser, separate on gas chromatographic column, detect by electron capture, flame ionization and infrared absorption. Develop techniques of removing water and CO2 interferences.
RESULTS: The infrared cells and cryocondensation system are being miniaturized as much as possible to reduce the required sample volume. Ten nanograms of a pollutant can now be detected. Another factor of the improvement in sensitivity is being sought.
PROJECT MILESTONES: 6/76 Collection system operators and detectors on stream.
KEYWORDS: SURFACE AIR;CHEMICAL COMPOSITION;GASEOUS WASTES;TRACE AMOUNTS;AIR POLLUTION MONITORS;PERFORMANCE TESTING;AIR SAMPLERS;GAS ANALYSIS;SAMPLING;AIR;GAS CHROMATOGRAPHY;SEPARATION PROCESSES;MONITORING;CONDENSERS;CRYOGENICS

<071785>
TITLE: Size Distribution and Other Physical Properties of Particle Emission from Selected Sources Categories
PROJECT NUMBER: G-712-B-BD-01
PRINCIPAL INVESTIGATOR: Knapp, K.T.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$9,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
RGY CYCLE: COMBUSTION OR END USE (100%)
LUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this task is to determine the size distribution, density, shape and optical properties of particles emitted from various source industries.

APPROACH: Particles are collected from various preselected source industries by filters and size fractioning devices. The samples are analyzed in the lab for the physical properties of the particulate.
RESULTS: Currently, emissions from oil-fired and coal-fired power plants and municipal incinerators are being sampled.
PROJECT MILESTONES: 12/76 Begin study on incinerators.
KEYWORDS: CHEMICAL EFFLUENTS;AIR POLLUTION;AEROSOLS;AIR SAMPLERS;THERMAL POWER PLANTS;FOSSIL-FUEL POWER PLANTS;GASEOUS WASTES;INCINERATORS;MUNICIPAL WASTES;SAMPLING;PHYSICAL PROPERTIES;PARTICLE SIZE;DENSITY;CONFIGURATION;OPTICAL PROPERTIES;HYDROCARBONS

<071786>
TITLE: Studies on the Effect of Environmental Variables on the Collection of Atmospheric Nitrate and Development of a Sampling and Analytic Method
PROJECT NUMBER: G-712-B-BE-02
ADDRESS: 505 King Avenue, Battelle Memorial Institute, Columbus Laboratories, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wittgenstein
TYPE OF FUNDING: Contract No.-68-02-2213
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/General (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: (1) A thorough study of sampling procedures for atmospheric nitrate and of factors and conditions affecting their collection efficiency, especially of those which may lead to the conversion of NO/sub x/ to nitrite and nitrate on the collection medium and consequently to the formation of artifacts and pseudoparticles. (2) Development of an efficient and dependable procedure for the accurate collection of nitrate from ambient air with particular emphasis on preventing the oxidation of nitrate precursors to nitrate on the collection medium. (3) Development of a dependable laboratory method for the determination of atmospheric nitrate. The method must be sufficiently sensitive to allow analysis of ambient air levels of nitrate in the submicrogram and low microgram range and should be potentially suited for eventual automation.
PROJECT MILESTONES: 12/77 Final report.
KEYWORDS: AIR POLLUTION;MONITORING;NITRATES;QUANTITATIVE CHEMICAL ANALYSIS;SURFACE AIR;SAMPLING

<071787>
TITLE: Continuous Monitor of Mass Concentration of Particulate Emission from Stationary Sources
PROJECT NUMBER: G-712-B-BA-03
PRINCIPAL INVESTIGATOR: Reisman, E.
ADDRESS: Ford Rd., Newport Beach, CA 92663
AFFILIATION: Aeronutronic Ford Corp., Newport Beach, Calif. (USA). Aeronutronic Div.
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
TYPE OF FUNDING: Contract No.-68-02-2206
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of the program is to construct an optical instrument that is capable of making measurements of mass concentration in times approaching real time.
APPROACH: The technique makes use of the fact that the wavelength dependence of opacity varies with the size of the particles in the effluent. The instrument makes transmission measurements at several wavelengths free of absorption bands in the visible and IR. The data is fed into a computer that has been programmed for a particular type of site. The program contains information on the optical indices of the particulate as a function of wavelength, the form of the particle size distribution function, typical size ranges, etc. The computer makes a best fit of the optical data by adjusting the parameters of the size distribution function and computes the mass concentration. Since the computations occur very rapidly, the results are available in almost real time. The current system uses time share but future units will use an on-board minicomputer.
RESULTS: The program will be accomplished in two phases. The first phase will involve the construction of a breadboard unit that will be checked out in the laboratory with controlled dust chambers and cells. The second phase involves the packaging of a field worthy unit which will be tested at a coal burning power plant and at a Portland cement plant. Concurrent probe measurements will also be made.
PROJECT MILESTONES: 2/77 Final report.
KEYWORDS: AIR POLLUTION;MONITORING;AIR POLLUTION MONITORS;PERFORMANCE TESTING;OPTICAL PROPERTIES;COMPUTER CALCULATIONS;AEROSOLS;PARTICLE SIZE;CHEMICAL EFFLUENTS

<071788>
TITLE: Mesoscale Sulfur Balance Studies
PROJECT NUMBER: G-712-B-BB-03
PRINCIPAL INVESTIGATOR: Winchester, J.W.
ADDRESS: Tallahassee, FL 32306
AFFILIATION: Florida State Univ., Tallahassee (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Patterson, Ron
TYPE OF FUNDING: Grant No.-R803887-02
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);SPECIFIED OTHER POLLUTANTS/Multiple (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;ECT
ECT DESCRIPTION: A comprehensive study is being conducted to characterize the occurrence of sulfur in aerosol particles at sampling stations in 14 locations between the mid-continent and eastern seaboard of continental U.S.A. Additional remote stations in marine and continental areas are also being operated to provide important background information.
APPROACH: Emphasis is being placed on the concentrations of sulfur in relation to other elements present in the aerosol and on the time variability of these concentrations with a time resolution of 2 hours. Sampling is being carried out continuously at heights from ground level to 30 meters by a unique time sequence filter sampler which has been developed at Florida State University. Additional samples are planned to be taken during intensive periods during the year by cascade impactors at about five of the filter sampling sites, using cascade impactors for determination of the particle size distribution of sulfur and related elements. Elemental analysis is performed using proton induced X-ray emission, a highly sensitive technique permitting both the extremely short 2-hour time resolution on a continuous basis for filter samples as well as the size resolution of particles as small as 0.25 mu m diameter by cascade impactors.
RESULTS: By means of the combination of sampling techniques, the impact of fossil fuel combustion and other anthropogenic sources of sulfur on the natural characteristics of the atmosphere may be precisely determined.
PROJECT MILESTONES: 12/77 Final Report.
KEYWORDS: AIR POLLUTION;MONITORING;AEROSOLS;SULFUR COMPOUNDS;QUANTITATIVE CHEMICAL ANALYSIS;SURFACE AIR;SAMPLING;X-RAY FLUORESCENCE ANALYSIS

<071789>
TITLE: Instrumentation to Measure Particle Size in Source Emissions
PROJECT NUMBER: G-712B-BD-03
PRINCIPAL INVESTIGATOR: Wertheimer, A.
ADDRESS: Dickerson Road, North Wales, PA 19454
AFFILIATION: Leeds and Northrup Co., North Wales, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
TYPE OF FUNDING: Contract No.-68-02-2447
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The purpose of this project is to develop a method for the real-time measurement of the size of particulate in source emissions. The method developed will be applicable to measuring the size of the particulates both in-stack by on-stack instrumentation and in-plumes of sources by remote instrumentation.
APPROACH: The particle size range of interest is 0.2 to 10 microns. The method of measurement of these particles is based on Rayleigh scattering produced by illuminating the particles with source(s) having wavelength(s) greater than the diameter of the particles. By measuring the scatter flux intensity at 90 degrees relative to the incident beam for two orthogonal polarizations and having qualitative information about the refractive index of the scattering material, the sizes of particles can be computed.
RESULTS: The project plan includes demonstration of the method in the laboratory, followed by design and construction of a prototype on-stack instrument. The latter instrument will then be evaluated in stationary stack facilities.
PROJECT MILESTONES: 6/78 Final Report.
KEYWORDS: CHEMICAL EFFLUENTS;AIR POLLUTION;MONITORING;GASEOUS WASTES;AEROSOLS;ENVIRONMENTAL TRANSPORT;STACK DISPOSAL;PLUMES;PARTICLE SIZE;STACKS;MONITORING;MEASURING METHODS;AIR POLLUTION MONITORS;DESIGN;DUSTS;PARTICLES

<071790>
TITLE: Investigation of Particulate Matter Monitoring Using Contact Electricity
PROJECT NUMBER: G-712-B-BB-04
PRINCIPAL INVESTIGATOR: Wesolowski, J.J.
ADDRESS: 714 P Street, Sacramento, CA 94704
AFFILIATION: California Dept. of Public Health, Sacramento (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader
TYPE OF FUNDING: Grant No.-R803719-01
77 FUNDING: Environmental Protection Agency FY77:$27,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective is to critically examine the basis for the indirect measurement of particulate matter mass concentration by the use of contact electricity as the detection mechanism.
APPROACH: A study of the literature has been made and a contact-electricity type of monitoring instrument has been tested in the laboratory. The total charge has been found to correlate well with gravimetric mass. The response of the instrument depends mainly on the electrical resistivity of the material. The condition of the surface of the probe has a major effect on the sensitivity.
SULTS: Further tests will be made to investigate the effect on the instrument performance of the condition of the probe surface, particle size, and other relevant parameters.
PROJECT MILESTONES: 6/78 Final Report.
KEYWORDS: AIR POLLUTION;MONITORING;AEROSOLS;AIR POLLUTION MONITORS;PERFORMANCE TESTING;ELECTRIC DISCHARGES;PARTICLE SIZE;SENSITIVITY

<071791>
TITLE: Aerosol Microscopy
PROJECT NUMBER: G-712-B-BB-04
PRINCIPAL INVESTIGATOR: Gerhard, J.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, William E.
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: Determine morphologies of collected aerosols and infer source types.
APPROACH: Polarizing light microscopy is used for collected aerosols that have diameters greater than 5 micrometers. Reflected color, polarization colors, and index of refraction are used to establish morphology. Smaller particles are investigated with scanning and transmission electron microscopes equipped with X-ray fluorescence detectors.
RESULTS: This effort supports the field and laboratory studies of ESRL.
PROJECT MILESTONES: 9/77 Report on Microscopy of Aerosol Samples.
KEYWORDS: AIR POLLUTION;MONITORING;AEROSOLS;MICROSCOPY;PARTICLE SIZE;AIR;SAMPLING;ELECTRON MICROSCOPY;X-RAY FLUORESCENCE ANALYSIS

<071792>
TITLE: Quantitative Analysis of Polynuclear Aromatic Hydrocarbons in Liquid Fuels
PROJECT NUMBER: G-712-B-BC-04
PRINCIPAL INVESTIGATOR: Mesich, F.G.;Bombaugh, K.J.;Oldham, R.G.
ADDRESS: 8500 Shoal Creek Boulevard, Austin, TX 78766
AFFILIATION: Radian Corp., Austin, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Braddock, James N.
TYPE OF FUNDING: Contract No.-68-02-2446
77 FUNDING: Environmental Protection Agency FY77:$11,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (33%);ORGANICS (33%);SPECIFIED OTHER POLLUTANTS/Multiple (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Air pollution is composed of a very complex mixture of gaseous and particulate matter originating from both natural and man-made sources. One class of atmospheric particulate pollution includes polynuclear aromatic hydrocarbons (PNA's) which have been shown to be carcinogenic in experimental animals.
APPROACH: Because PNA compounds are formed in combustion processes with hydrocarbon fuels, almost all PNA's in the atmosphere arise from man-made sources. Currently, important investigations of mobile source emissions contribution to PNA levels in the atmosphere are under study by the Environmental Protection Agency. Results of these investigations will qualitatively and quantitatively demonstrate which PNA's are found in mobile source exhaust emissions. A strong correlation between PNA levels in automobile exhaust and pre-existent PNA's in fuel has been demonstrated in previous work.
RESULTS: The purpose of this project is to quantitatively determine 12 individual polynuclear aromatic hydrocarbons present in various aircraft turbine, diesel, and gasoline test fuels. The results of these determinations are necessary to correlate the amount of PNA present in fuel with PNA exhaust emission levels.
PROJECT MILESTONES: 76/11 Contract awarded.
KEYWORDS: CONDENSED AROMATICS;QUANTITATIVE CHEMICAL ANALYSIS;EXHAUST GASES;CHEMICAL ANALYSIS;AVIATION FUELS;DIESEL FUELS;AUTOMOTIVE FUELS;AIR POLLUTION;CARCINOGENS;HYDROCARBONS

<071793>
TITLE: Morphology and Composition of Particulates Emitted by Stationary Sources
PROJECT NUMBER: G-712-B-BD-04
PRINCIPAL INVESTIGATOR: Miller, J.L.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Herget, William F.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$17,500
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Determine the morphology and elemental composition of particulate matter emitted by stationary sources using electron optical techniques.
APPROACH: The analyses will be carried out using transmission and scanning electron microscopy in conjunction with electron diffraction, electron microprobe measurements, and advanced image analysis techniques.

RESULTS: Sources under study include oil-fired and coal-fired power plants, incinerators, and basic oxygen furnaces.
PROJECT MILESTONES: 7/77 Report on incinerator emissions.
WORDS: PARTICLES;AEROSOLS;CHEMICAL COMPOSITION;MORPHOLOGICAL CHANGES;STATIONARY POLLUTANT SOURCES;INCINERATORS;FUEL OILS;COAL;FOSSIL-FUEL POWER PLANTS;FURNACES

<071794>
TITLE: Aerosol Characterization
PROJECT NUMBER: G-712-B-BB-05
PRINCIPAL INVESTIGATOR: Patterson, R.K.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Lab.
MONITOR: Wilson, William E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To determine composition and sources of atmospheric aerosols.
APPROACH: Collect and analyze atmospheric aerosol samples. Develop improved collection and analysis techniques. Participate in cooperative aerosol characterization studies. Interpret data in terms of aerosol sources.
RESULTS: (1) New York City Aerosol Experiment: collect two weeks of samples in cooperation with the New York University Medical Center, Institute of Environmental Medicine. Compare reduced data and publish joint reports where warranted. Samples were collected between January 31 and February 13, 1977. (2) Natural Organic Aerosol Program: collect particulate and gas-phase organic in a controlled Loblolly Pine Forest, for gravimetric, GC-MS, and Particulate profile analysis. Preliminary samples have been collected and are being evaluated.
PROJECT MILESTONES: 09/77 Report on relationship between ambient aerosol loading and aerosol sources.
KEYWORDS: AIR POLLUTION;AEROSOL MONITORING;PARTICLES;AEROSOLS;EARTH ATMOSPHERE;MONITORING;DATA ANALYSIS;CHEMICAL COMPOSITION;NEW YORK CITY;AIR QUALITY;USA;PINES

<071795>
TITLE: Detailed Organic and Inorganic Analysis of Particle Emissions from Selected Sources
PROJECT NUMBER: G712-B-BD-05
PRINCIPAL INVESTIGATOR: Bennett, R.L.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Lab.
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this task is to obtain chemical analyses on particulate samples of the emissions from various preselected source industries. The analysis will be for both organic and inorganic compounds.
APPROACH: The samples will be collected by various filters and special solid sorbent systems. The analyses will be by x-ray fluorescence for trace element and IR and other methods of spectroanalysis for the organic content.
RESULTS: Currently, emission samples from oil-fired and coal-fired power plants are being analyzed.
PROJECT MILESTONES: 4/77 Report on steel plants.
KEYWORDS: PARTICLES;AEROSOLS;AIR POLLUTION;AEROSOL MONITORING;CHEMICAL COMPOSITION;CHEMICAL ANALYSIS;DUSTS;OIL SHALE INDUSTRY;COAL INDUSTRY;COAL;FUEL OILS

<071796>
TITLE: Morphology and Composition of Particulates Emitted by Mobile Sources
PROJECT NUMBER: G712-B-BC-06
PRINCIPAL INVESTIGATOR: Miller, J.L.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Lab.
MONITOR: Herget, William F.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$17,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);SPECIFIED OTHER POLLUTANTS/Multiple (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Determine the morphology and elemental composition of particulate matter emitted by mobile sources using electron-optical techniques.

APPROACH: The analyses will be carried out using transmission and scanning electron microscopy in conjunction with electron diffraction, electron microprobe measurements, and advanced image analysis techniques.
RESULTS: Particulate sources currently under study include automobile brake linings and diesel engines, and specific items being studied include lead and asbestos samples.
PROJECT MILESTONES: 11/77 Further asbestos studies.
KEYWORDS: PARTICLES;AEROSOLS;AEROSOL MONITORING;CONFIGURATION;PARTICLE SIZE;CHEMICAL COMPOSITION;DUSTS;VEHICLES;EXHAUST GASES;AUTOMOBILES;DIESEL ENGINES;LEAD;ASBESTOS;EARTH ATMOSPHERE;ELECTRON SPECTROSCOPY;ECOLOGICAL CONCENTRATION;ELECTROMAGNETISM

<071797>
TITLE: Development of a Field Instrument for Continuous On-Stack Monitoring of Mass Concentration of Particulates in Stack Emissions
PROJECT NUMBER: G-712-B-BA-07
PRINCIPAL INVESTIGATOR: Liskowitz, J.W.
ADDRESS: Dept. of Electrical Engineering, Newark, NJ 07102
AFFILIATION: New Jersey Inst. of Tech., Newark (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
MONITOR: Connor, William
TYPE OF FUNDING: Grant No.-R803509-02-0
77 FUNDING: Environmental Protection Agency FY77:$65,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The object of this program is to provide an instrument which can be mounted on a stack and continuously monitor the mass concentration of particulate emissions.
APPROACH: The basis for this instrument is the measurement of the depolarization of backscattered polarized radiation. Such a monitor can be used for regulatory purposes, to evaluate the efficiency of abatement equipment, and to record for control purposes the particulate emissions under different plant operating conditions. Such information can be used to define the optimum plant and abatement equipment operating conditions required to meet acceptable particulate emissions standards for different types of fuels. Optimization of the operation of the abatement equipment under different conditions would advance the state of the art of pollution abatement and lead to improve air quality.
PROJECT MILESTONES: 10/77 Final report.
KEYWORDS: STACK DISPOSAL;AIR POLLUTION;MONITORING;AIR POLLUTION MONITORS;DESIGN;PARTICLE SIZE;AEROSOL MONITORING;EARTH ATMOSPHERE;FLUE GAS;CHEMICAL COMPOSITION;AIR POLLUTION CONTROL;POLLUTION CONTROL EQUIPMENT;BOILER FUEL;FOSSIL-FUEL POWER PLANTS

<071798>
TITLE: Development of an In-Situ Monitoring Technique for Molecular Comp. of Particulate Emissions
PROJECT NUMBER: G-712B-BD-07
PRINCIPAL INVESTIGATOR: Gravatt, C.C.
ADDRESS: Department of Commerce, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Nader, J.S.
TYPE OF FUNDING: Interagency agreement-IAG-D6-F012
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates;NOXIOUS GAS/Nitrates;NOXIOUS GAS/Carbonates (75%);SPECIFIED OTHER POLLUTANTS/Multiple (25%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: NBS, with its micro-Raman capability in facilities and expertise will perform the following tasks: (1) Generate preliminary reference spectra of various major types of stationary source particulates of interest to EPA, including sulfates, nitrates, and carbonates. Analyze several representative particulate samples to be provided by EPA. These samples will have been previously characterized for elemental composition by EPA or their contractors to provide a basis for comparison with micro-Raman results. (2) Cooperate with and advise EPA in the development of stack sampling methods compatible with micro-Raman analysis. (3) Develop and install rapid automated sample holding systems for the NBS micro-Raman instrument in order to reduce data acquisition time, and to permit unattended operation in the analysis of multi-particle samples.
PROJECT MILESTONES: 1/77 Development procurement feasibility.
KEYWORDS: SULFATES;NITRATES;CARBONATES;AEROSOL MONITORING;STATIONARY POLLUTANT SOURCES;MONITORING;PARTICLES;AEROSOLS;INVENTORIES;EMISSION;STANDARDS;FEASIBILITY STUDIES;AUTOMATION;RAMAN SPECTRA;SAMPLING;MEASURING INSTRUMENTS;HYDROCARBONS

<071799>
TITLE: X-Ray Optical Techniques for the Chemical Analysis of Particulate Pollutants
PROJECT NUMBER: G-712B-BD-10
PRINCIPAL INVESTIGATOR: Birks, L.S.
ADDRESS: Washington, DC 20390
AFFILIATION: Naval Research Lab., Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Wagman, Jack
TYPE OF FUNDING: Interagency agreement-IAG-D6-F344
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Objective of this work is to advance the state-of-the-art of x-ray optical methods (incl. x-ray fluorescence and x-ray diffraction techniques) for analysis of filter-deposited environmental samples.
APPROACH: Currently, high resolution XRF spectrometry is being developed for the analysis of sulfur oxidation states in particulate samples.
RESULTS: A sulfur-valence spectrometer channel has been built for use in the EPA simultaneous multiwavelength spectrometer.
PROJECT MILESTONES: 8/77 Report on measurement of distribution of s-oxidation states in aerosol samples
KEYWORDS: AEROSOL MONITORING;TECHNOLOGY ASSESSMENT;X-RAY FLUORESCENCE ANALYSIS;CHEMICAL COMPOSITION;AEROSOLS;PARTICLES;DUSTS;SULFUR DIOXIDE;OPTICAL PROPERTIES

<071800>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BB-11
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Drive, P.O. Box 1484, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, Marijon
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (70%);SPECIFIED OTHER POLLUTANTS/Multiple (30%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Provide technical support for EPA.
APPROACH: The contractor, Northrop Services Inc., operates and maintains government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research, (2) stationary source emissions research, (3) gas kinetics and physics research, (4) special techniques research, (5) aerosol research, (6) air instrumentation development and testing, (7) fluid modeling facility operation and testing, and (8) sampling and analysis methods research.
PROJECT MILESTONES: 09/77 Demonstration of improved method for automated XRF data processing.
KEYWORDS: US EPA;RESEARCH PROGRAMS;AIR POLLUTION;POLLUTION CONTROL;EQUIPMENT;PARTICLES;SULFUR DIOXIDE;NITROGEN OXIDES;EARTH ATMOSPHERE

<071801>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BB-12
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Drive, P.O. Box 1484, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, Marijon
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (70%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (30%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Provide support services to EPA.
APPROACH: The contractor, Northrop Services Inc., operates and maintains government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research, (2) stationary source emissions research, (3) gas kinetics and physics research, (4) special techniques research, (5) aerosol research, (6) air instrumentation development and testing, (7) fluid modeling facility operation and testing, and (8) sampling and analysis methods research.
KEYWORDS: US EPA;ENVIRONMENT;POLLUTION CONTROL;RESEARCH PROGRAMS;AIR POLLUTION;WATER POLLUTION;ECOSYSTEMS;REACTION KINETICS;GASES;AEROSOLS

<071802>
TITLE: Measurement of H2SO4 Emission from Selected Sources
PROJECT NUMBER: G-712B-BD-12
PRINCIPAL INVESTIGATOR: Cheney, J.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfur oxides (75%);SPECIFIED OTHER POLLUTANTS/Multiple (25%)
CHARACTER OF STUDY: RESEARCH/Applied (25%);DEVELOPMENT/Pilot plant (75%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this task is to adapt an extractive H2SO4 monitor developed for use at a contact H2SO4 plant for use in measuring H2SO4 emissions from combustion sources.
APPROACH: The conductivity detector currently incorporated in the system will be replaced with a pH monitor to facilitate measurement of H+ concentration resulting from the absorption of gaseous H2SO4 in solution.
RESULTS: Currently, the prototype is undergoing evaluation at an acid plant. Upon completion of the testing, the system will be delivered to EPA for modification and use on combustion sources.
PROJECT MILESTONES: 6/78 Final Report.
KEYWORDS: SULFURIC ACID;ECOLOGICAL CONCENTRATION;MONITORING;AIR POLLUTION;AEROSOL MONITORING;COMBUSTION PRODUCTS;INDUSTRY;SULFUR DIOXIDE;AIR POLLUTION MONITORS;POLLUTION CONTROL EQUIPMENT

<071803>
TITLE: Evaluation of Measurement Technology for Size and Composition of Particle Emissions
PROJECT NUMBER: G-712-B-BA-13
PRINCIPAL INVESTIGATOR: Conner, W.D.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this task are to study various particle sizing devices for measurement of size and for measurement of particle size composition.
APPROACH: Both extractive and in-stack sizing devices are being tested in the laboratory at a stationary source simulator and in the field at various sources. Optical and inertial type sampling methods will be studied and various types of impaction surfaces are being tested for their applicability to the impactors, to the source conditions (temperature, humidity, loading, velocity, etc.) and to the analytical method of analyses.
RESULTS: Currently, two in-stack impactors, an extractive impactor and a series cyclone are being tested at oil-fired and coal-fired power plants, portland cement plants and municipal incinerators. A two wavelength transmissometer is being tested at oil-fired power plants and a four wavelength transmissometer is to be tested at the source simulator and in the field for particle size measurement.
PROJECT MILESTONES: (1) 9/77 Report-Comparison/In-Situ Extractive inertial size classification techniques. (2) 12/77 Report-Size Correction/Quantitative Analysis. (3) 6/78 Report of the size distribution of emissions from incinerators.
KEYWORDS: PARTICLE SIZE;PARTICLES;AEROSOLS;CHEMICAL COMPOSITION;AEROSOL MONITORING;TECHNOLOGY ASSESSMENT;EARTH ATMOSPHERE;AIR POLLUTION;MEASURING METHODS

<071804>
TITLE: Measurement of SO2, SO3 and H2SO4 from Fossil-Fuel Fired Combustion Sources
PROJECT NUMBER: G-712B-BD-13
PRINCIPAL INVESTIGATOR: Homolya, J.B.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$64,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this task are to characterize sulfur emissions from coal and oil-fired combustion sources and to assess the adequacy of present emission factors and to study the characteristics of SO3/H2SO4 formation and emission relative to operating parameters.
APPROACH: Selected emission sources will be sampled which represent a cross-section of boiler size, combustion operating conditions, emissions controls and fuel type. Samples will be collected and analyzed for SO2, total water soluble sulfates, CO, CO2, and oxygen. In addition, research measurements will be carried out to evaluate the adequacy of advanced methods and monitors for the characterization of emissions.
RESULTS: Currently, data has been obtained from three coal-fired sources and light oil-fired boilers which indicate a significant difference in emissions of SO4/sup 2-/ between coal and oil fuels.
PROJECT MILESTONES: 6/77 Final Report.
KEYWORDS: SULFUR DIOXIDE;SULFUR TRIOXIDE;SULFURIC ACID;MONITORING;SULFATES;COAL;PETROLEUM;ENVIRONMENTAL TRANSPORT;COMBUSTION KINETICS;BOILER FUEL;HYDROCARBONS;WATER

<071805>
TITLE: Northrop Services, Inc.
PROJECT NUMBER: G712B-BB-15
PRINCIPAL INVESTIGATOR: Coloff, S.
ADDRESS: 6025 Technology Drive, Huntsville, AL 35807
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, Marijon

TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (50%);PARTICULATES/Dust (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Conduct field study.
APPROACH: The contractor, Northrop Services Inc., operates and maintains government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research, (2) stationary source emissions research, (3) gas kinetics and physics research, (4) special techniques research, (5) aerosol research, (6) air instrumentation development and testing, (7) fluid modeling facility operation and testing, and (8) sampling and analysis methods research.
PROJECT MILESTONES: 08/78 Report on field study.
KEYWORDS: US EPA;RESEARCH PROGRAMS;AIR POLLUTION;POLLUTION CONTROL;AEROSOLS;PARTICLES;SULFUR DIOXIDE;NITROGEN OXIDES;ENVIRONMENT

<071806>
TITLE: Biogenic Emission of Aerosol Precursors
PROJECT NUMBER: G-712B-BB-16
PRINCIPAL INVESTIGATOR: Spiller, L.L.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Wilson, W.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/NOx (60%);ORGANICS/Microbiological (40%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To determine the contribution of naturally occurring bacterial sources to the total atmospheric sulfur load. Select monitoring sites showing good promise of biogenic sulfur production with a clean reference site nearby. Monitor atmospheric sulfur levels at selected sites along with meteorological data. (Wind speed, wind direction and temperature.) Correlation of sulfur levels with natural cycles (tides, day/night and seasonal). Design a simple and inexpensive method of measuring ambient NO2 levels in the atmosphere.
APPROACH: Development of specially treated filters to selectively absorb different volatile sulfur and NOx compounds. Collect laboratory data on efficiencies of collection, effects of temperature, humidity, various volatile sulfur selectivities, ease and accuracy of analysis at low levels. Development of a field collection system with high portability.
RESULTS: (a) A method of collection of volatile sulfur compounds using selective filters treated with various silver salts and (OH-) anions were tested in regard to effect of temperature and humidity on collection efficiency. AgNO3 treated filters were selected for H2S absorption and LiOH treated filters for SO2 absorption. X-ray fluorescence is used for analysis. (b) Further laboratory testing will be done on these filters to determine performance limits regarding air temperature, humidity, flow rate, selectivity, and sulfur load extremes and to compare XRF non-destructive analysis with other destructive wet methods of higher accuracy but greater costs. (D.F. Natusch Method) (c) Design instruments and interface circuitry to support environmental studies anticipated in the near future.
PROJECT MILESTONES: 9/80 Final Report.
KEYWORDS: AEROSOLS;SULFUR DIOXIDE;NITROGEN OXIDES;MICROORGANISMS;NITROGEN DIOXIDE;AIR FILTERS;DATA ACQUISITION;MOBILITY;LABORATORY EQUIPMENT;MINERAL CYCLING;PERFORMANCE TESTING;ENVIRONMENTAL TRANSPORT

<071807>
TITLE: Design of Stack Sampling System with Dilution
PROJECT NUMBER: G-712B-BD-16
PRINCIPAL INVESTIGATOR: Heinsohn, R.J.
ADDRESS: University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Knapp, Ken
TYPE OF FUNDING: Grant No.-R803560 03
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The specific objective of the proposal is to design, develop and test a stack sampling system in which the sample is diluted with air in order to simulate source emissions at ambient conditions.
APPROACH: The performance of the system will be compared directly to the performance of a typical conventional system.
RESULTS: Direct comparison tests will be conducted to determine the effect of dilution on: (a) mass of the

particulate matter; (b) size distribution of the particulate matter; (c) chemical composition of the particulate matter.
PROJECT MILESTONES: 6/77 Final Report.
KEYWORDS: STACK DISPOSAL;FLUE GAS;SAMPLING;FOSSIL-FUEL POWER PLANTS;DILUTION;DUSTS;PARTICLES;AEROSOLS;EARTH ATMOSPHERE;SIMULATION;AEROSOL MONITORING;DESIGN;PERFORMANCE;PARTICLE SIZE;CHEMICAL COMPOSITION

<071808>
TITLE: Development of In-Stack and Remote Plume Opacity Measurement Technology
PROJECT NUMBER: G-712B-BA-17
PRINCIPAL INVESTIGATOR: Conner, W.D.
ADDRESS: Environmental Sciences Research Lab, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Nader, J.C.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this task is to develop technology for plume opacity measurement both in-stack and remote and to evaluate the application to various industrial sources.
APPROACH: Simultaneous plume opacity measurements are made at a selected site by in-stack transmissometers, remote methods such as lidar, visual observers, sun photometer, and telephotometers. Particulate loadings are determined by EPA Reference Method 5 to provide information on possible correlation between mass and opacity for various types of emissions.
RESULTS: Studies have been conducted on a series of sources including coal and oil-fired power plants, portland cement plants, kraft recovery furnace and a phosphate fertilizer plant. Reports on tests and technology are available or are being prepared. Additional measurement method development and evaluation will continue.
PROJECT MILESTONES: 7/77 Report on effect of weather on plume opacity measurement.
KEYWORDS: PLUMES;OPACITY;MEASURING METHODS;TECHNOLOGY UTILIZATION;REMOTE SENSING;OPTICAL PROPERTIES;MASS TRANSFER;FOSSIL-FUEL POWER PLANTS;FLUE GAS;ENVIRONMENTAL IMPACTS;WEATHER;INDUSTRY;FURNACES;FERTILIZERS;PHOSPHATES;MONITORING;PARTICLES;AEROSOLS;STACK DISPOSAL

<071809>
TITLE: Evaluation of a System for Direct Output of Pollutant Mass Emission Rate Data
PROJECT NUMBER: G-712B-BA-18
PRINCIPAL INVESTIGATOR: Rollins, R.
ADDRESS: Environmental Sciences Research Lab, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (50%);PARTICULATES/Dust (50%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this task are to evaluate a commercially available monitoring system which provides sulfur dioxide mass emission rate data as a direct output.
APPROACH: The system will be operated continuously for extended periods at a coal-fired power plant and a sulfuric acid production facility. Field performance will be verified by comparing output data with the results obtained by EPA reference method tests.
RESULTS: Currently, field evaluation at the power plant has been completed without any major malfunctions. The system's accuracy was found to be about 17 percent relative to the compliance tests. Evaluation of the sulfuric acid plant is in progress.
PROJECT MILESTONES: 11/76 Complete evaluation of H_2SO_4 plant.
KEYWORDS: SULFUR DIOXIDE;MONITORING;AIR POLLUTION MONITORS;COMMERCIALIZATION;COMPARATIVE EVALUATIONS;SULFURIC ACID;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL IMPACTS;PARTICLES;MEASURING INSTRUMENTS;QUANTITATIVE CHEMICAL ANALYSIS;PERFORMANCE

<071810>
TITLE: Develop Calibration and Analysis Techniques for XRF Analysis of Sulfur and Toxic Elements
PROJECT NUMBER: G-712B-BE18
PRINCIPAL INVESTIGATOR: Stevens, R.K.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Stevens, R.K.
TYPE OF FUNDING: Agency in-house effort
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (40%);PARTICULATES/Dust (30%);SPECIFIED OTHER POLLUTANTS/Toxics (30%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND

MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To collect aerosols in a variety of geographic locations in the United States. Aerosols are collected with dichotomous samplers and analyzed for elemental content by x-ray fluorescence.
'ROACH: The sulfur measurements are compared with sulfate measurements made by wet chemical procedures to determine (1) ratio of sulfates in the fine and coarse aerosols and (2) whether XRF sulfur measurements are directly correlated with ion-chromatographic measurements for sulfates.
RESULTS: Samples are being collected in a variety of locations, and are being analyzed for elemental sulfate, H+ and NH4/sup +/ content. As a result of these studies it is concluded that sulfur in the fine particle fraction is in the form of ammonium sulfate. A procedure has been developed which permits quantitative extraction of sulfate and sulfite from Fluoropore filters without converting the sulfite to sulfate. Studies are continuing to collect aerosol samples at a large number of urban and rural sites across the United States to determine the ratio of elements in the fine and coarse fractions with particular emphasis on the sulfate distribution.
PROJECT MILESTONES: 2/77 Final Report.
KEYWORDS: AEROSOLS;PARTICLES;NITROGEN OXIDES;SULFUR DIOXIDE;TOXICITY;DUSTS;AIR POLLUTION MONITORS;X-RAY FLUORESCENCE ANALYSIS;CALIBRATION;SULFATES;PARTICLE SIZE

<071811>
TITLE: Identification and Characterization of SO2 Sources Using Remote Sensors
PROJECT NUMBER: G-712B-BA-19
PRINCIPAL INVESTIGATOR: Rollins, R.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this task is to evaluate the viability of a prototype remote SO2 sensor for surveillance and enforcement applications.
APPROACH: A performance data base will be obtained through studies at the stationary source simulator facility and field tests at a coal-fired power plant.
RESULTS: Currently, a preliminary laboratory evaluation was performed to verify those performance specifications claimed by the manufacturer. Results of those studies were reported, indicating the design of the JRB prototype system was unacceptable due to several malfunctions including gas cell leakage, lack of sensitivity, and electronic drift. At this time, no further effort will be pursued with the JRB system. Future efforts will be contingent upon the success of evaluations by the Special Techniques Group on a more recent prototype development by SAI.
PROJECT MILESTONES: (1) 8/77 Experimental design of COSPEC/JRB study at urban point source.
KEYWORDS: EMISSIONS;INSTRUMENTATION;ENFORCEMENT;SULFUR DIOXIDE;MONITORING;REMOTE SENSING;STATIONARY POLLUTANT SOURCES;FOSSIL-FUEL POWER PLANTS;AIR POLLUTION;ENVIRONMENTAL IMPACTS;AIR POLLUTION MONITORS;PERFORMANCE;AIR;SULFUR COMPOUNDS

<071812>
TITLE: Study of the Chemistry of Ion Selective Electrodes and Its Application to Quasi-Real Time Monitoring of Particulate Nitrates in the Atmosphere
PROJECT NUMBER: G-712-B-BE-19
PRINCIPAL INVESTIGATOR: Moyers, J.J.;Freiser, H.
ADDRESS: Tucson, AZ 85721
AFFILIATION: Arizona Univ., Tucson (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Mulik
TYPE OF FUNDING: Grant No.-R80338902-2
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Investigations are being conducted on the utility of ion selective electrodes for measurement of atmospheric particulate nitrate concentrations. This program which has been conducted for the past 18 months has provided substantial information regarding nitrate electrode chemistry.
APPROACH: Over 100 particulate samples have been measured with various types of selective electrodes and the obtained results compared with other nitrate measurement techniques. This work will be extended to include organic carbon measurement and characterization on similar samples.
RESULTS: The methodology which will be developed to meet these objectives includes various oxidation techniques and selective solvent extraction coupled with high performance liquid chromatography. Included in these efforts will be a detailed evaluation and comparison of the results obtained from the different oxidation techniques using a variety of sample types.
PROJECT MILESTONES: 78/1 Final report.
EYWORDS: AEROSOL MONITORING;NITRATES;PARTICLES;AEROSOLS;ION SELECTIVE ELECTRODE ANALYSIS;SOLVENT EXTRACTION;CHROMATOGRAPHY;CARBON;HYDROCARBONS;OXIDATION;AIR POLLUTION MONITORS;DESIGN;EARTH ATMOSPHERE

<071813>
TITLE: Evaluation of Sulfuric Acid Dewpoint Monitor
PROJECT NUMBER: G-712-B-BA-20
PRINCIPAL INVESTIGATOR: Cheney, J.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (50%);PARTICULATES/Sulfates (50%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this task are to evaluate the utility of measuring the sulfuric acid dewpoint temperature as an indirect measurement of the sulfuric acid concentration in combustion source emissions.
APPROACH: A laboratory study will investigate the adequacy of existing empirical relationships between acid dewpoint and concentration. A commercially available dewpoint monitor will be used in conjunction with a gas phase H_2SO_4 generator in the laboratory. The monitor will then be used in the field and results will be compared with the isopropanol absorption and controlled condensation methods for SO_3/H_2SO_4 determinations.
RESULTS: Currently, a laboratory evaluation of the system has been completed. Comparative field data have also been obtained at residual oil-fired sources which indicate the applicability of calibrated dewpoint probe. Future studies will be made to determine the viability of the method as applied to coal, gas turbine, and advanced power generation combustion processes.
PROJECT MILESTONES: 76/12 Field evaluation at oil fired boilers.
KEYWORDS: SULFURIC ACID;AIR POLLUTION MONITORS;SULFATES;SULFUR DIOXIDE;DEW POINT;HUMIDITY;VAPOR CONDENSATION;AIR POLLUTION;AEROSOL MONITORING;ECOLOGICAL CONCENTRATION;POWER GENERATION;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL IMPACTS;COAL;TECHNOLOGY TRANSFER

<071814>
TITLE: Development and Testing of Instrumental Techniques for Nitrogen Containing Compounds
PROJECT NUMBER: G-712-B-BE-20
PRINCIPAL INVESTIGATOR: Stevens, R.K.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: McClenny, W.A.
TYPE OF FUNDING: Agency in-house effort
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/ (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To sustain an active and forward-looking development and testing activity related to the monitoring of nitrogen containing compounds in ambient air.
APPROACH: To set up laboratory experiments in which new detection techniques can be evaluated and in which advanced techniques can be improved. Specifically, physical techniques involving the creation of light due to molecular interaction (chemiluminescence) has proved a sensitive, simple and low cost approach to monitoring certain nitrogen containing compounds. With previous work as a basis, different aspects of the chemiluminescence technique are being improved. The feasibility of other techniques, which provide advantages in some aspect of measurement, is being investigated.
RESULTS: Current plans include: (1) the investigation of new NO2 to NO converter designs in chemiluminescence monitors; (2) investigation of water vapor effects in commercial chemiluminescence monitors; (3) feasibility studies of NH3 detection by chemiluminescence and opto-acoustic techniques; (4) feasibility studies of long paths systems for NO measurements. Progress during the past year includes: (1) the evolution of an ambient NH3 monitor using chemiluminescence techniques; (2) the evolution of a design for an opto-acoustic for sensitive NH3 detection; (3) characterization studies of the detection of PAN by chemiluminescence techniques.
PROJECT MILESTONES: 78 Testing of GC detector for nitrogen containing compounds complete.
KEYWORDS: AIR POLLUTION;NITROGEN OXIDES;AIR POLLUTION MONITORS;AEROSOL MONITORING;CHEMILUMINESCENCE;FEASIBILITY STUDIES;AMMONIA;ORGANIC NITROGEN COMPOUNDS;PAN

<071815>
TITLE: Elemental Quantitative Analysis of Air Particulate Matter by Proton Scattering
PROJECT NUMBER: G-712-B-BE-21
PRINCIPAL INVESTIGATOR: Nelson, J.W.
ADDRESS: Tallahassee, FL 32306
AFFILIATION: Florida State Univ., Tallahassee (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dzubay, T.G.
TYPE OF FUNDING: Grant No.-R802913-03
77 FUNDING: Environmental Protection Agency FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/ (50%);SPECIFIED OTHER POLLUTANTS/Multiple (50%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND

MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Develop technique for performing complete elemental analysis of aerosol particles.
APPROACH: Collect aerosols on thin Nuclepore filters. Use existing x-ray techniques to determine elements with atomic numbers above 12. Develop new proton scattering technique, to determine the concentrations of elements with atomic numbers between 1 and 16. Use tandem Van de Graaff accelerator to accelerate protons to an energy of 16 MeV. Pass the proton beam through the sample, and observe the spectrum of scattered protons using a solid state detector. Deduce the amount of each element from analysis of the spectrum.
RESULTS: All facets of the method have been developed, and initial field testing has begun. Limited tests show that only about 70 percent of the gravimetric mass can be accounted for by the sum of the elemental components. Tests are to be conducted to determine if the remaining 30 percent is a volatile water component.
PROJECT MILESTONES: 77/2 Final report.
KEYWORDS: AEROSOL MONITORING;QUANTITATIVE CHEMICAL ANALYSIS;EARTH ATMOSPHERE;AIR POLLUTION;SULFUR DIOXIDE;NITROGEN OXIDES;ENVIRONMENTAL TRANSPORT;PARTICLES;AEROSOLS;AIR FILTERS;FILTRATION;PARTICLE SIZE;PROTON SPECTRA;PROTON BEAMS

<071816>
TITLE: Obtain High Resolution Spectra of H2SO4 in Gas Phase
PROJECT NUMBER: G-712B-BA-22
ADDRESS: 38 Hartwell Ave., Lexington, MA 02173
AFFILIATION: Laser Analytics, Inc., Lexington, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Jahnke
TYPE OF FUNDING: Contract No.-68-02-2482
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (50%);PARTICULATES/Sulfates (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The purpose of the contract is to identify line positions and line strengths of the sulfuric acid vapor spectrum in regions free from interference, for eventual consideration in the development of a prototype sulfuric acid monitoring system.
RESULTS: Two diode lasers are to be delivered at the end of the contract period for use in existing EPA diode laser instrumentation.
PROJECT MILESTONES: (1) 4/77 Interim Report. (2) 8/77 Final Report.
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;SULFURIC ACID;VAPORS;MEASURING METHODS;SURFACE AIR;MONITORING;LASERS

<071817>
TITLE: Development of a Two Stage Particle Fractionator by Filtration Through Nuclepore Sciences
PROJECT NUMBER: G-712-B-BE-22
PRINCIPAL INVESTIGATOR: Buzzard, G.H.
ADDRESS: Durham, NC 27706
AFFILIATION: Duke Univ., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Science Research Laboratory
MONITOR: Dzubay, T.G.
TYPE OF FUNDING: Grant No.-R803018-03
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Develop an aerosol sampling technique consisting of Nuclepore filters in series that enables respirable and nonrespirable particles to be separately collected.
APPROACH: Use 12 mu m Nuclepore filters to collect particles in the nonrespirable fraction, and use an appropriate high efficiency polycarbonate or Teflon filter to collect the respirable particles, which penetrate the first filter. Develop theoretical model to predict the efficiency curve for the 12 mu m Nuclepore filter, and use this model to predict the operating conditions that allow a best match to the ACGIH curve for respirable sampling. Test model using monodisperse aerosols produced in a vibrating orifice generator.
RESULTS: Measure collection efficiency curves using both solid and liquid particles to determine any dependence on particle type. Investigate the extent to which particle loading might affect the collection efficiency. Work to date indicates that there is no change for modest particle loadings.
PROJECT MILESTONES: 78 Final report.
KEYWORDS: DUSTS;PARTICLES;AEROSOLS;FILTRATION;SAMPLING;AIR FILTERS;PARTICLE SIZE;EFFICIENCY;SOLIDS;AQUEOUS SOLUTIONS

<071818>
TITLE: Develop Optical Techniques for Aerosol Sizing
PROJECT NUMBER: G-712-B-BE-24
PRINCIPAL INVESTIGATOR: Lewis, C.W.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lewis, Charles W.
TYPE OF FUNDING: Agency in-house effort
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH (50%);FULL SCALE DEMONSTRATION (30%);ANALYTICAL (20%)

REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: The objective is to develop an ambient aerosol particle sizing system to operate in the 0.3 to 10 mu m domain, in real time, and with the output in the form of differential volume versus the logarithm of particle size (the ''bimodal'' representation).
APPROACH: The sensor of a commercial light scattering aerosol spectrometer is connected to a pulse-type analog to digital converter (ADC) via a microcomputer, which controls the ADC, and stores its output in a bimodal representation prior to teletype printout.
RESULTS: The system is in its final stages of fabrication and testing.
PROJECT MILESTONES: 78 Delivery of instruments.
KEYWORDS: PARTICLE SIZE;AEROSOL MONITORING;OPTICAL PROPERTIES;AEROSOLS;DUSTS;SPECTROSCOPY;COMPUTER OUTPUT DEVICES;READOUT SYSTEMS;FABRICATION;TESTING

<071819>
TITLE: Development of Particulate Emissions Sampling Technology
PROJECT NUMBER: G-712B-BA-26
PRINCIPAL INVESTIGATOR: Knapp, K.T.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this task are to develop sampling interfaces and study these and other interfaces with various particulate emissions sampling devices and measurement systems.
APPROACH: The various components of the sampling systems will be carefully evaluated. This includes nozzles, probes, both standard and boundary layer dilution, filter types and sizes and gas flow measuring systems.
RESULTS: Currently, a boundary layer dilution probe is being tested both at the stationary source simulator and in the field at oil-fired and coal-fired power plants. Special sampling boxes for temperature control have been built and are now being used with various sampling devices.
PROJECT MILESTONES: 7/77 Report on the use of quantitative transport probe as an interface for particulate mass monitors.
KEYWORDS: PARTICLES;AEROSOLS;SAMPLING;AEROSOL MONITORING;TECHNOLOGY ASSESSMENT;TEMPERATURE EFFECTS;AIR POLLUTION MONITORS;AIR POLLUTION

<071820>
TITLE: Study of Interface Problems in Sampling and Measurement of Particulate Pollutants in Hot Stack Bases
PROJECT NUMBER: G-712B-BA-28
PRINCIPAL INVESTIGATOR: Lundgren, D.A.
ADDRESS: Department of Environmental Engineering, Gainesville, FL 32611
AFFILIATION: Florida Univ., Gainesville (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Knapp
TYPE OF FUNDING: Grant No.-R8033692-03
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this research is to study the interface problems associated with extractive sampling and measurement of particulate pollutants in hot stack gases.
APPROACH: A careful study and analysis of known or suspected problem areas will first be undertaken. Certain important problem areas will be selected and studied experimentally in order to define and understand the causes. Solutions to or ways to minimize these problems will then be found and described.
RESULTS: A study of problem areas has been made. Particulate sampling errors due to tangential flow have been experimentally studied in the laboratory. A report entitled ''Isokinetic Sampling of Turbulent and Tangential Flow Streams'' has been prepared and submitted to EPA. An experimental evaluation of in-stack impactors is now being conducted.
PROJECT MILESTONES: 10/77 Final Report.
KEYWORDS: PARTICLES;AEROSOLS;AEROSOL MONITORING;PARTICLE SIZE;STACK DISPOSAL;SAMPLING;MONITORING;AIR POLLUTION MONITORS;TECHNOLOGY ASSESSMENT;QUALITY ASSURANCE;CASCADE IMPACTORS;ERRORS

<071821>
TITLE: Develop and Test Improved Methods for Measuring CO, Hydrocarbons and Halogenated Hydrocarbons
PROJECT NUMBER: G-712B-BE-35
PRINCIPAL INVESTIGATOR: McClenny, W.A.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: McClenny, W.A.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)

POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
OJECT DESCRIPTION: To sustain an active and forward-looking development and testing activity related to the monitoring of carbon monoxide, hydrocarbons and halogenated hydrocarbons.
APPROACH: To set up laboratory experiments in which new detection techniques can be evaluated and in which advanced techniques can be improved. Optical techniques based on the absorption of radiation at characteristic wavelengths are currently receiving attention as an alternative to the more established techniques involving flame ionization detection.
RESULTS: Current plans include: (1) continued evaluation of the gas filter technique for carbon monoxide and various hydrocarbons; (2) feasibility studies on the use of an opto-acoustic detector for ambient gases; (3) improvement of the flame ionization approach to non-methane hydrocarbon measurement. Progress during the past year includes: (1) field testing (successful) of the prototype CO monitor based on gas filter correlation; (2) feasibility testing of a combination gas chromatograph and opto-acoustic detector to demonstrate the separation and detection of typical infrared absorbing compounds.
PROJECT MILESTONES: 5/77 Measure ambient freons with opto-acoustic detector.
KEYWORDS: CARBON MONOXIDE;HYDROCARBONS;ORGANIC HALOGEN COMPOUNDS;CHEMICAL ANALYSIS;MEASURING METHODS;DESIGN;TESTING;AIR POLLUTION

<071822>
TITLE: Coordination of Test Programs and Modifications and Improvements to the Stationary Source Simulator Facility
PROJECT NUMBER: G712B-BA-36
PRINCIPAL INVESTIGATOR: Rollins, R.
ADDRESS: Environmental Sciences Research Lab., Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/CO;NOXIOUS GAS/CO2 (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this task are to coordinate activities involving test programs, maintenance and operation of the Stationary Source Simulator Facility, upgrade source reference instrumentation and install an ambient air monitoring system for personnel safety.
APPROACH: The SSSF will be modified to incorporate an in-situ monitoring system for SO2, NO, CO and CO2. Ambient air monitors for SO2, NO and CO will be installed to allow for continuous monitoring of ambient air in the testing area. This monitoring system will include an alarm feature to alert personnel of potential hazardous conditions.
RESULTS: Currently, required monitors have been procured and are scheduled to be installed in the near future.
PROJECT MILESTONES: 03/77 Installation of EDC Source Monitoring System.
KEYWORDS: STATIONARY POLLUTANT SOURCES;MONITORING;SIMULATION;NITROGEN OXIDES;SULFUR DIOXIDE;AIR POLLUTION;EARTH ATMOSPHERE;AIR POLLUTION MONITORS;CARBON MONOXIDE;CARBON DIOXIDE;PERSONNEL;SAFETY;PERFORMANCE TESTING;OPERATION;DESIGN

<071823>
TITLE: Evaluate an Improved Manual Particle Size Fractionator
PROJECT NUMBER: G-712-B-BE-36
PRINCIPAL INVESTIGATOR: McFarland, A.R.
ADDRESS: P.O. Box H, College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA). Research Foundation
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lewis, C.W.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To evaluate and improve the performance of the Dichotomous Virtual Impactor Aerosol Sampler.
APPROACH: A Dichotomous Sampler is a device for collecting ambient aerosol samples in two size ranges, consisting of particles whose aerodynamic diameter is less than, and greater than, 3.5 mu m. A crucial factor in obtaining quantitative results with such samplers is the knowledge of sampling efficiency, as it depends on both particle size and wind speed. Both mathematical modelling and wind tunnel tests are being used to obtain this information.
RESULTS: A long series of wind tunnel tests of alternative aerosol inlet heads has resulted in a head design which exhibits the generally favorable characteristics of high sampling efficiency up to about 20 mu m, and minimal wind speed dependence. A mathematical modelling study will next be performed to better understand the results so far obtained largely by empirical means, and which will make possible the design of future instruments employing the dichotomous principle at other flow rates and cut-points. In particular an experimental investigation will be made of a virtual impactor with a 0.1 mu m cut-point.
PROJECT MILESTONES: 78 Final report.
KEYWORDS: PARTICLE SIZE;DUSTS;AEROSOLS;AIR SAMPLERS;EARTH ATMOSPHERE;EFFICIENCY;DESIGN;PERFORMANCE TESTING;CASCADE IMPACTORS;AEROSOL MONITORING

<071824>
TITLE: Research on Air Sampling Filter Media
PROJECT NUMBER: G-712-B-BE-37
PRINCIPAL INVESTIGATOR: Liv, B.Y.H.
ADDRESS: University of Minnesota, Minneapolis, MN 55455
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
MONITOR: Dzubay, Tom
TYPE OF FUNDING: Grant No.-R804600-01
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The primary objective of this program is to study air sampling filter media and to evaluate the available commerical filter media in terms of their sampling efficiency, resistance to flow, dust holding capacities, moisture retention characteristics, and other physical properties of interest.
APPROACH: All major commercial filter media will be studied.
RESULTS: The end result of the project will be the preparation of a ''Filter Handbook'' in which the major filter characteristics are described. In addition, a concurrent study will be undertaken to relate the sampling efficiency and flow resistance of flters to those predicted by theory. Also, the ''series filter'' method will be studied as a possible alternative to the dichotomous sampler for separating atmospheric particles into a fine and a course fraction with a cut point near 2.0 mu m.
PROJECT MILESTONES: 79/12 Final report.
KEYWORDS: EARTH ATMOSPHERE;SAMPLING;AIR FILTERS;EFFICIENCY;PHYSICAL PROPERTIES;SAMPLERS;COMPARATIVE EVALUATIONS;AEROSOLS;PARTICLE SIZE

<071825>
TITLE: Develop Aerosol Size Distribution Monitor Using Acoustical Laser Doppler Effect
PROJECT NUMBER: G-712B-BE-39
PRINCIPAL INVESTIGATOR: Testerman, M.K.
ADDRESS: Graduate Institute of Technology, P.O. Box 3017, Little Rock, AR 72203
AFFILIATION: Arkansas Univ., Little Rock (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lewis, Charles W.
TYPE OF FUNDING: Grant No.-R804429-02
77 FUNDING: Environmental Protection Agency FY77:$33,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To develop an ambient aerosol particle size spectrometer capable of measuring in real-time the aerodynamic size distribution in the range 0.05 to 25 mu m diameter.
APPROACH: The measurement method consists of (1) causing individual aerosol particles to oscillate in a sinuscidally varying acoustical field, and (2) measuring by means of a laser Doppler technique the phase lag of each particle's motion relative to the acoustical excitation, with the phase lag being directly related to the aerodynamic size of the particle.
RESULTS: At the end of the first year's work a first prototype spectrometer has been built which is able to measure aerodynamic size distributions in the 0.3 to 5 mu m range. During the second year the prototype's performance will be evaluated, and basic research will be performed to investigate the most feasible method for extending the size range. During the third year a second prototype will be built which should meet the original objective.
PROJECT MILESTONES: 79 Final report.
KEYWORDS: AEROSOLS;PARTICLE SIZE;AIR POLLUTION MONITORS;DESIGN;AEROSOL MONITORING;ACOUSTIC MONITORING;DOPPLER EFFECT;LASERS;DUSTS;EARTH ATMOSPHERE

<071826>
TITLE: Development of Nonextractive Electro-Optical Instrument for NOx Emission Analysis
PROJECT NUMBER: G-712B-BA-40
PRINCIPAL INVESTIGATOR: Yoder, J.R.
ADDRESS: P.O. Box 2351, La Jolla, CA 92038
AFFILIATION: Science Applications, Inc., La Jolla, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Herget, William F.
TYPE OF FUNDING: Contract No.-68-02-2490
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO;NOXIOUS GAS/NOx (50%);PARTICULATES/Nitrates (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Design, fabricate and conduct laboratory evaluations and calibrations of a nonextractive electro-optical system for measurement of path-averaged concentrations of NO and NO2 and gas temperature

in a gas turbine exhaust plume.
APPROACH: The approach taken is the use of gas filter correlation for NO and NO2 measurement and infrared radiometry for temperature measurement.
JECT MILESTONES: 10/77 Delivery of NO/NO2 instrument.
WORDS: NITROGEN OXIDES;CHEMICAL ANALYSIS;AIR POLLUTION MONITORS;DESIGN;INFRARED SPECTRA;OPTICAL PROPERTIES

<071827>
TITLE: Develop Analytical Techniques for Measurement of Nitric Acid
PROJECT NUMBER: G-712B-BE-41
PRINCIPAL INVESTIGATOR: Ross, W.D.
ADDRESS: Dayton Laboratory of Monsanto Corporation, Dayton, OH 45407
AFFILIATION: Monsanto Research Corp., Dayton, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
TYPE OF FUNDING: Contract No.-68-02-2466
77 FUNDING: Environmental Protection Agency FY77:$27,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS/Nitrates;NOXIOUS GAS/Nitrogen oxides (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The purpose of this contract is through a laboratory feasibility study to determine and develop a satisfactory technique for the measurement of ambient concentrations (less than 0.010 ppM of nitric acid).
APPROACH: The contractor will develop and evaluate an analytical method for the measurement of atmospheric nitric acid based on the nitration of an aromatic compound with subsequent analysis by electron capture gas chromatography.
RESULTS: The contractor is presently evaluating different types of scrubbers to remove other nitrogen containing gases such as nitrogen dioxide prior to the nitration step in the analysis procedure. The contractor has operating a nitric acid generator and electron capture GC. An alternate technique for nitric acid measurement is also being evaluated.
PROJECT MILESTONES: 79 Evaluation in the field complete.
KEYWORDS: NITRIC ACID;CHEMICAL ANALYSIS;NITRATES;NITROGEN OXIDES;AEROSOL MONITORING;MEASURING METHODS;SCRUBBERS;GAS CHROMATOGRAPHY

<071828>
TITLE: Development of GPC Instruments for Gaseous Pollutant Measurements
PROJECT NUMBER: G-712B-BA-42
PRINCIPAL INVESTIGATOR: Yoder, J.R.
ADDRESS: 1200 Prospect St., P.O. Box 2351, La Jolla, CA 92037
AFFILIATION: Science Applications, Inc., La Jolla, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Science Research Laboratory
MONITOR: Herget, William
TYPE OF FUNDING: Contract No.-68-02-1798
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/H2S (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To design, fabricate, field test and reduce the data for two infrared Gas Filter Correlation instruments for measurement of extended area stationary source gaseous pollutant emissions. One instrument will operate in the up-looking mode (single-ended, passive) to sense ambient temperature sulfur dioxide against the cold sky background. The second will operate in the open-path mode (double-ended, active) to sense sulfur dioxide, hydrogen sulfide, and vinyl chloride monomer at ground level. The design goals for each instrument are: sensitivity: 50 ppM-meters (nominal), dynamic range: two orders of magnitude, time constant: variable from 1 to 60 seconds.
APPROACH: To measure the infrared radiation emitted or absorbed by the pollutants and correlating this radiation by alternately passing it through a gas cell containing a sample of the specific pollutant to be detected and a reference cell which is transparent. This is the GFC technique which provides a highly specific measurement in the presence of interfering species. The passive, up-looking instrument will measure SO2 at 4.0 mu m. The active instrument will measure SO2 at 8.6 mu m, H2S at 7.9 mu m, and VCM at 10.9 mu m using an infrared source and a retroreflector.
RESULTS: To build and calibrate the two instruments over the next nine months and then to field test them in the vicinity of a coal-burning power plant.
PROJECT MILESTONES: 9/77 Final report.
KEYWORDS: STATIONARY POLLUTANT SOURCES;POLLUTION CONTROL EQUIPMENT;GASEOUS WASTES;SULFUR DIOXIDE;HYDROGEN SULFIDES;VINYL MONOMERS;AIR POLLUTION MONITORS;DESIGN;FABRICATION

<071829>
TITLE: Development of a Flashlamp-Induced Fluorescence Ambient Air NO2 Monitor
PROJECT NUMBER: G-712B-BE-42
PRINCIPAL INVESTIGATOR: Birnbaum, M.
ADDRESS: Electronics Research Laboratory, P.O. Box 92957, Los Angeles, CA 90009
AFFILIATION: Aerospace Corp., Los Angeles, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Paur, R.J.
TYPE OF FUNDING: Contract No.-68-02-2708
77 FUNDING: Environmental Protection Agency FY77:$87,000
TECHNOLOGY: FOSSIL FUEL/General (100%)

ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Develop a pulsed fluorescence monitor for NO2. The instrument should have a sensitivity of 2 ppb and should be suitable for airborne measurements.
APPROACH: Under EPA contract No. 68-02-2246 the Aerospace Corp. developed a laboratory prototype monitor with a sensitivity of 5 ppb of NO2.
RESULTS: The sensitivity of the prototype developed under EPA contract No. 68-02-2246 is to be improved to 2 ppb and the instrument is to be re-engineered into a package suitable for airborne measurements. Two instruments are to be delivered to EPA/RTP (ESRL-AIB). The contractors will also extend studies of the instruments response to possible interferents. To date no significant interferences with the measurement technique have been found.
PROJECT MILESTONES: 78 Delivery of 2 improved units.
KEYWORDS: NITROGEN DIOXIDE;AIR POLLUTION MONITORS;DESIGN;EARTH ATMOSPHERE;AERIAL MONITORING;FLUORESCENCE

<071830>
TITLE: Investigate Interferences in Optical Infrared Measurement Techniques
PROJECT NUMBER: G-712B-BE-45
PRINCIPAL INVESTIGATOR: Patty, R.R.
ADDRESS: N.C. State University, Raleigh, NC 27607
AFFILIATION: North Carolina State Univ., Raleigh (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: McClenny, W.A.
TYPE OF FUNDING: Grant No.-R805332-01
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates (50%);PARTICULATES/Dust (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To sponsor the development of a research effort directed at the identification and quantification of gaseous and particulate absorbers in the infrared, particularly in the spectral region near 9 microns.
APPROACH: To fund a grant effort in which the optical technique of opto-acoustic detection is used to measure absorption coefficients of gaseous and particulate absorbers in the infrared and to quantify ambient concentrations of these absorbers. The approach is sufficiently new so that several feasibility experiments will be tried initially in order to determine the most effective research plan.
RESULTS: Current plans include: (1) initiate experiments to determine feasibility to begin in the summer of 1977; (2) finalization of first year research objectives as based on initial feasibility studies in the fall of 1977. Progress during the immediate past has consisted of the processing of a grant proposal.
PROJECT MILESTONES: 1/79 In-situ measurements of sulfates complete.
KEYWORDS: INFRARED SPECTRA;PARTICLES;OPTICAL PROPERTIES;FEASIBILITY STUDIES;AEROSOLS;SULFATES;SORPTIVE PROPERTIES;QUANTITATIVE CHEMICAL ANALYSIS;INTERFERENCE

<071831>
TITLE: Develop and Evaluate Monitors for Detection of Sulfur Containing Gaseous Compounds
PROJECT NUMBER: G-712B-BE-46
PRINCIPAL INVESTIGATOR: Stevens, R.K.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Stevens, R.K.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: DEVELOPMENT (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: The purpose of this project is to provide continuing information on the latest advances in the detection of gaseous sulfur compounds to provide a basis for projection of future needs in instrumentation and to have expertise available to users of existing instruments.
APPROACH: This project will combine evaluation of prototype monitors of gaseous sulfur as well as development activity to meet the future needs.
RESULTS: A highly sensitive FPD total sulfur analyzer has been under evaluation for the past eight months and results indicate a sensitivity of less than 1 ppb. Interfacing this sensitive monitor to a gas chromatograph for resolution of a variety of sulfur compounds at the sub ppb level is underway.
PROJECT MILESTONES: 78 Evaluation of sensitive SO2 monitors complete.
KEYWORDS: AIR POLLUTION MONITORS;TECHNOLOGY ASSESSMENT;SULFUR DIOXIDE;SULFATES;AEROSOL MONITORING;GASEOUS WASTES;EARTH ATMOSPHERE;EVALUATION

<071832>
TITLE: Develop Tapered Element Oscillating Micro Balance (TEOM) for Ambient Mass Measurement
PROJECT NUMBER: G-712B-BE-47
PRINCIPAL INVESTIGATOR: Patashnick, H.
ADDRESS: Plaza 7, 1202 Troy Schenectady Road, Latham, NY 12110
AFFILIATION: Dudley Observatory, Latham, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lewis, Charles
TYPE OF FUNDING: Grant No.-R805222-01
77 FUNDING: Environmental Protection Agency FY77:$19,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To develop an instrument for real-time measurement of ambient aerosol mass associated with respirable aerosol particles.
APPROACH: A newly developed device, tapered element oscillating microbalance (TEOM), similar to a classical quartz crystal microbalance, but without many of the latter's problems, will be mated to a dichotomous virtual impactor. The impactor segregates particles whose aerodynamic diameter is less than 3.5 microns, and whose accumulated mass is subsequently measured with the TEOM.
RESULTS: Work is expected to begin by August 1977. During the first year of work a TEOM especially suited to incorporation in a dichotomous impactor will be developed. A completed TEOM-impactor system is expected to be available and laboratory tested by the end of the second year.
PROJECT MILESTONES: 9/77 Phototype completed.
KEYWORDS: QUARTZ CRYSTAL MICROBALANCE;AEROSOLS;PARTICLE SIZE;AIR POLLUTION MONITORS;DESIGN;MASS DIFFERENCE;MEASURING METHODS;MICROBALANCES

<071833>
TITLE: Feasibility Study of Giant Aerosol Particle Sizing by Holography
PROJECT NUMBER: G-712B-BE-48
PRINCIPAL INVESTIGATOR: Trolinger, J.D.
ADDRESS: 3303 Harbor Boulevard, Suite C-3, Costa Mesa, CA 92626
AFFILIATION: Spectron Development Labs., Inc., Costa Mesa, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Science Research Laboratory
MONITOR: Lewis, Charles
TYPE OF FUNDING: Contract No.-68-02-2491
77 FUNDING: Environmental Protection Agency FY77:$9,600
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);SPECIFIED OTHER POLLUTANTS/Multiple (50%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To investigate the feasibility of measuring ambient aerosol size and shape distributions in the range 1-100 mu m by means of holographic recording and image analysis.
APPROACH: Holographic recording has previously been demonstrated as a method of measuring aerosol particle size and shape distributions in the super-micron size regime. Its chief advantage is that it is a true in situ method, not depending on intake of the aerosol into the measuring instrument, and thus avoids the severe sampling efficiency problems which plague super-micron measurements. Analysis of the resulting holograms is very tedious however, and limits the usefulness of the method. This study investigates the degree to which the holographic analysis can be automated by use of a commercial image analyzer (IMANCO Quantimet).
RESULTS: Work is expected to begin in May 1977. Holograms will be made of a series of laboratory generated aerosols and field acquired aerosols. The holograms will be analyzed on a Quantimet image analyzer which has been modified to accept a holographically generated image.
PROJECT MILESTONES: 2/77 Final report.
KEYWORDS: AEROSOL MONITORING;PARTICLE SIZE;HOLOGRAPHY;FEASIBILITY STUDIES;SHAPE;EARTH ATMOSPHERE;IN-SITU PROCESSING;MONITORING

<071834>
TITLE: Determination of SO2 Mass Emission Rates by Remote Sensing
PROJECT NUMBER: G-712B-BA-59
PRINCIPAL INVESTIGATOR: Sperling, R.B.
ADDRESS: 215 Leidesdorff St., San Francisco, CA 94111
AFFILIATION: Environmental Measurements, Inc., San Francisco, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Herget, William F.
TYPE OF FUNDING: Contract No.-68-02-2711
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The project objective is to determine the relative accuracy of remotely measured SO2 mass emission rates from a power generating station with respect to standard reference methods.
APPROACH: Under a preceding contract, two types of remote sensing air quality instruments (spectrometers) were used to measure fence-line vertically integrated burdens of SO2. Concurrent wind velocity

measurements were made by means of a laser Doppler velocimeter, a tethersonde and pilot balloon. The current contract will provide two stages of data evaluation: data processing and data analysis. The SO2 mass emission rates will be calculated from the SO2 and wind data. Comparisons of these results will be made with in-stack and cross-stack results.
RESULTS: An analysis will be made of the effect on accuracy made by each wind measuring system.
PROJECT MILESTONES: 9/77 Final report.
KEYWORDS: SULFUR DIOXIDE;AEROSOL MONITORING;REMOTE SENSING;AIR POLLUTION;FOSSIL-FUEL POWER PLANTS;MASS SPECTRCMETERS;COMPARATIVE EVALUATIONS;LASERS;METEOROLOGY;EARTH ATMOSPHERE;FLUE GAS

<071835>
TITLE: Development of a Portable Lidar Plume Opacity Instrument
PROJECT NUMBER: G-712B-BA-61
ADDRESS: Menlo Park, CA 94025
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader
TYPE OF FUNDING: Contract No.-68-02-1291
77 FUNDING: Environmental Protection Agency FY77:$8,100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);VISUAL AESTHETICS (50%)
CHARACTER OF STUDY: DEVELOPMENT (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This contract is for continuation of the development of the CW lidar method into a portable instrument for remote measurement of plume opacities suitable for use by Air Pollution Control Agencies.
APPROACH: The visibility of plumes and particulate emissions are regulated by plume opacity standards. It is probably the oldest and most used method for regulating particulate emissions to the atmosphere from stationary sources. Compliance with these standards is usually determined by the subjective evaluation of plume opacities by trained visible emissions observers. To improve the accuracy and objectivity of the opacity determination, an instrumental method is needed. Pulsed lidar has been used as an effective instrumental method for remote measurement of plume opacity; however, its application has been restricted to opacity measurement research due to its cost, size and complexity. A recent study on the feasibility of developing a new lidar method that uses a low powered CW laser showed promise for developing the method into a small portable opacity measuring instrument for surveillance work by control agencies.
PROJECT MILESTONES: 3/77 Final report.
KEYWORDS: PULSED LIDAR;LABORATORY EQUIPMENT;MOBILITY;OPACITY;PLUMES;DUSTS;PARTICLES;AEROSOLS;REMOTE SENSING;POLLUTION CONTROL AGENCIES;STANDARDS;MEASURING INSTRUMENTS;DESIGN;LASERS;AIR POLLUTION MONITORS

<071836>
TITLE: SO2 and SO4 Methods Evaluation
PROJECT NUMBER: G-601B-CA-17
PRINCIPAL INVESTIGATOR: Tejada, S.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Bradow, Ronald L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (40%);PARTICULATES (30%);ORGANICS (30%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Provides for continuing support in methods evaluation and standardization for measurement of mobile source sulfur oxide emissions.
APPROACH: Analytical methods for sulfate and SO2 measurement from mobile sources have been well-developed over the last few years. Present approach involves refinement efforts in analytical finished, identification of diesel sulfates, standardization and sampling methods.
RESULTS: Recent work in ion-chromatography has permitted segregation of sulfate, sulfide, and sulfite in solution and has provided a routine means for cross-check of BCA color procedures. Evaluation of photometric and BCA methods in MSERB laboratories has shown that the methods give essentially identical results. The last series of collaborative testing (the 8th round-robin so far conducted) showed that all participating laboratories have worked out calibration biases; consequently, effective means now exist for measuring vehicular sulfuric acid emissions throughout the industry and government. Current plans include identification of the source of diesel sulfate emissions in experiments with pure hydrocarbons and further study of sampling methods.
PROJECT MILESTONES: 1977 Annual Report.
KEYWORDS: EMISSIONS;SULFUR DIOXIDE;SULFATES;AIR POLLUTION;MONITORING;CHEMICAL ANALYSIS;DIESEL FUELS;STANDARDS;SAMPLING;SULFIDES;SULFITES;ION EXCHANGE CHROMATOGRAPHY;CALIBRATION;VEHICLES;EXHAUST GASES;SULFURIC ACID;HYDROCARBONS;MEASURING METHODS;EVALUATION;QUALITY CONTROL;SULFUR COMPOUNDS

<071837>
TITLE: Characterization of Sulfur Emissions
PROJECT NUMBER: G-601B-CA19
NCIPAL INVESTIGATOR: Bradow, R.L.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Bradow, Ronald L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Update emissions factors for H_2SO_4 from production catalyst cars.
APPROACH: Historically, this project has been aimed at developing data on catalyst-sulfate emissions from low-mileage cars. Continuing efforts are concentrating on improved factors for new technology vehicles at a lower level. Vehicles obtained for characterization studies are routinely examined for SO_4 emissions.
RESULTS: Work on 1977 foreign cars has been completed and awaits only release of certified data for publication. Production car data has been reported in several recent SAE papers. Numerous vehicles were studied in the EPA baseline program at RTP and these data were published by OAWM in SAE paper 770166. Future work on characterization will continue to produce sulfate data on current-year technologies.
PROJECT MILESTONES: 1977 Supplement Records.
KEYWORDS: SULFURIC ACID;AUTOMOBILES;CATALYTIC CONVERTERS;ENVIRONMENTAL IMPACTS;AIR POLLUTION ABATEMENT;EXHAUST GASES;MONITORING;DATA;SULFATES;EARTH ATMOSPHERE

<071838>
TITLE: Precipitation Scavenging
PROJECT NUMBER: G-603A-AF-04
PRINCIPAL INVESTIGATOR: Viebrock, H.
ADDRESS: Meteorology and Assessment Division, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Div. of Meteorology
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Viebrock, Hubert
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates;NOXIOUS GAS/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: An assessment of the effectiveness of precipitation as a removal process for sulfates and nitrates will be conducted.
APPROACH: Current state-of-the-art techniques will be reviewed to assess the inclusion of precipitation scavenging in air quality simulation models, with an emphasis on long-distance transport models.
PROJECT MILESTONES: 9/79 Progress Report.
KEYWORDS: PRECIPITATION SCAVENGING;SULFATES;NITRATES;EARTH ATMOSPHERE;ENVIRONMENTAL TRANSPORT;ATMOSPHERIC PRECIPITATIONS;MATHEMATICAL MODELS;AIR QUALITY;METEOROLOGY;DEPOSITION

<071839>
TITLE: Atmospheric Optical Properties
PROJECT NUMBER: G-603-A-AG-05
PRINCIPAL INVESTIGATOR: Griffring, G.W.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Niemeyer, L.E.
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: VISUAL AESTHETICS (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To analyze sunphotometer and nephelometer data which are a measure of air quality with the objective of establishing the relationship between visibility and air quality.
APPROACH: Approximately four years of sunphotometer and nephelometer data have been collected at the Research Triangle Park. These data and the daily weather observations taken at Raleigh-Durham airport will be used in attempting to establish a relationship between visibility and air quality.
RESULTS: Preliminary examination of 1975 and 1976 sunphotometer and nephelometer data has been completed. While both sets of data will be useful, it is clear that the nephelometer data will be of greatest benefit to the investigation. The preliminary examination of the data indicates that relative humidity has a key role in the relationship between visibility and air quality. It is planned to examine the available sunphotometer, nephelometer and weather data in detail and attempt to derive definite conclusions on the relationship between visibility and air quality.
PROJECT MILESTONES: (1) 5/78 Report on visibility trends in U.S. (2) 9/79 Report on the relationship between air quality and visibility trends in the U.S.
KEYWORDS: AESTHETICS;EARTH ATMOSPHERE;OPTICAL PROPERTIES;AIR QUALITY;DATA;WEATHER;USA;EVALUATION;AIRPORTS;NORTH CAROLINA;AEROSOL MONITORING

<071840>
TITLE: 1977 Field Study to Access Long Range Oxidant Transport
PROJECT NUMBER: G-603A-AJ-08
PRINCIPAL INVESTIGATOR: Lonneman, W.A.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Bufalini, Joseph J.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Long range transport of ozone and other pollutants has been the objective of other studies. The studies, however, were limited to the investigation of either transported ozone from a very complex urban area such as New York or short distance transport of ozone from a simpler urban plume such as Columbus. What is generally missing from these studies is detailed information concerning precurser-ozone and other product relationships for short time periods over long downwind distances. Since this type of information is necessary for air pollution modeling, this study will be designed to obtain these type of data.
APPROACH: The in-house effort will be coordinated with Washington State University (EPA contract number 68-02-2298) and Battelle (EPA contract number 68-02-2439) to perform aircraft and ground level sampling downwind of an urban area (not chosen as yet). Our effort will be to provide primarily detailed hydrocarbon compositional analyses of collected air samples.
RESULTS: The study is scheduled to commence in June 1977. Tentative discussions concerning a generalized study approach have been discussed; however, a detailed plan has not yet been decided. The study area has not yet been selected.
PROJECT MILESTONES: 9/78 Final Report.
KEYWORDS: PHOTOCHEMICAL OXIDANTS;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;AIR POLLUTION;NITRATES;OZONE;URBAN AREAS;NEW YORK CITY;PLUMES;OHIO;DATA ACQUISITION;HYDROCARBONS;ECOLOGICAL CONCENTRATION

<071841>
TITLE: Small Chamber Studies on Reactivity of Organic Compounds
PROJECT NUMBER: G-603A-AC-19
PRINCIPAL INVESTIGATOR: Gay, B.W.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Determine, using smog chamber experiments, the reactivities of various hydrocarbons emitted by natural as well as anthropogenic sources. Determine product formation, NO/sub x/ conversion, ozone formation as well as reactant depletion.
APPROACH: Using established smog chamber techniques, hydrocarbons and oxides of nitrogen in air at near ambient concentrations are irradiated with UV light. Reactant decay and product formation are monitored using gas chromatographic or long path infrared techniques. Ozone and oxides of nitrogen are measured using chemiluminescence or long path infrared.
RESULTS: UV irradiations of selected naturally emitted hydrocarbons (terpenes) and anthropogenic hydrocarbons observed in auto exhaust have been studied at various initial hydrocarbon/NO/sub x/ ratios. Products of the reactions are followed throughout the UV irradiation. The reaction rate for most terpenes is fast. Formed in these reactions as a product are peroxyacylnitrate type compounds. Gas phase products do not account for all of the systems reacted carbon and nitrogen. The reaction of ozone with many terpenes is rapid. Future plans include smog chamber studies of naturally emitted hydrocarbons observed in field studies. Particular attention will be directed toward determining the reactivity and ozone forming potential of the compound. To obtain good carbon and nitrogen balances for the photochemical systems, investigation will include aerosols formed in the UV irradiations of naturally emitted hydrocarbons.
PROJECT MILESTONES: 9/79 Final Report.
KEYWORDS: ORGANIC COMPOUNDS;NITROGEN OXIDES;NITRATES;ENVIRONMENTAL TRANSPORT;SMOG;PHOTOCHEMICAL OXIDANTS;OZONE;INFRARED SPECTRA;CHEMILUMINESCENCE;ULTRAVIOLET RADIATION;AUTOMOBILES;EXHAUST GASES

<071842>
TITLE: Develop GC-MS Computer Instrumentation
PROJECT NUMBER: G712B-BE-14
PRINCIPAL INVESTIGATOR: Krost, K.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Sawicki, Eugene
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To have in-house capability for the characterization and determination of various organic gases, vapors and particles that are considered toxic or carcinogenic.
ROACH: Primarily to collect samples on suitable solid sorbents (e.g., Tenax) and then assay by means of computer GC-MS technology.
ULTS: Two GC-MS systems have been installed and are nearly operational.
PROJECT MILESTONES: 02/78 Evaluate ambient air samples.
KEYWORDS: GAS CHROMATOGRAPHY;MASS SPECTROSCOPY;AUTOMATION;AIR POLLUTION;AEROSOL MONITORING;SAMPLING;CHEMICAL ANALYSIS;COMPUTER CALCULATIONS;ABSORPTION;ORGANIC COMPOUNDS;GASES;AEROSOLS;PARTICLES;TOXICITY;CARCINOGENS;ELECTRONIC EQUIPMENT;AIR POLLUTION MONITORS;POLLUTION CONTROL EQUIPMENT;DESIGN

<071843>
TITLE: Organic Composition of Particles Collected on Filters
PROJECT NUMBER: G-712B-BE-15
PRINCIPAL INVESTIGATOR: Sawicki, E.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITOR: Sawicki, Eugene
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Biological plant emissions and residues (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To thoroughly characterize organic vapors and the organic fraction of ambient aerosols in terms of different types of carbon and composition.
APPROACH: This characterization of ambient aerosols will consist of selective solvent extraction, removal of the solvent by sublimation or freezedrying followed by high pressure liquid chromatographic and total organic carbon analyses. Organic vapors will be collected on cartridges and the total carbon and the different types of carbon will be determined. Eventually we hope to determine the relative amounts of gaseous, vapor and particulate carbons.
RESULTS: The instrumentation has been received and is in the process of being set up and tested.
PROJECT MILESTONES: 1/79 Final Report.
KEYWORDS: PARTICLES;AEROSOLS;CHEMICAL COMPOSITION;SAMPLING;HYDROCARBONS;SOLVENT EXTRACTION;MEASURING INSTRUMENTS;AIR POLLUTION MONITORS;TESTING;CARBON;ORGANIC COMPOUNDS;CHEMICAL EFFLUENTS;PLANTS;RESPIRATION

<071844>
TITLE: Evaluation of Dichotomous Samplers
PROJECT NUMBER: G712B-BE-25
PRINCIPAL INVESTIGATOR: Dzubay, T.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Stevens, R.K.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates (33%);METALS/Heavy (33%);PARTICULATES/Dust (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Test newly developed dichotomous samplers for the following performance properties: stability of flow rate, uniformity of deposit, performance during adverse weather conditions, intercomparability with high volume samplers.
APPROACH: Install differential flow control with electrical cutoff switch to insure that the flow is constant up to the maximum practical particle load. Investigate the use of new filter media and new types of filter seal gaskets.
RESULTS: Conduct 8 day intercomparison of method to sample and analyze aerosol moss, sulfate, and lead. The sampling is to be conducted in Charleston, West Virginia, during the second week in May 1977. The results are to be reported by September 1, 1977 to the Lawrence Livermore Laboratory which will tabulate the results.
PROJECT MILESTONES: 1977 Results of intercomparison published.
KEYWORDS: SULFATES;METALS;DUSTS;WASTE MANAGEMENT;WEATHER;AIR POLLUTION MONITORS;SAMPLERS;PERFORMANCE TESTING;AEROSOLS;FILTERS;GASKETS;LEAD;SULFUR COMPOUNDS;MOSSES

<071845>
TITLE: Develop Technique for Measuring Total Carbon and Organic Soluble Carbon in Fine and Coarse Particles
PROJECT NUMBER: G712B-BE-30
PRINCIPAL INVESTIGATOR: Stevens, R.K.
ADDRESS: Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
)NITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Stevens, Robert K.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)

ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/General (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Develop an ultrasensitive method to measure carbon concentration in ambient aerosols collected with dichotomous samplers.
APPROACH: Aerosols collected on Fluoropore filters are extracted with organic solvents. A fraction of the extract is deposited on a platinum strip, the solvent evaporated and the pt. strip to 100 degrees C with N2 flowing over the strip to a flame ionization detector. The signal from the FID is proportional to organic content of the extract. A second aliquot is deposited onto MnO2 catalyst and heated to 800 degrees C. The products of this treatment are also directed to an FID. The signal produced by the FID is proportional to the carbon content of the extract.
RESULTS: Both instruments have been calibrated and give response proportional to carbon content for standards. Aerosol samples are being collected for analysis and comparison with the gamma emission analysis method.
PROJECT MILESTONES: 8/79 Complete analytical method prepared for publication.
KEYWORDS: CARBON;ECOLOGICAL CONCENTRATION;DUSTS;AEROSOLS;CHEMICAL ANALYSIS;SAMPLERS;CHEMICAL COMPOSITION;AIR POLLUTION;SOLVENT EXTRACTION;SAMPLE PREPARATION;HYDROCARBONS;GAMMA RADIATION;COMPARATIVE EVALUATIONS

<071846>
TITLE: Develop Improved Methods for Calibration of Ozone and NOx Monitors
PROJECT NUMBER: G712B-BE-33
PRINCIPAL INVESTIGATOR: Stevens, R.K.
ADDRESS: Environmental Sciences Research Laboratory, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Paur, R.J.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Improve the reliability, accuracy and precision of methods used for calibration of ozone and NOx monitors. Develop new methods if old ones are inadequate.
APPROACH: Critically evaluate current methods to determine weaknesses. Study feasibility of alternate methods. Develop and characterize hardware for the most promising methods.
RESULTS: Have developed a unitized piece of gas phase titration glassware for ozone and NOx calibration. Have studied a new potassium iodide procedure for ozone calibration. Have designed and constructed a photometer for ozone calibration. This photometer is the most accurate and precise piece of hardware available of ozone calibration work and is the standard against which other methods will be compared. Further work will be in area of designing additional photometer circuits to provide operator with additional information on the performance of the photometer, further examination of gas phase titration as a NOx calibration technique, and participation in the EPA task force formed to choose a new Federal Reference method for ozone calibration.
PROJECT MILESTONES: 6/77 Fabricate and evaluate new ozone generator and calibration systems.
KEYWORDS: AIR POLLUTION MONITORS;CALIBRATION;OZONE;NITROGEN OXIDES;AIR POLLUTION;DESIGN;POTASSIUM IODIDES;PHOTOMETRY;FABRICATION

<071847>
TITLE: In Vitro Assay of Relative Toxicity of Diesel-Engine Exhausts
PROJECT NUMBER: G712B-BC-05
PRINCIPAL INVESTIGATOR: Meltz, M.L.;Greene, N.;Gause, E.
AFFILIATION: Southwest Foundation for Research and Education, San Antonio, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bradow, R.L.
77 FUNDING: Environmental Protection Agency FY77:$130,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The two main objectives of this proposal are (1) the direct assessment of the relative toxicity of combustion products of 4 different diesel fuels as emitted from a diesel engine and diluted and cooled to gas concentrations and temperatures compatible with biological test systems; and (2) the measurement of the relative biochemical toxicity of 6 or 7 chemically separable fractions from the collected combustion products of one of the fuels. A secondary objective is to utilize and compare the biochemical alterations resulting when in vitro cell culture systems of human, baboon, and rodent blood and lung origin are directly exposed and utilized as the biological test system.
APPROACH: The biochemical indices to be used upon exposure of baboon macrophages include macrophage migration and response to MIF, phagocytic ability, aryl hydrocarbon hydroxylase (AHH) activity, ATP concentration, and RNA precursor incorporation rate. Upon exposure of other cell types, the following parameters will be measured: collagen synthesis in WI-38 cells, response of baboon lymphocytes to mitogens, RNA and DNA precursor incorporation rates, AHH activity and inducibility, proliferative capacity, viability, and colony forming ability. For each cell type the induction of repair replication, indicative of damage to the cell DNA, will be measured.
PROJECT MILESTONES: 11/77 Final report.
KEYWORDS: BIOASSAY;TOXICITY;DIESEL ENGINES;COMBUSTION PRODUCTS;DIESEL FUELS;EXHAUST GASES;MAN;RODENTS;APES;LUNGS;METABOLISM;HEALTH HAZARDS;MACROPHAGES;CYTOLOGY;TOXICITY

<071848>
TITLE: Northrop Support Services
PROJECT NUMBER: G625B-EA-30
INCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
NITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and testing; (7) fluid modeling facility operating and testing; (8) sampling and analysis methods research.
PROJECT MILESTONES: Continuing
KEYWORDS: ENERGY PARKS;ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;HEALTH HAZARDS;AEROSOLS;EQUIPMENT;AIR POLLUTION MONITORS;BIOLOGICAL MODELS;SAMPLING;OPERATION;TESTING;CHEMICAL ANALYSIS

<071849>
TITLE: Northrop Support Services
PROJECT NUMBER: G603A-AB-07
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$128,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and testing; (7) fluid modeling facility operation and testing; (8) sampling and analysis methods research.
PROJECT MILESTONES: Continuing
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;MOBILITY;AIR POLLUTION;GASES;FLUID FLOW;OPERATION;TESTING;SAMPLING;CHEMICAL ANALYSIS

<071850>
TITLE: Northrop Support Services
PROJECT NUMBER: G603A-AC-02
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
TYPE OF FUNDING: Contract No.-68-02-2566
77 FUNDING: Environmental Protection Agency FY77:$78,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and testing; (7) fluid modeling facility operation and testing; (8) sampling and analysis methods research.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;POLLUTION;FINANCING;GASES;FLUID FLOW;OPERATION;TESTING;SAMPLING;CHEMICAL ANALYSIS

<071851>
TITLE: Oxidant Precursor Relationships
PROJECT NUMBER: G603A-AC-03
PRINCIPAL INVESTIGATOR: Ripperton, L.A.;Sickles, J.E.;Eaton, W.C.
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.J.
TYPE OF FUNDING: Contract No.-68-02-2207
77 FUNDING: Environmental Protection Agency FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this study was to investigate the ozone forming potential of hydrocarbons with multi-day irradiations. This was done in four 27 cubic meter outdoor chambers. The chambers were constructed of 5 mil FEP Teflon on aluminum frames. The initial charge of non-methane hydrocarbon (NMHC) ranged from 1.0 to 10.0 ppmC; nitrogen oxides (NOx) from 0.100 to 1.00 ppm. This makes initial NMHC/NOx ratios between 7 and 20. On second and third day irradiations the NMHC/NOx ranged from 16 to 610. High levels of ozone were generated on second and third days.
ROJECT MILESTONES: 09/77 Final report.
KEYWORDS: PHOTOCHEMICAL OXIDANTS;BIOLOGICAL EFFECTS;HYDROCARBONS;OZONE;ECOLOGICAL CONCENTRATION;NITROGEN OXIDES

<071852>
TITLE: Study of OX/HC/NOx
PROJECT NUMBER: G603A-AC-10
PRINCIPAL INVESTIGATOR: Bufalini, J.;Lonnerman, W.A.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Lonnerman
TYPE OF FUNDING: Agency in-house effort-68-02-2299
77 FUNDING: Environmental Protection Agency FY77:$16,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Analyze indoor and outdoor data for updating SIPs for oxidants.
PROJECT MILESTONES: 07/77 Access Ox formation from low HC and NOx values.
KEYWORDS: HYDROCARBONS;NITROGEN OXIDES;PHOTOCHEMICAL OXIDANTS;EARTH ATMOSPHERE

<071853>
TITLE: Reactions of Oxy Radicals in the Atmosphere
PROJECT NUMBER: G603A-AC-11
PRINCIPAL INVESTIGATOR: Hendry, D.G.;Kenley, R.A.
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dodge, M.C.
TYPE OF FUNDING: Grant No.-R803846-03
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The current study of the reaction of OH with aromatic hydrocarbons indicates that in the urban atmosphere compounds like toluene will be converted initially to aromatic aldehydes and phenolic compounds. Therefore, the objective of this proposed grant continuation is to study the reactions of these types of products with OH radical and ozone in order to determine their fate in the urban atmosphere. A secondary objective is to evaluate the rate constants for reactions of HO2 with simple olefins such as ethylene, propylene, and isobutylene.
PROJECT MILESTONES: 12/78 Final report.
KEYWORDS: AIR POLLUTION;URBAN AREAS;EARTH ATMOSPHERE;HYDROXYL RADICALS;AROMATICS;PHOTOCHEMICAL OXIDANTS;HYDROCARBONS;CHEMICAL REACTIONS;ALKENES;PHENOLS;ALDEHYDES;OZONE;MATHEMATICAL MODELS

<071854>
TITLE: Fate of Aromatics in Photochemical Smog
PROJECT NUMBER: G603A-AC-12
PRINCIPAL INVESTIGATOR: O'Brien, R.J.
AFFILIATION: Oregon State Higher Education System, Salem (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dodge, M.C.
TYPE OF FUNDING: Grant No.-R804764-01S1
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Identify intermediate and final products when aromatic HC are irradiated with NOx under simulated atmospheric conditions.
PROJECT MILESTONES: 12/79 Final report.
KEYWORDS: AROMATICS;HYDROCARBONS;NITROGEN OXIDES;PHOTOCHEMISTRY;CHEMICAL REACTIONS;EARTH ATMOSPHERE;PHOTOCHEMICAL OXIDANTS;SMOG

<071855>
TITLE: Experimental Study of Aerosol Formation Mechanisms in a Controlled Atmosphere
PROJECT NUMBER: G603A-AC-14
PRINCIPAL INVESTIGATOR: Fox, D.L.;Reist, P.C.
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Durham, J.
TYPE OF FUNDING: Grant No.-R802472-03
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Objectives of this project during the third budget period: This program has designed and built an outdoor chamber facility for the investigation of aerosol formation processes similar to those occurring in the ambient atmosphere. During the second budget period, experimental methods and procedures were developed or adapted for this project and an experimental program is now in progress. The overall objectives of this budget period will be to investigate gas to particle conversion processes.
APPROACH: This will be accomplished by conducting chamber experiments in three areas: sulfate aerosol formation in hydrocarbon-NOx systems, SO2-NOx plume systems and systems containing metallic seed nuclei. During this coming period additional experiments will be conducted on this system. Aerosol parameters to be obtained include condensation nuclei count, size distributions by electric aerosol analyzer and filter samples for sulfate analysis by x-ray fluorescence and flash vaporization flame photometric detection. The hydrocarbon-NOx-SO2 system is an analog of aerosol formation in urban areas with multiple sources of pollution, stationary and mobile. The second area of research involves the SO2-NOx system as an analog of the processes occurring in a power plant plume. A series of experiments with various initial concentrations of SO2, NO, NO2 and water vapor will be conducted. The third major area of research will be generation of aerosols in the presence of seed nuclei. Existing aerosols provide an alternate oxidation process for conversion of SO2 to sulfate. Metallic nuclei will be introduced into the chamber and the size distribution will be determined, then SO2 will be introduced and evolution of the aerosol will be measured.
PROJECT MILESTONES: 06/78 Laboratory data for test of integrated chemical and physical mode.
KEYWORDS: AEROSOL GENERATORS;PHOTOCHEMICAL OXIDANTS;GASES;PARTICLES;AEROSOLS;HYDROCARBONS;NITROGEN OXIDES;SULFUR DIOXIDE;NITROGEN OXIDES;POWER PLANTS;PLUMES;EXHAUST GASES;OXIDATION

<071856>
TITLE: Kinetic Modeling of Chamber Data
PROJECT NUMBER: G603A-AC-18
PRINCIPAL INVESTIGATOR: Dodge, M.C.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.J.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this program is to develop chemical kinetics mechanisms that describe the formation of photochemical smog.
APPROACH: The mechanisms under development are tested and modified by comparing the computed concentration-time profiles of various reactants and products with those observed experimentally in smog chamber studies of irradiated hydrocarbon and NOx mixtures.
RESULTS: A method is under development for deriving ozone-precursor relationships based on the combined results of photochemical modeling techniques and smog chamber data. A model has been developed to fit O3 yields obtained in smog chamber studies of auto exhaust and NOx mixtures. This model is being used to construct O3 isopleths as a function of hydrocarbon and NOx levels. These isopleths can be used to estimate O3 control requirements for urban areas. Currently, the effect of selected parameters on the predictions of this model is being investigated.
PROJECT MILESTONES: 09/79 Final report.
KEYWORDS: CHEMICAL REACTION KINETICS;PHOTOCHEMICAL OXIDANTS;SMOG;OZONE;AUTOMOBILES;EXHAUST GASES;NITROGEN OXIDES;MATHEMATICAL MODELS

<071857>
TITLE: Relationship Between Air Quality, Emissions and Meteorology
PROJECT NUMBER: G603A-AD-07
PRINCIPAL INVESTIGATOR: Demarrais, G.A.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$16,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Examine air quality data, mainly ozone, and determine whether there is a greater potential for high concentrations with flows from urban than from non-urban areas. Examine prolonged (three or more days) periods when widely-separated urban areas (cities more than 200 kilometers apart) simultaneously had high concentrations and determine the meteorological conditions which contributed to the high concentrations.
APPROACH: Trajectory analyses for the surface-to-700 meters or surface-to-1000 meters layer of air are used to estimate the source-receptor relationships. In the second part it will be determined whether phenomena previously associated with high ozone concentrations (that is, intense solar radiation, low wind speeds, high temperatures) occurred with the high concentrations found in this study.
RESULTS: Ozone data for the Hampton Roads, Virginia, area have been analyzed and summarized. Ozone data for the Richmond-Washington-Baltimore corridor are being analyzed and evaluated.
PROJECT MILESTONES: 12/77 Summary report.
KEYWORDS: AIR QUALITY;EMISSION;METEOROLOGY;EARTH ATMOSPHERE;OZONE;URBAN AREAS;RURAL AREAS;ECOLOGICAL CONCENTRATION

<071858>
TITLE: Synoptic Meteorology and Air Quality Patterns in the St. Louis RAPS Program
PROJECT NUMBER: G603A-AD-09
PRINCIPAL INVESTIGATOR: Robinson, E.
AFFILIATION: Washington State Univ., Pullman (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Kasl, F.
TYPE OF FUNDING: Grant No.-R805142-01
77 FUNDING: Environmental Protection Agency FY77:$15,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: (1) To develop an objective classification system for the synoptic weather patterns that affect the St. Louis, Missouri, area; and (2) to determine general or average air quality patterns using the RAPS data file for St. Louis as a function of prevailing synoptic weather as identified in the pattern classification study.
PROJECT MILESTONES: (1) 12/77 Report on synoptic weather typing. (2) 05/78 Report on preliminary determination. (3) 05/80 Final report.
KEYWORDS: METEOROLOGY;AIR QUALITY;URBAN AREAS;MISSOURI

<071859>
TITLE: Reactions of Oxy Radicals in the Atmosphere
PROJECT NUMBER: G603A-AE-04
PRINCIPAL INVESTIGATOR: Hendry, D.G.;Kenley, R.A.
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dodge, M.
TYPE OF FUNDING: Grant No.-R803846-03
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The current study of the reaction of OH with aromatic hydrocarbons indicates that in the urban atmosphere compounds like toluene will be converted initially to aromatic aldehydes and phenolic compounds. Therefore, the objective of this proposed grant continuation is to study the reactions of these

types of products with OH radical and ozone in order to determine their fate in the urban atmosphere. A secondary objective is to evaluate the rate constants for reactions of HO2 with simple olefins such as ethylene, propylene, and isobutylene.
PROJECT MILESTONES: 06/77 Final report.
KEYWORDS: EARTH ATMOSPHERE;CHEMICAL REACTIONS;URBAN AREAS;HYDROXYL RADICALS;OZONE;PHOTOCHEMICAL OXIDANTS;PHOTOCHEMISTRY;ENVIRONMENTAL TRANSPORT;ETHYLENE;PROPYLENE;BUTENES;POLYCYCLIC AROMATIC HYDROCARBONS

<071860>
TITLE: Evaluation of the Emission of Natural Hydrocarbons from Forest Vegetation by Micrometeorological Methods
PROJECT NUMBER: G603A-AG-10
PRINCIPAL INVESTIGATOR: Knoerr, K.R.;Mowry, F.L.;Dudgeon, A.C.
AFFILIATION: Duke Univ., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.J.
TYPE OF FUNDING: Grant No.-R804860-01
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
APPROACH: The research proposed for this study would utilize a micrometeorological approach to obtain improved estimates of the total amount and the time course of the natural emissions of hydrocarbons from the forest vegetation. Micrometeorological measurements, including vertical profiles of various hydrocarbons, will be made in a forested area near Durham, N.C. at the Triangle Site for the International Biological Program (IBP) Project. These measurements will enable us to calculate the vertical flux of these hydrocarbons and then their emission rate from the forest vegetation. The proposed research will be a cooperative effort involving personnel and instrumetation from both the IBP project and the Gas Kinetics Photochemistry Branch (GKPB) of the EPA Environmental Sciences Research Laboratory. The measurements will be made for selected sampling days over a six month period beginning in July, 1976. They will provide daily and seasonal time course estimates of the emission of natural hydrocarbons which can be related to both the physiological activity and water status of the forest vegetation and general climatic conditions. They will give us a better understanding of the importance of vegetation in the production of photochemical smog.
PROJECT MILESTONES: 12/78 Final report.
KEYWORDS: FORESTS;ENVIRONMENTAL EFFECTS;HYDROCARBONS;TRANSPIRATION;PHOTOCHEMISTRY;CLIMATES;METEOROLOGY;SMOG;BIOSYNTHESIS;NATURAL OCCURRENCE

<071861>
TITLE: Measurement of Tropospheric and Stratospheric Trace Gases by Gas Chromatography
PROJECT NUMBER: G603A-AI-04
PRINCIPAL INVESTIGATOR: Cronn, D.R.;Rasmussen, R.A.;Robinson, E.
AFFILIATION: Washington State Univ., Pullman (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Hanst, P.
TYPE OF FUNDING: Grant No.-R804033-03
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective is to make measurements of the vertical concentration distributions of selected trace gas species in the troposphere and lower stratosphere. Emphasis will be placed on determinations of halocarbons and non-methane hydrocarbons. Determination of the concentrations of the halocarbon species will be accomplished by the methods of electron capture--gas chromatography and gas chromatography-mass spectrometry--while gas chromatography with flame ionization detection will be employed for the determination of the hydrocarbons. Samples will be collected by aircraft flights in the United States.
PROJECT MILESTONES: 02/78 Final report.
KEYWORDS: EARTH ATMOSPHERE;TRACE AMOUNTS;STRATOSPHERE;TROPOSPHERE;GASES;GAS CHROMATOGRAPHY;CHEMICAL REACTION KINETICS;ECOLOGICAL CONCENTRATION;HYDROCARBONS;ORGANIC HALOGEN COMPOUNDS;QUANTITATIVE CHEMICAL ANALYSIS;AIR QUALITY

<071862>
TITLE: Natural Hydrocarbon Emissions
PROJECT NUMBER: G603A-AJ-09
PRINCIPAL INVESTIGATOR: Gay, B.W.;Arnts, R.R.;Kuntz, R.;Seila, R.;Cox, M.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.J.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$38,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Determine emissions of natural hydrocarbons over several differing areas of vegetation in the United States. Determine the contribution of natural to anthropogenic hydrocarbon emissions as oxidant precursors. Determine ozone formation attributed to natural hydrocarbon emissions and its effects on urban and rural areas.
APPROACH: Cryogenic concentrating of sample and gas chromatographic techniques are used in measuring natural hydrocarbons at extremely low concentrations in the ambient atmosphere. The emissions of flux of natural hydrocarbons are obtained by mathematically combining data of natural hydrocarbon measurements taken concurrently with micrometeorological data. Chemiluminescence techniques are employed to measure ozone and oxides of nitrogen.
RESULTS: Measurements of natural hydrocarbons (terpenes) and anthropogenic hydrocarbons are being made at a rural pine forest site to determine emissions of terpenes from the trees. The forest, part of an International Biological Project (IBP) is operated by Duke University. Through an EPA grant, Duke provides micrometeorological data (energy balances of CO, H2O, temperature) obtained simultaneously with natural hydrocarbon measurements which are combined to calculate the natural hydrocarbon flux. Ozone measurements are being made to determine the effects natural terpenes have on rural oxidant. Continued measurements at the IBP site of natural and anthropogenic hydrocarbons, ozone and NOx will provide a data base from which

seasonal variations and effects on rural oxidant due to natural emissions can be established. Future studies will be directed toward emissions of leafy trees, grasslands, and swamplands.
PROJECT MILESTONES: 09/77 Report on contribution of natural emissions of ozone oxidation.
KEYWORDS: HYDROCARBONS;EMISSION;NATURAL OCCURRENCE;PHOTOCHEMICAL OXIDANTS;ECOLOGICAL CONCENTRATION;OZONE;SMOG;MATHEMATICAL MODELS;EARTH ATMOSPHERE;NITROGEN OXIDES

<071863>
TITLE: IR Analysis for Tropospheric Halogenated Compounds
PROJECT NUMBER: G603A-AI-05
PRINCIPAL INVESTIGATOR: Hanst, P.L.;Spence, J.W.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Hanst, P.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$3,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: Measure trace gases in the ambient air.
APPROACH: Collect air samples at various locations in the Research Triangle Area and bring them to the laboratory for analysis in the several available long path infrared cells. Develop techniques of freeze-drying the samples and of compressing them to increase pollutant detection sensitivity. Record the spectra by FTS techniques. Process the spectra by computer manipulation techniques to minimize interferences between pollutants.
RESULTS: The freeze-dry technique is being perfected. Multiple pass cell innovations have been adopted. Background pollutants not detectable by any other technique are being measured, including COS, and CHClF2. Cell miniaturization has progressed to the point where 10 nanograms of a pollutant can be detected.
PROJECT MILESTONES: 06/78 Final report.
KEYWORDS: ORGANIC HALOGEN COMPOUNDS;TRACE AMOUNTS;AIR POLLUTION;EARTH ATMOSPHERE;SAMPLING;SAMPLE PREPARATION;MATHEMATICAL MODELS;ECOLOGICAL CONCENTRATION;TROPOSPHERE;DEHYDRATION

<071864>
TITLE: Numerical Study of Halocarbon Chemical Reaction on Stratospheric and Tropospheric Ozone and Other Photochemical Processes (Abbrev.)
PROJECT NUMBER: G603A-AI-06
PRINCIPAL INVESTIGATOR: Cruizen, P.J.
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Hanst, P.
TYPE OF FUNDING: Grant No.-R804921 01
77 FUNDING: Environmental Protection Agency FY77:$34,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: A systematic development of numerical models capable of examining the effects of halogenated gases on stratospheric photochemistry and the earth's ozone balance will be undertaken. Because the industrial halogenated gases have their origin at the surface, this research will also be concerned with the fate of these gasses in the troposphere. To accomplish this goal, it is important to simulate atmospheric processes as realistically as possible. Therefore, the model should be designed such that exchange mechanisms in the planetary boundary layer, as well as between the troposphere and stratosphere, can be properly simulated. The first step of this modeling effort will be the design and examination of the results of a one-dimensional, time-dependent model. Eventually two- and three-dimensional models incorporating realistic boundary conditions will be developed. Using the best available chemical kinetic data, a detailed examination of the formation of intermediate halogenated gases which may or may not be removed from the troposphere by heterogeneous processes will be conducted. To obtain a measure of the efficiency of these processes, the numerical simulations will be compared to measurements of the various halogenated gases in the atmosphere.
PROJECT MILESTONES: 06/79 Final report.
KEYWORDS: ORGANIC HALOGEN COMPOUNDS;STRATOSPHERE;ECOLOGICAL CONCENTRATION;MONITORING;PHOTOCHEMISTRY;EARTH ATMOSPHERE;MATHEMATICAL MODELS;CHEMICAL REACTION KINETICS

<071865>
TITLE: Meteorological Sub-Models for AQSMS--Radiative Transfer
PROJECT NUMBER: G603A-AB-13
PRINCIPAL INVESTIGATOR: Binkowski, F.B.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$8,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective is to develop models of radiative transfer (solar and terrestrial) in the planetary boundary layer and lower troposphere.
APPROACH: The terrestrial radiation model will use as its basis the 12 interval model of Binkowski. The model will be extended to include cloud, fog and aerosol effects in the 8-13 micron window. Simple solar radiation models are being developed and extended to include cloud and aerosol efforts.
RESULTS: The solar radiation models will be tested against observations of global and direct beam; solar radiation made locally. The terrestrial radiation models have been verified against clear skies, clean air test data, and when extended, will be verified against appropriate data.
KEYWORDS: AIR QUALITY;MATHEMATICAL MODELS;EARTH ATMOSPHERE;TROPOSPHERE;CLOUDS;FOG;AEROSOLS;ENVIRONMENTAL IMPACTS;SOLAR FLUX

<071866>
TITLE: Two-Dimensional, Finite-Difference Line Source Model
PROJECT NUMBER: G603A-AB-15
PRINCIPAL INVESTIGATOR: Eskridge, R.E.;Demerjian, K.L.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$21,500
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: A two-dimensional, finite-difference model simulating a highway is being developed which is able to handle linear and nonlinear chemical reactions. The model currently only includes reactions of sulfuric acid and ammonia, but will be expanded to include more complex reactions.
APPROACH: Transport of the pollutants is accomplished by use and upstream-flux-corrected algorithm developed at the Naval Research Laboratories. This algorithm insures positive concentrations and reduces numerical diffusion. The model develops background eddy diffusion coefficients which are then perturbed by the mechanical turbulence introducd by vehicular motion. The model calculations are currently being compared to the SF6 experiments carried out by General Motors in the GM sulfate diffusion experiment. Model development is complete with only final comparisons of the predictions and observations to be completed. A paper is presently being prepared that will present the findings of this work.
PROJECT MILESTONES: 09/77 Report--development of model. 09/78 Report--application of model on and near highways.
KEYWORDS: TWO-DIMENSIONAL CALCULATIONS;ROADS;MATHEMATICAL MODELS;CHEMICAL REACTIONS;SULFURIC ACID;AMMONIA;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;TURBULENCE;AUTOMOBILES;EXHAUST GASES;ENVIRONMENTAL IMPACTS

<071867>
TITLE: Liaison with Model Users
PROJECT NUMBER: G603A-AB-18
PRINCIPAL INVESTIGATOR: Turner, D.B.;Petersen, W.B.;Irwin, J.S.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: To advise users on the proper application of Air Quality Simulation Models made available by EPA and to determine model user needs for additional models.
APPROACH: The Environmental Applications Branch serves as the contact point in the Meteorology and Assessment Division for those seeking advice and having comments on Air Quality Simulation Models. Contacts are by phone, letter, or personal visit.
RESULTS: Each contact is handled by a dispersion modeler. Available pertinent information (user guides, reprints) are made available to requestors. Project results of general interest are summarized and made available.
PROJECT MILESTONES: Continuing
KEYWORDS: AIR QUALITY;SIMULATION;MATHEMATICAL MODELS;TECHNOLOGY UTILIZATION;METEOROLOGY;AIR POLLUTION;DIFFUSION;EARTH ATMOSPHERE

<071868>
TITLE: Evaluation of Highway Air Quality Simulation Models
PROJECT NUMBER: G603A-AB-19
PRINCIPAL INVESTIGATOR: Petersen, W.B.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To test and improve highway air quality simulation models.
APPROACH: Available data from beside the roadway studies will be used to make estimates of concentrations near roadways which are compared with the field measurements of concentration.
RESULTS: Data are being obtained from the ROADS study on Long Island supported by a grant to the New York Department of Environmental Conservation. Pollutants measured are carbon monoxide and particulates. Comparisons of HIWAY model estimates and concentrations from the GM test track study have been made. Additional detailed meteorological data from the GM test track study are becoming available and will be used to estimate dispersion directly from fluctuation statistics for input into a Highway Air Quality Simulation Model.
PROJECT MILESTONES: (1) 09/77 Progress report. (2) 09/78 Final report.
KEYWORDS: ROADS;AIR QUALITY;SIMULATION;MATHEMATICAL MODELS;COMPUTER CODES;R CODES;NEW YORK;CARBON MONOXIDE;PARTICLES;AEROSOLS;H CODES;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL TRANSPORT

<071869>
TITLE: Measurement of Boundary Conditions in Regional Modeling
PROJECT NUMBER: G603A-AB-21
PRINCIPAL INVESTIGATOR: Snowman, L.R.;Craig, S.E.;Roberts, D.L.
AFFILIATION: General Electric Co., San Jose, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: McClenny, W.A.
TYPE OF FUNDING: Agency in-house effort-68-02-1783
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)

PROJECT DESCRIPTION: To develop a long-path open-air monitoring technique capable of determining the path-averaged concentration of selected ambient trace gases over distances of up to 5 km.
APPROACH: To complete development of a long-path open-air monitoring system designed for measuring ambient ozone concentrations. This system has been designed by G.E. after the evaluation of tests using a prototype system. The technique measures attenuation of radiation at several wavelengths after transmission through the atmosphere. Differential attenuation is related to concentration.
RESULTS: Current plans include: (1) the field testing of the long-path system during June, 1977; (2) delivery of the system to EPA during the summer of 1977. Progress during this fiscal year includes the award of contract for the completion of the system.
PROJECT MILESTONES: (1) 08/77 Field study. (2) 08/78 Field test.
KEYWORDS: REGIONAL ANALYSIS;AIR QUALITY;MATHEMATICAL MODELS;AEROSOL MONITORING;OZONE;TRACE AMOUNTS;DESIGN;BOUNDARY CONDITIONS;EARTH ATMOSPHERE

<071870>
TITLE: Plume Rise in Calm, Linearly Stratified Environment
PROJECT NUMBER: G603A-AB-25
PRINCIPAL INVESTIGATOR: Snyder, W.H.;Briggs, G.A.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$74,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This study is designed to characterize the behavior of plumes in calm, stably stratified surroundings. Pure jets (non-buoyant) and buoyancy-dominated plumes will be emitted into the salt-water-stratified water channel. Photographs will be analyzed to determine the maximum penetration height, the angle of spread, the equilibrium height and the thickness and growth rate of the equilibrium layer. A secondary goal will be to determine the sensitivity to these effects to variations in jet Reynolds number, i.e., to establish criteria for modeling of plumes in the laboratory. Knowledge of the growth rate and thickness of the equilibrium layer is essential in order to predict ground-level concentrations resulting from morning inversion break-up. As time permits, this project will be extended to include plume rise in a crosswind and the merger of multiple buoyant plumes, for which little experimental data are available.
PROJECT MILESTONES: 01/78 Final report (Modelers).
KEYWORDS: PLUMES;DIFFUSION;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;MATHEMATICAL MODELS;BRINES;STRATIFICATION;REYNOLDS NUMBER;PHOTOGRAPHY;RECOMMENDATIONS;BOUNDARY CONDITIONS;TEMPERATURE INVERSIONS;WIND

<071871>
TITLE: Diffusion Around Buildings
PROJECT NUMBER: G603A-AB-26
PRINCIPAL INVESTIGATOR: Snyder, W.H.;Briggs, G.A.;Thompson, R.S.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This is a basic, systematic study of the diffusion in the vicinity of buildings. Three reports have been prepared within the scope of this study to date and the project will be continued in FY77. Previous work includes (1) determination of a necessary height for stack near a tall thin building, (2) a mathematical model constructed from diffusion tests in the vicinity of a rectangular-shaped building, and (3) dispersion measurements downstream of a cubical building with roof-top emissions. During FY77, it is proposed to study the effect of the ratio of building height to roughness length on the shape of and the turbulence intensity and resulting concentrations in the building cavity and wake regions. This would be done for a number of simple building shapes. As time permits, this study will be extended to include other parameters such as effluent to wind speed ratio, stack height to building height ratio, effluent buoyancy, etc. The overall goal is to develop and verify a ''cookbook'' of approximate effects of basic building shapes on diffusion in the area of building influence.
PROJECT MILESTONES: (1) 09/78 Progress report. (2) 09/79 Final report.
KEYWORDS: BUILDINGS;DIFFUSION;AIR POLLUTION;EARTH ATMOSPHERE;STACKS;HEIGHT;STACK DISPOSAL;MATHEMATICAL MODELS;SHAPE;TURBULENCE;WIND;VELOCITY;PLUMES

<071872>
TITLE: Evaporation Study
PROJECT NUMBER: G603A-AB-27
PRINCIPAL INVESTIGATOR: Snyder, W.H.;Shreffler, J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$5,000
TECHNOLOGY: GENERAL SCIENCE (100%)
OJECT DESCRIPTION: This study involves the determination of the effect of grass blades on the evaporation rate from a liquid surface. A grass-like surface will be formed by fixing aluminum strips on a base plate, which is then immersed in a pan of water in the wind tunnel. Measurements of velocity profiles and turbulence statistics will be made to determine the zero-plane displacement and roughness lengths as functions of blade spacing and height. Evaporation rates will be determined by directly monitoring the liquid level. This problem is mathematically equivalent to finding the rate of dry deposition of gaseous pollutants on surfaces. This project will provide data for verification of a mathematical model which has

recently been developed in the Model Development and Assessment Branch.
PROJECT MILESTONES: 01/78 Final report.
KEYWORDS: EVAPORATION;GRASS;AQUEOUS SOLUTIONS;WATER;VELOCITY;TURBULENCE;POLLUTION;DEPOSITION;GASES;MATHEMATICAL MODELS;EARTH ATMOSPHERE;ENVIRONMENTAL EFFECTS;ENVIRONMENTAL TRANSPORT;SURFACES;WIND TUNNELS

<071873>
TITLE: Surface Exchange Study
PROJECT NUMBER: G603A-AB-28
PRINCIPAL INVESTIGATOR: Shreffler, J.H.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$6,700
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The Fluid Modeling Facility wind tunnel will be used to study characteristics of turbulent shear flow over a fibrous canopy.
APPROACH: A grass-like canopy of aluminum strips set into a plexiglas substrate has been constructed. The canopy is set in a pan of liquid on the floor of the wind tunnel, and, by adjusting the depth of submersion, the effective height of the blades may be changed from 0 to 10 cm. The experiment is conducted in two phases. In the first phase, measurements of mean speed, turbulent intensities and Reynolds stress are taken over the canopy. The objective is to determine the changes of these properties and the deduced roughness and zero-plane with free stream speed and blade height. The second phase deals with vertical exchange within and above the canopy. For this phase, the liquid at the tunnel floor is isopropyl alcohol. The evaporation rate is measured directly and a profile of vapor concentration is measured within and above the canopy. Objectives are to determine the eddy diffusivity within the canopy and the reliability of the profile method above the canopy, both as a function of canopy height and wind speed.
RESULTS: The first phase measurements have been made. Analysis of the data is in progress.
PROJECT MILESTONES: (1) 09/77 Progress report. (2) 09/78 Final report.
KEYWORDS: SURFACES;TURBULENCE;GRASS;WIND TUNNELS;ENVIRONMENTAL EFFECTS;FLUID FLOW;EVAPORATION;ALCOHOLS;WIND;VELOCITY;EARTH ATMOSPHERE;MATHEMATICAL MODELS;METEOROLOGY;ENVIRONMENTAL TRANSPORT;AIR POLLUTION

<071874>
TITLE: Meteorological Sub-Models for AQSMS-Turbulence Models
PROJECT NUMBER: G603A-AB-29
PRINCIPAL INVESTIGATOR: Binkowski, F.S.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$26,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective is to develop a model which will yield realistic estimates of turbulent moments such as the variance of the velocity components, temperature, and of the covariances of the velocity components (stresses) and the kinematic heat fluxes.
APPROACH: The model will use second order closure techniques in their simplest form, and empirical information along with conventional meteorological data such as winds, temperatures, temperature difference and mixing depths.
RESULTS: The model for the surface layer is complete and produces excellent results when compared with turbulence data. Developmental work is under way for extension of the model to the convectively mixed layer.
PROJECT MILESTONES: 09/78 Final report.
KEYWORDS: AIR QUALITY;MATHEMATICAL MODELS;EARTH ATMOSPHERE;SURFACES;BOUNDARY CONDITIONS;VELOCITY;TURBULENCE;METEOROLOGY;TEMPERATURE EFFECTS

<071875>
TITLE: Clinch River Model Study
PROJECT NUMBER: G603A-AB-30
PRINCIPAL INVESTIGATOR: Snyder, W.H.;Thompson, R.S.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: NUCLEAR/General (100%)
APPROACH: A large amount of field data is being collected on contract to EPA on the dispersion of pollutants from the Clinch River Power Station in West Virginia, which is located in complex terrain. In the current study a terrain model will be run in the EPA Meteorological Wind Tunnel to provide preliminary data for the development of mathematical models, and by comparison of wind tunnel data with field data, to determine the validity of wind tunnel modeling of flow and diffusion in complex terrain.
PROJECT MILESTONES: (1) 09/78 Progress report. (2) 09/79 Final report.
KEYWORDS: AIR POLLUTION;DIFFUSION;ENVIRONMENTAL TRANSPORT;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL IMPACTS;MATHEMATICAL MODELS;PLUMES;WIND TUNNELS;EARTH ATMOSPHERE

<071876>
TITLE: Vertical Variation of Diffusion Parameters
ECT NUMBER: G603A-AD-05
CIPAL INVESTIGATOR: Demarrais, G.A.
FFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$16,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Determine the variation of stability with height for six layers between 26 and 444 meters over Oklahoma City.
APPROACH: Determine the stability variations using the split-sigma technique (that is, vertical stability is determined by temperature differences between heights and horizontal stability is determined by the standard deviation of wind direction near the middle of the layer) with 10-second readings for half-hour periods. These are data for approximately 600 half-hour periods.
RESULTS: The data are analyzed and summarized. An original draft, completed in December 1976, is being revised. Major emphasis is given to the marked decrease in standard deviation of wind direction with height.
PROJECT MILESTONES: 12/76 Final report on stability variations with weight.
KEYWORDS: DIFFUSION;EARTH ATMOSPHERE;STABILITY;HEIGHT;MATHEMATICAL MODELS;AIR POLLUTION

<071877>
TITLE: Air Pollution Climatology
PROJECT NUMBER: G603A-AD-06
PRINCIPAL INVESTIGATOR: Holzworth, G.C.;Fisher, R.W.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$64,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To develop climatological information that contributes to our understanding of atmosphere transport and diffusion processes, and to our ability to assess the environmental impact of air pollutants.
APPROACH: Routine ground-level and free-air observations/measurements, made throughout the United States by the National Weather Service, are specially processed and summarized in terms of their impact on transport and diffusion.
RESULTS: (1) A very comprehensive summary of lapse rate and temperature inversion characteristics (base height, thickness, intensity) is being prepared for more than 60 locations, 2 soundings/day, 5 years of observations. An EPA report will be published during 1977. (2) A climatology of effective chimney heights, based on vertical profiles of temperature and wind speed and for hypothesized chimney heights of 50, 100, 200, 300 and 400 meters throughout the United States, is in progress. Results will be published in 1977. (3) Studies of the trends of stagnating anticyclones in the eastern U.S. and of limited mixing episodes will be prepared for comparison to trends in air quality. (4) Statistics on wind direction persistence over periods of hours will be developed for applications in receptor-oriented diffusion models. A report will be issued in 1978.
PROJECT MILESTONES: (1) 05/77 Report on effective stack height climatology for the U.S. (2) 06/77 Report on trends of stagnating anticyclones in eastern N.C. (3) 09/77 Report on trends of limited mixing episodes. (4) 10/78 Report on wind direction persistence climatology of the U.S.
KEYWORDS: AIR POLLUTION;CLIMATES;DIFFUSION;ENVIRONMENTAL EFFECTS;USA;ENVIRONMENTAL TRANSPORT;STATISTICS;MATHEMATICAL MODELS;EARTH ATMOSPHERE

<071878>
TITLE: Instrumental Detection of Viruses
PROJECT NUMBER: G603A-AG-12
PRINCIPAL INVESTIGATOR: Wallace, C.J.
AFFILIATION: National Aeronautics and Space Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, W.
TYPE OF FUNDING: Interagency agreement-IAG
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To develop procedures for identifying and measuring virus particles utilizing laser-excited fluorescence (LAF) with a tunable acousto-optical filter (TAOF).
APPROACH: (1) To develop procedures for staining T-2, bacteriophage with ethidium bromide. (2) To adapt the LAF/TAOF available at JPL to measure the fluorescence of various virus particles in water. (3) To measure the fluorescence intensity of a single T-2 bacteriophage particle using the adapted LAF/TAOF system.
RESULTS: Future activities should the system look promising: (1) to utilize this technique to measure viruses in aerosols generated in sewage treatment plants; (2) to develop and combine the use of immunological specificity and virus monitoring of surface waters to provide a means of indicating the disease potential of surface water by identifying a specific marker virus (i.e., hepatitis); (3) to investigate the potential use of multiple staining of nucleic acid and protein in developing classification capabilities.
PROJECT MILESTONES: 06/81 Final report.
KEYWORDS: VIRUSES;MEASURING INSTRUMENTS;QUANTITATIVE CHEMICAL ANALYSIS;LASERS;FLUORESCENCE SPECTROSCOPY;FILTERS;WATER;AEROSOLS;SEWAGE;IMMUNOLOGY;DISEASES;INFECTIVITY;NUCLEIC ACIDS;PROTEINS;WASTE WATER;PURIFICATION;BACTERIA;ENVIRONMENTAL IMPACTS;WASTE PROCESSING;HEALTH HAZARDS

<071879>
TITLE: Visibility Loss Model
PROJECT NUMBER: G603A-AG-14
PRINCIPAL INVESTIGATOR: Ellestad, T.G.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, W.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To develop a model of light extinction caused by aerosols of various size distributions and molecular compositions. The model will be used to predict the effects of relative humidity on light extinction and to calculate the relative contributions of aerosol sources to observed visibility loss.
APPROACH: Identify major molecular species and particle morphologies in the size range of interest. Develop and/or apply electromagnetic scattering theory to calculate the optical properties of these aerosols. Test the model against available data bases.
RESULTS: Suitable data for model evaluation was collected in January 1977 in New York City and is currently being analyzed.
PROJECT MILESTONES: 12/77 Progress report.
KEYWORDS: AEROSOLS;ENVIRONMENTAL EFFECTS;VISIBILITY;OPTICAL PROPERTIES;EARTH ATMOSPHERE;HUMIDITY;PARTICLES;SHAPE;PARTICLE SIZE;ELECTROMAGNETIC RADIATION;SCATTERING

<071880>
TITLE: National Visibility Study
PROJECT NUMBER: G603A-AG-16
PRINCIPAL INVESTIGATOR: Ellestad, T.G.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, W.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To produce an atlas of visibility isopleth maps of the U.S. from 1950 to 1975.
APPROACH: Obtain visibility data from NOAA. Finalize computer program to produce the isopleth maps. Produce the atlas.
RESULTS: Data has been ordered. Program is being finalized. Production of the atlas is expected within six months.
PROJECT MILESTONES: 09/80 Final Report.
KEYWORDS: USA;VISIBILITY;AIR QUALITY;EARTH ATMOSPHERE;DATA COMPILATION;MANUALS;AEROSOLS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;STATISTICS

<071881>
TITLE: Research in Air Pollution Meteorology
PROJECT NUMBER: G603A-AK-01
PRINCIPAL INVESTIGATOR: Niemeyer, L.E.
AFFILIATION: Department of Commerce, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Talley, W.K.
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Environmental Protection Agency FY77:$380,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GEOTHERMAL/General (25%);CONSERVATION/General (25%)
PROJECT DESCRIPTION: The research effort includes the continuing development, evaluation, and validation of air quality simulation models, both for inert and reactive pollutants. Users will be provided access to these models through the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP). New concepts and technologies will be developed and adapted for improving the weakest components of existing models, with emphasis on the effects of topography, pollutant removal and conversion processes, and complex sources. Other activities will be directed toward the determination and definition of the effects of pollutant emissions on visibility, weather, and climate. Further studies will be conducted in air pollution potential climatology. Participation will continue in the Regional Air Pollution Study (RAPS). The field portion of the study will terminate in Spring, 1977, and analysis and use of the data for model evaluation and verification will be initiated.
PROJECT MILESTONES: Continuing
KEYWORDS: AIR POLLUTION;METEOROLOGY;RESEARCH PROGRAMS;EVALUATION;SIMULATION;MATHEMATICAL MODELS;EARTH ATMOSPHERE;TOPOGRAPHY;REMOVAL;CHELATING AGENTS;VISIBILITY;WEATHER;CLIMATES;ENVIRONMENTAL IMPACTS;AIR QUALITY

<071882>
TITLE: Aircraft Turbine Emission Measurements
PROJECT NUMBER: G712B-BA-41
PRINCIPAL INVESTIGATOR: Herget, W.F.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Herget, W.F.
77 FUNDING: Environmental Protection Agency FY77:$4,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Determine reasons for apparent discrepancy between NO concentrations in jet engine exhausts as determined by non-extractive electro-optical methods and by extractive probe methods.
APPROACH: Several types of non-extractive electro-optical instruments and probe systems will be used to measure NO concentrations in heated cells and in flat-flame burners. Experiments will be conducted to

determine which type of measurement gives the most accurate results and to determine the reasons for differences between the results obtained by the different methods.
RESULTS: This two-year program is to be jointly funded by the EPA, Navy, NASA, Air Force and FAA, with the AA acting as the lead agency. A procurement document has been prepared and contract is expected to be warded during FY 77.
PROJECT MILESTONES: 09/79 Completion of NO probe study program.
KEYWORDS: AIRCRAFT;TURBINES;EXHAUST GASES;ENVIRONMENTAL IMPACTS;NITROUS OXIDE;ECOLOGICAL CONCENTRATION;ERRORS;QUANTITATIVE CHEMICAL ANALYSIS;ELECTRO-OPTICAL EFFECTS

<071883>
TITLE: Characterization of Emissions From Advanced Automotive Power Plant Concepts
PROJECT NUMBER: G712B-BC-15
PRINCIPAL INVESTIGATOR: Hare, C.T.;Springer, K.J.;Dietzmann, H.E.
AFFILIATION: Southwest Research Inst., San Antonio, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bradow, R.L.
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of this program are to determine emissions of regulated and (especially) non-regulated, potentially harmful substances from advanced engine concepts which may ultimately find application as passenger car power plants.
APPROACH: These objectives will be met by utilizing or developing analytical methods for such materials under various consumer driving simulations, and by testing a number of advanced concepts to obtain data. Types of power plants under consideration for testing include Stirling, Brayton, and Rankine cycle engines as well as more conventional diesels. Power plants chosen for testing by the Project Officer will depend on availability and on assessment of future usage potential. Two fuels will be used in each engine if at all possible. Constituents of both gaseous and particulate emissions will be studied.
PROJECT MILESTONES: (1) 01/78 Interim report. (2) 03/79 Final report.
KEYWORDS: AUTOMOBILES;EXHAUST GASES;QUANTITATIVE CHEMICAL ANALYSIS;SIMULATION;STIRLING ENGINES;BRAYTON CYCLE POWER SYSTEMS;RANKINE CYCLE ENGINES;DIESEL ENGINES;PARTICLES;AEROSOLS;GASEOUS WASTES;TURBINES;THERMODYNAMICS;AUTOMOTIVE FUELS

<071884>
TITLE: Formation of Atmospheric Aerosols
PROJECT NUMBER: G601B-CA-01
PRINCIPAL INVESTIGATOR: Whitby, K.T.;Kittelson, D.B.;Cantrell, B.K.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, W.
TYPE OF FUNDING: Grant No.-R803851-03 (Grant)
77 FUNDING: Environmental Protection Agency FY77:$225,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Aerosol size distributions have been measured in the St. Louis area as part of EPA's Project MISST using aircraft and ground based self contained mobile laboratories. These measurements were made with a group of collaborators such that a complete array of chemical, physical, and meteorological measurements were obtained on a coal fired power plant plume. The University of Minnesota's portion of the project included aerosol measurements aboard an aircraft and the operation of a mobile van on the ground under the plumes. This mobile van was also operated on freeways in the Los Angeles area during October 1976 as part of an EPA sponsored project to study sulfur aerosols on roadways. Much of the work during the next project year will be analysis and reporting of the large amount of data obtained during the past several years. Analysis is being directed toward obtaining aerosol growth rates in the plumes, aerosol nucleation rates in the plumes and surrounding atmosphere, and toward better descriptions of the aerosol size distributions. Laboratory work toward the development of a continuous instrument for the measurement of aerosol sulfur is also being partially supported by this project.
PROJECT MILESTONES: 03/77 Final report.
KEYWORDS: AIR POLLUTION;AEROSOLS;PARTICLE SIZE;PARTICLES;AEROSOL MONITORING;MISSOURI;AERIAL MONITORING;MOBILITY;FOSSIL-FUEL POWER PLANTS;PLUMES;FLUE GAS;ROADS;CALIFORNIA;SULFUR DIOXIDE;DATA ACQUISITION;AIR POLLUTION MONITORS;DESIGN;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL IMPACTS;CHEMICAL REACTION KINETICS

<071885>
TITLE: Formation of Atmospheric Aerosols
PROJECT NUMBER: G601B-CA-05
PRINCIPAL INVESTIGATOR: Whitby, K.T.;Kittelson, D.B.;Cantrell, B.K.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wilson, W.
TYPE OF FUNDING: Grant No.-R803851-03 (Grant)
77 FUNDING: Environmental Protection Agency FY77:$225,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: Aerosol size distributions have been measured in the St. Louis area as part of EPA's Project MISST using aircraft and ground based self contained mobile laboratories. These measurements were made with a group of collaborators such that a complete array of chemical, physical, and meteorological measurements were obtained on a coal fired power plant plume. The University of Minnesota's portion of the project included aerosol measurements aboard an aircraft and the operation of a mobile van on the ground under the plumes. This mobile van was also operated on freeways in the Los Angeles area during October 976 as part of an EPA sponsored project to study sulfur aerosols on roadways. Much of the work during the ext project year will be analysis and reporting of the large amount of data obtained during the past several years. Analysis is being directed toward obtaining aerosol growth rates in the plumes, aerosol nucleation rates in the plumes and surrounding atmosphere, and toward better descriptions of the aerosol size distributions. Laboratory work toward the development of a continuous instrument for the measurement of aerosol sulfur is also being partially supported by this project.

PROJECT MILESTONES: 09/77 Evaluation of highway model.
KEYWORDS: ROADS;MATHEMATICAL MODELS;EARTH ATMOSPHERE;AERIAL MONITORING;AEROSOL MONITORING;CHEMICAL PROPERTIES;PHYSICAL PROPERTIES;METEOROLOGY;FOSSIL-FUEL POWER PLANTS;PLUMES;FLUE GAS;CALIFORNIA;MISSOURI;SULFUR DIOXIDE;DATA ACQUISITION;DATA ANALYSIS;PARTICLE SIZE;ENVIRONMENTAL TRANSPORT;ENVIRONMENTAL IMPACTS;AIR POLLUTION MONITORS;DESIGN

<071886>
TITLE: Los Angeles Field Modeling and Measurement Study
PROJECT NUMBER: C601B-CA-10
PRINCIPAL INVESTIGATOR: Richards, L.W.;Mann, N.R.;Fertig, K.
AFFILIATION: Rockwell International Corp., Anaheim, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Stevens, R.K.
TYPE OF FUNDING: Contract No.-68-02-2463 (Contract)
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: Provide support to an EPA two-week experiment conducted by staff members from three universities in which measurements are made on the Los Angeles freeways to determine the concentration of and to characterize the sulfates emitted by catalyst equipped vehicles.
APPROACH: Design a larger program which may continue for more than a year which had the goal of determining the distribution of exposures of vehicle occupants in Los Angeles to sulfuric acid or sulfates resulting from catalyst equipped vehicles.
RESULTS: Select monitoring methods to measure exposure of vehicle occupants to sulfuric acid from catalyst equipped cars. Test measurement method under roadway conditions in Los Angeles and Raleigh-Durham, N.C.
PROJECT MILESTONES: 10/79 Final report.
KEYWORDS: CALIFORNIA;ROADS;AIR QUALITY;SULFATES;ECOLOGICAL CONCENTRATION;HEALTH HAZARDS;TRANSPORTATION SYSTEMS;DOSIMETRY;HUMAN POPULATIONS;SOCIAL IMPACT;CATALYTIC CONVERTERS;AUTOMOBILES;SULFURIC ACID;NORTH CAROLINA;OCCUPANTS

<071887>
TITLE: Northrop Support Services
PROJECT NUMBER: G601B-CA-25
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
TYPE OF FUNDING: Contract No.-68-02-2566 (Contract)
77 FUNDING: Environmental Protection Agency FY77:$142,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and testing; (7) fluid modeling facility operating and testing; (8) sampling and analysis methods research.
PROJECT MILESTONES: Continuing
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;MOBILE POLLUTANT SOURCES;POINT POLLUTANT SOURCES;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;INVENTORIES;GASES;CHEMICAL REACTION KINETICS;MEASURING METHODS;AEROSOLS;PARTICLES;MEASURING INSTRUMENTS;FLUID FLOW;MATHEMATICAL MODELS;AEROSOL MONITORING;SAMPLING;CHEMICAL ANALYSIS;AIR POLLUTION MONITORS

<071888>
TITLE: ADP Technical Analysis and Programming Service
PROJECT NUMBER: G601B-CA-39
PRINCIPAL INVESTIGATOR: McCutchen
AFFILIATION: General Services Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Browning
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Environmental Protection Agency FY77:$54,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: The purpose of this understanding is to provide ADP technical analysis and programming services in support of Data Management projects involving both the Meteorology and Assessment Division (MD) and the Regional Air Pollution Study (RAPS). The agencies involved are the General Services Administration, Federal Data Processing Center, Post Office Box 1900, West Station, Huntsville, Alabama 35807 and the Environmental Protection Agency, Environmental Sciences Research Laboratory, Environmental Research Center, Research Triangle Park, North Carolina 27711. SCOPE OF WORK: In the performance of work under this understanding, the GSA shall provide a supervisory systems analyst, a staff systems analyst, a senior programmer, and an assistant programmer. The estimated staffing date is 13 October 1975; an estimated 4160 hours is required for each position.
KEYWORDS: DATA ACQUISITION;DATA ANALYSIS;METEOROLOGY;COMPUTER CODES;DATA PROCESSING;REGIONAL ANALYSIS;R CODES;AIR POLLUTION;FINANCING;PERSONNEL;POLLUTION CONTROL AGENCIES

<071889>
TITLE: ADP Technical Analysis and Programming Service
PROJECT NUMBER: G603A-AA-04
PRINCIPAL INVESTIGATOR: McCutchen
AFFILIATION: General Services Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Browning
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Environmental Protection Agency FY77:$151,000

TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: The purpose of this understanding is to provide ADP technical analysis and programming services in support of Data Management projects involving both the Meteorology and Assessment Division D) and the Regional Air Pollution Study (RAPS). The agencies involved are the General Services ministration, Federal Data Processing Center, Post Office Box 1900, West Station, Huntsville, Alabama 35807 and the Environmental Protection Agency, Environmental Sciences Research Laboratory, Environmental Research Center, Research Triangle Park, North Carolina 27711.
APPROACH: In the performance of work under this understanding, the GSA shall provide a supervisory systems analyst, a staff systems analyst, a senior programmer, and an assistant programmer. The estimated staffing date is 13 October 1975; an estimated 4160 hours is required for each position.
PROJECT MILESTONES: 12/70-Aerometric data available from SAROAD, ESRL.
KEYWORDS: POLLUTION CONTROL AGENCIES;FINANCING;DATA ACQUISITION;AIR POLLUTION;DATA PROCESSING;METEOROLOGY;REGIONAL ANALYSIS;COMPUTER CODES;R CODES;PERSONNEL

<071890>
TITLE: Quality Assurance
PROJECT NUMBER: G603A-AA-06
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Boolen
TYPE OF FUNDING: Contract No.-68-02-2407
77 FUNDING: Environmental Protection Agency FY77:$42,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: The most critical period in the operation of the RAMS stations sensors is during the RAPS Intensive Studies. The RAPS Intensive Studies are one-month studies in which investigators (EPA, University, others) from across the USA conduct independent research projects within the geographical area of the RAMS Network and use the air monitoring data from the RAMS stations in their research projects. The results from the performance audits will be used to: A. Determine the areas of quality assurance improvement. Conversely, to determine areas needing additional attention in RAMS. B. Results from current audits will be used by EPA RAPS Field Manager to take immediate corrective actions since audit results will be reported within 3 days to him.
KEYWORDS: QUALITY ASSURANCE;AIR QUALITY;EARTH ATMOSPHERE;MONITORING

<071891>
TITLE: Modification of Livermore Air Quality Model for Use in St. Louis
PROJECT NUMBER: G603A-AA-11
PRINCIPAL INVESTIGATOR: Duewer, W.H.
AFFILIATION: California Univ., Riverside (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Shreffler, J.
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Environmental Protection Agency FY77:$65,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: The LIRAQ air quality models developed at Lawrence Livermore Laboratory will be modified for use with the Regional Air Pollution Study (RAPS) data of St. Louis.
APPROACH: In order that the EPA have access to LIRAQ, all computer codes are being transferred to the Lawrence Berkeley Laboratory computer system. Grid systems and topography unique to St. Louis are being incorporated into the model. Input and output routines are being modified to accept RAPS data and display results. The model will be tested on data for several days supplied by EPA.
RESULTS: This project is near completion. There has been a no-cost extension to 04/01/77.
PROJECT MILESTONES: 06/77-CY 1976 data reviewed; 12/77-All data reviewed.
KEYWORDS: CALIFORNIA;AIR QUALITY;MISSOURI;TECHNOLOGY TRANSFER;MATHEMATICAL MODELS;COMPUTER CODES;L CODES;EARTH ATMOSPHERE;AEROSOL MONITORING;ENVIRONMENTAL TRANSPORT

<071892>
TITLE: Long Path Air Pollution Monitor Evaluation
PROJECT NUMBER: G603A-AA-12
PRINCIPAL INVESTIGATOR: Bariman, F.L.;Chaney, L.W.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: McClenny, W.A.
TYPE OF FUNDING: Grant No.-R803399-03
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: To evaluate the performance of prototype air pollution monitors and to effect engineering solutions to problem areas. Emphasis has been on the evaluation of long path monitors and of monitors based on gas filled correlation.
APPROACH: To conduct laboratory and field tests in which various prototype monitors can be evaluated. Long path systems have been evaluated in regional studies in which their capabilities for area monitoring, as distinct from point monitoring, can provide useful information on the representativeness of stationary monitoring sites. Point monitors have been used in new types of applications.
RESULTS: Current plans include: (1) To develop a better design for a diode laser-based, long path system and in so doing to enhance stability and reliability of the present system; (2) To test two long path systems, one based on a diode laser and one based on a CO2 laser. Progress during the past year includes: (1) redesign of a wavelength selection system for the diode laser, long path monitor; (2) evaluation of a carbon monoxide monitor based on the optical technique of gas filter correlation (GFC); (3) participation in a field study to determine the diffusion of CO from automobile traffic on the San Diego freeway; (4)

evaluation of data pertinent to the site representativeness of sites in the Regional Air Monitoring System in St. Louis.
PROJECT MILESTONES: 06/77-ILAMS field tested; 06/79-Long path absorption spectroscopy implemented.
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;AEROSOL MONITORING;DESIGN;AIR POLLUTION;SITE SELECTION;CARBON MONOXIDE;DIFFUSION;ENVIRONMENTAL TRANSPORT;MOBILE POLLUTANT SOURCES

<071893>
TITLE: Smog Chamber Study of Conversion of SO2 as a Function of Reactant Concentration
PROJECT NUMBER: G603A-AA-20
PRINCIPAL INVESTIGATOR: Miller
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dimitrides
TYPE OF FUNDING: Contract No.-68-02-1720
77 FUNDING: Environmental Protection Agency FY77:$11,200
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The purpose of this contract activity is to obtain experimental evidence on the effects of various controllable factors, such as concentrations of reactant hydrocarbon, NO/sub x/, and SO2, under various ambient conditions, and in the presence of other atmospheric constituents. This contract effort focusses on the area-wide atmospheric process: other contract effort is addressed to the process prevailing in roadway atmospheres. The experimental work includes measurement of rate of SO2 oxidation under conditions that approach as closely as possible those prevailing in the real atmosphere above an urban center. Such conditions can be approximated to some degree in the laboratory and to a much greater degree in smog chambers filled with real atmosphere air and irradiated by natural sunlight. This contract activity is intended to provide the requisite experimental data following both approaches, namely, the in-laboratory simulation approach. Results will be used by EPA to estimate the degree to which SO2 is converted (into SO4 ions) in the atmosphere through the homogeneous gas-phase photooxidation process, and to assess the relative effects of the SO2, HC, and NO/sub x/ reactants on this process.
PROJECT MILESTONES: 09/77-Final report.
KEYWORDS: SMOG;PHOTOCHEMICAL OXIDANTS;CHEMICAL REACTIONS;PHOTOCHEMISTRY;EARTH ATMOSPHERE;HYDROCARBONS;NITROGEN OXIDES;SULFUR DIOXIDE

<071894>
TITLE: Select Research Group in Air Pollution Meteorology
PROJECT NUMBER: G603A-AB-02
PRINCIPAL INVESTIGATOR: Thomson, D.W.;Anthes, R.A.;Blackadar, A.K.;Kabel, R.L.;Lumley, J.;Tennekes, H.
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.E.
TYPE OF FUNDING: Grant No.-R800397
77 FUNDING: Environmental Protection Agency FY77:$220,000
APPROACH: Previous work in the continuing program was focused toward development of a comprehensive, meteorological model suitable for application to urban and synoptic scale problems. The resulting model is now undergoing extensive testing and validation case studies. Several of the 1, 2 and 3-d versions are also being applied to selected air pollution transport and diffusion situations such as east coast air stagnation episodes. Research also continues into improved planetary boundary layer (PBL) parameterization schemes. Simplified 11-nd order close schemes have been verified against sodar and aircraft measurements using observational system developed earlier in the program. Several 1-d PBL models have been integrated with commonly used diffusion prediction models and adapted for general use on desk calculators. Testing of surface boundary condition parameterization schemes is proceeding using satellite observations of the Los Angeles basin. Selected pollutant deposition velocities are being derived on the basis of airborne measurements made in Pennsylvania and New York. Air borne measurements made during the St. Louis RAPS experiment will be prepared for use in urban scale modeling studies.
PROJECT MILESTONES: 03/78-Final report.
KEYWORDS: AIR POLLUTION;METEOROLOGY;DEPOSITION;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;EARTH ATMOSPHERE;BOUNDARY CONDITIONS;MISSOURI;AIR QUALITY;AERIAL MONITORING;DIFFUSION

<071895>
TITLE: Development of Atmospheric Models and Modeling Capability
PROJECT NUMBER: G603A-AB-11
PRINCIPAL INVESTIGATOR: Demerjian, K.L.;Schere, K.L.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To develop an intermediate, simple photochemical air quality simulation model.
APPROACH: Incorporate parameterized meteorological functions for modeling atmospheric transport processes with more attention given to the fundamental chemical transformation process.
RESULTS: Several chemical mechanisms are available for consideration. A box model approach has been developed and evaluation studies have been developed and evaluation studies have begun using the St. Louis RAPS data base.
PROJECT MILESTONES: 09/77-Final report.
KEYWORDS: EARTH ATMOSPHERE;MATHEMATICAL MODELS;METEOROLOGY;AIR QUALITY;SIMULATION;PHOTOCHEMISTRY;CHEMICAL REACTION KINETICS;MISSOURI

<071896>
TITLE: Research in Air Pollution Meteorology
PROJECT NUMBER: G603A-AD-01
PRINCIPAL INVESTIGATOR: Niemeyer, L.F.
AFFILIATION: Department of Commerce, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Niemeyer, L.F.
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Environmental Protection Agency FY77:$182,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The research effort includes the continuing development, evaluation, and validation of air quality simulation models, both for inert and reactive pollutants. Users will be provided access to these models through the EPA User's Network for the Applied Modeling of Air Pollution (UNAMAP). New concepts and technologies will be developed and adapted for improving the weakest components of existing models, with emphasis on the effects of topography, pollutant removal and conversion processes, and complex sources. Other activities will be directed toward the determination and definition of the effects of pollutant emissions on visibility, weather, and climate. Further studies will be conducted in air pollution potential climatology. Participation will continue in the Regional Air Pollution Study (RAPS). The field portion of the study will terminate in Spring, 1977, and analysis and use of the data for model evaluation and verification will be initiated.
KEYWORDS: AIR POLLUTION;METEOROLOGY;AIR QUALITY;SIMULATION;EARTH ATMOSPHERE;TECHNOLOGY ASSESSMENT;MATHEMATICAL MODELS;REMOVAL;TOPOGRAPHY;ENVIRONMENTAL TRANSPORT;REGIONAL ANALYSIS;EVALUATION

<071897>
TITLE: Resistance Laws of the Urban Planetary Boundary Layer
PROJECT NUMBER: G603A-AD-03
PRINCIPAL INVESTIGATOR: Ching, J.;Clarke, J.;Godowitch, J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$3,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To derive the stability functions for calculating the fluxes of momentum and heat using large and mesoscale flow parameters in the St. Louis metropolitan area. The computed values of the momentum, heat fluxes and roughness length values determined from RAPS (Regional Air Pollution Study) special field study periods will be used along with the radiosonde, pibal data and LIDAR information to determine the stability functions for estimating heat and momentum fluxes. These results will be compared against results of other studies conducted over much less complex surface conditions.
RESULTS: The turbulence data from four (4) 30 meter towers are being processed. LIDAR, radiosonde and pibal data are presently available. Current plans: The depth of the mixed layer and the average wind within the mixed layer, geostrophic wind, horizontal temperature gradients, momentum and heat fluxes and roughness and stability lengths will be calculated from the various data sets gathered as part of the RAPS boundary layer intensive field study. Extensive analyses will be conducted to determine the stability function from this data set.
PROJECT MILESTONES: 09/77-Report on St. Louis urban boundary layer structure; 09/78-Development of initial model; 09/80-Report on evaluation of model.
KEYWORDS: URBAN AREAS;BOUNDARY LAYERS;STABILITY;EARTH ATMOSPHERE;MATHEMATICAL MODELS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;REGIONAL ANALYSIS;MISSOURI;TURBULENCE

<071898>
TITLE: Highway Study
PROJECT NUMBER: G603A-AB-31
PRINCIPAL INVESTIGATOR: Thompson, R.S.;Snyder, W.H.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: Concentration measurements downwind of moving 1/32nd scale, model cars are to be made in the meteorological wind tunnel. Rectangular-block model vehicles emitting a hydrocarbon tracer gas are to be mounted on a chain drive system. Concentration measurements are to be made for various highway/wind orientations, traffic densities, vehicle to wind speed ratios, etc., from the highway center to full-scale equivalent of 200m downwind. This model study will provide data that are difficult if not impossible to obtain in the field.
PROJECT MILESTONES: 01/78 Progress report. 01/79 Final report.
KEYWORDS: ROADS;AIR POLLUTION;WIND TUNNELS;SIMULATION;ENVIRONMENTAL TRANSPORT;AUTOMOBILES;VEHICLES;WIND;MATHEMATICAL MODELS;METEOROLOGY;ENVIRONMENTAL IMPACTS;TRANSPORTATION SYSTEMS

<071899>
TITLE: AQSM--Model Evaluation and Verification
PROJECT NUMBER: G603A-AB-32
PRINCIPAL INVESTIGATOR: Shreffler, J.H.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$13,500

TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This project will evaluate the capability of state-of-the-art air quality models to predict pollutants concentrations in an urban region. Models from a broad span of complexity, including photochemical and inert species models, will be tested against the Regional Air Pollution Study (RAPS) data from St. Louis
APPROACH: A set of approximately 50 days will be selected on which to base comparisons. Three of these days will be randomly chosen to adjust the models to try peculiarities of the St. Louis region. Once adjusted, the models will be run on the remaining days of the set. Comparison of predicted and observed pollutant concentrations will be made in terms of spatial and temporal correlations as well as relative differences in hourly averages at individual points.
RESULTS: This project is presently in the stage of adapting seven models to simulate the St. Louis region.
PROJECT MILESTONES: 09/78 Progress report. 09/79 Final report.
KEYWORDS: AIR QUALITY;SIMULATION;EARTH ATMOSPHERE;MATHEMATICAL MODELS;TECHNOLOGY ASSESSMENT;FORECASTING;AIR POLLUTION;ECOLOGICAL CONCENTRATION

<071900>
TITLE: Temporal and Spatial Variation of Turbulence in an Urban Area
PROJECT NUMBER: G603A-AD-10
PRINCIPAL INVESTIGATOR: Clarke, J.;Ching, J.;Godowitch, J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: To describe and to model the temporal and spatial variation of the turbulence structure over the St. Louis metropolitan area for purposes of improving urban dispersion parameterization in air quality simulation modeling.
APPROACH: Three to five 30 m towers were instrumented to obtain high frequency observations of the horizonal and vertical wind components, temperature and moisture. These towers were situated in various urban rural locations in metropolitan St. Louis. From this data set, turbulent moments, derived scaling parameters, and spectra and cospectra will be computed for various land uses. These results will be tested against current similarity theories.
RESULTS: Approximately one month of summer and one month of fall data has been collected. These data are presently being processed to compute the various essential parameters and spectra. The specific topics to be addressed are: (1) in depth study of the temporal and spatial variability of the turbulent quantities; (2) applicability of current similarity theory based on horizontal homogeneity to urban areas; and (3) relating the above results to pollutant dispersion in urban areas.
PROJECT MILESTONES: 06/79 Final report.
KEYWORDS: EARTH ATMOSPHERE;MATHEMATICAL MODELS;STABILITY;TURBULENCE;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;URBAN AREAS;DIFFUSION;AIR QUALITY;SIMULATION;MISSOURI

<071901>
TITLE: Representativeness of Meteorological Measurements in Urban Areas
PROJECT NUMBER: G603A-AD-11
PRINCIPAL INVESTIGATOR: Ching, J.;Snodgrass, H.;McElroy, J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$11,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: To evaluate the representativeness of the upper heat island temperature distribution obtained from a moving vehicle. Also to determine the representativeness of point wind measurements for a larger (0.3 to 3 km) adjacent area of similar land area.
APPROACH: Temperature collected as part of the RAPS (Regional Air Pollution Study) in St. Louis from the RAMS network will be compared with the data from an instrumented mobile van to determine possible roadway biases. Also, wind measurements for two locations, an urban and rural site, will be compared with optical wind sensor data that provides an average wind across a path 0.3 to 3 km.
RESULTS: Mobile van temperature data for selected routes are currently being compared to the subjectively analyzed RAMS temperature fields. (1) Statistics of the temperature difference obtained from the two systems as a function of time and land use will be evaluated. (2) Data from the optical wind system are not yet available. Plans call for obtaining statistics of the difference between a point measurement and space average values for a rural and an urban site.
PROJECT MILESTONES: 06/78 Final report.
KEYWORDS: METEOROLOGY;VEHICLES;WASTE HEAT;TEMPERATURE GRADIENTS;REGIONAL ANALYSIS;WIND;ENVIRONMENTAL TRANSPORT;METEOROLOGY;MATHEMATICAL MODELS;ROADS;EARTH ATMOSPHERE

<071902>
TITLE: Objective Analysis of Wind Fields
PROJECT NUMBER: G603A-AD-12
PRINCIPAL INVESTIGATOR: Eskridge, R.E.;Clark, T.L.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$24,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The algorithm developed by this project generates two-dimensional, non-divergent wind fields using 15-minute averaged wind data from 21 stations of the Regional Air Pollution Study in St. Louis, Missouri. In most Eulerian-type air pollution models, divergent-free wind fields are required,

since divergence can influence the calculated concentrations of the pollutants. The algorithm is based upon modified techniques developed by Hovland, et al. (Control Data Corporation, 1976) and Liu and Goodin (Mon. Wea. Rev., June 1976). The Hovland technique generates a two-dimensional wind field which is not divergent-free via a weighted scan-radius procedure. The Liu and Goodin technique adjusts the wind field produced by the Hovland technique to minimize the divergence. A technical paper describing the algorithm and the modifications made to each and illustrating resultant wind fields has been finalized. The paper also contains a listing of the computer program and a users' guide.
PROJECT MILESTONES: 06/77 Final report.
KEYWORDS: WIND;TWO-DIMENSIONAL CALCULATIONS;REGIONAL ANALYSIS;EARTH ATMOSPHERE;MATHEMATICAL MODELS;AIR QUALITY;SIMULATION;MISSOURI;AIR POLLUTION;COMPUTER CODES;MANUALS

<071903>
TITLE: Energy Budget of Concrete, Blacktop and Soil
PROJECT NUMBER: G603A-AD-13
PRINCIPAL INVESTIGATOR: Ching, J.;Godowitch, J.;Ranishiro, J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$14,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: To obtain a climatology and a model of energy fluxes at the surface for concrete, simulated blacktop and soil. The surface energy balance will be calculated for idealized cities composed of various fractions of these materials.
APPROACH: In depth analyses of the data set collected at and along a deserted airport runway in a rural area 25 miles NW of St. Louis area will be conducted. The data set includes net radiation fluxes and subsurface temperature profiles for at least one year and sensible heat flux during a 3 week summer period.
RESULTS: Data are presently being processed and edited under Task Order contract with Rockwell International as part of the RAPS (Regional Air Pollution Study) program. The field collection phase covers the period February 1976 through May 1977. (1) Compute, compare, and model the ground heat fluxes from the subsurface temperature profiles for the three surface types. (2) The surface energy budget will be calculated for St. Louis based on estimated percentage of these three materials in the metropolitan area.
PROJECT MILESTONES: 12/78 Progress report. 12/79 Final report.
KEYWORDS: EARTH ATMOSPHERE;CLIMATES;ALBEDO;CONCRETES;SOILS;ASPHALTS;SOLAR FLUX;AIRPORTS;URBAN AREAS;PARTICLES;AEROSOLS;MATHEMATICAL MODELS;MISSOURI

<071904>
TITLE: Vertical Distribution of Wind, Temperature and Air Quality in the Urban Boundary Layer
PROJECT NUMBER: G603A-AD-14
PRINCIPAL INVESTIGATOR: Ching, J.;Godowitch, J.;Clarke, J.;Schere, K.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: To describe and to model the temporal and spatial variability of the vertical wind and temperature profiles over an urban area and to relate these to the vertical fields of SO2 and light scattering. These studies will provide a basis for improving air quality simulation modeling.
APPROACH: Data from eight RAPS (Regional Air Pollution Study) intensity boundary layer field studies obtained by instrumented helicopter and mobile van, by a LIDAR and an acoustic sounder, from fixed wind aircrafts and from the RAMS surface and upper air network will be subjected to in-depth analyses on the spatial and temporal behavior of the mixed layer and associated air quality field as a function of land use and season.
RESULTS: 75 percent of helicopter/mobile van data has been processed. Current Plans: Remaining helicopter data will be processed along with LIDAR, acoustic sounder and fixed-wing aircraft data. Mixed layer depths derived for these periods will be made available. Further analyses will include: (1) intercomparison of the mixed layer depths observed using LIDAR, radiosondes, SODAR and helicopter soundings; (2) statistics of the morning and evening transition period, i.e., the rate of rise strength, duration and onset of the inversion over St. Louis for different seasons and land uses; (3) tests of current inversion rise parameterization formulas against the observations in the St. Louis urban/rural areas; (4) case studies of the urban heat island.
PROJECT MILESTONES: 12/78-Progress Report; 12/79-Final Report.
KEYWORDS: URBAN AREAS;BOUNDARY LAYERS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION;AIR QUALITY;WIND;TEMPERATURE GRADIENTS;MATHEMATICAL MODELS;SIMULATION;EARTH ATMOSPHERE;MISSOURI;HEAT TRANSFER;WASTE HEAT

<071905>
TITLE: Computation of Urban Energy Budgets
PROJECT NUMBER: G603A-AD-15
PRINCIPAL INVESTIGATOR: Ching, J.;Clark, J.;Godowitch, J.;Snodgrass, H.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Demerjian, K.L.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: To obtain the best estimate of the energy budget for metropolitan St. Louis as function of land use with particular emphases on the surface and vertical distribution of the sensible heat flux. These studies will lead to a model of the energy budget and subsequently to an improved understanding of dispersion in the urban boundary layer.
APPROACH: Evaluate derived and measured values of the sensible heat flux as a function of time and land use from data obtained during several RAPS (Regional Air Pollution Study) intensive field investigations

involving an instrumented helicopter and mobile van, a fixed-wing aircraft, pibals, radiosondes and specially instrumented 30 m towers.
RESULTS: Analyses of several case studies involving helicopter temperature profiles and pibal winds have been made. These involve deriving the vertical profile of sensible heat flux for different land uses as the residual term of the enthalpy equation given the closure assumption that the heat flux at the top of the inversion is proportional to the surface value. Primary emphasis is on the morning transition period. The direct measurement by the eddy correlation technique is being processed for the instrumented towers. (1) Several additional case studies using the enthalpy approach will be made. (2) Vertical profiles of heat flux will be computed from measurements of the turbulent temperature and vertical velocity obtained by fixed-wing aircraft equipped with inertial navigation system. (3) Surface sensible and latent heat fluxes as a function of time and land use will be obtained via the eddy correlation technique from the 30 m tower data. (4) Construct a model of the heat flux for St. Louis from the results of the above 3 tasks.
PROJECT MILESTONES: 1979 Final report.
KEYWORDS: MATHEMATICAL MODELS;EARTH ATMOSPHERE;AIR QUALITY;SIMULATION;URBAN AREAS;MISSOURI;HEAT TRANSFER;TEMPERATURE GRADIENTS;AERIAL MONITORING;TURBULENCE

<071906>
TITLE: Aircraft Measurements in Support of Project MISTT, Midwest Interstate Sulfur Transformation and Transport
PROJECT NUMBER: G624B-EA-07
AFFILIATION: Meteorology Research, Inc., Altadena, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Durham
TYPE OF FUNDING: Contract No.-68-02-2411
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The purpose of the 1976 MISTT study is to extend the results of previous studies to cover larger distances from the sources and obtain more detailed knowledge of the chemical processes occurring in polluted air. The aerosol formation processes as well as gaseous plume chemistry will be the subject of continued study. Conversion rates and mechanisms identified earlier need to be verified under a variety of meteorological conditions. The aerosol chemistry of the urban and power plants plumes will be examined using new techniques which will yield information on substances other than sulfate. In addition to refining our understanding of the chemical processes, the 1976 program will attempt to better define the regional transport and accumulation mechanisms at work in the Eastern United States. The project will be expanded from the immediate St. Louis area to include the study of pollutant accumulation and transport in synoptic scale, slow moving, stable air masses.
PROJECT MILESTONES: 12/77 Final report.
KEYWORDS: AERIAL MONITORING;ENVIRONMENTAL IMPACTS;AIR POLLUTION;SULFUR DIOXIDE;AEROSOL MONITORING;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;BIOLOGICAL ACCUMULATION

<071907>
TITLE: Ambient Hydrocarbon and Ozone Measurements Near a Refinery
PROJECT NUMBER: G625B-EA-01
PRINCIPAL INVESTIGATOR: Westberg, H.;Holdren, M.W.
AFFILIATION: Washington State Univ., Pullman (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, J.J.
TYPE OF FUNDING: Grant No.
77 FUNDING: Environmental Protection Agency FY77:$5,800
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The primary objective of this study is to examine the impact of a petroleum refinery on downwind ambient air quality. Monitoring the production of secondary gaseous pollutants such as ozone and other oxidants in the plume is an important goal. Both ground and aircraft monitoring systems will be employed to record chemical and physical changes in the plume as it disperses downwind of the refinery. Detailed analyses for hydrocarbons, the oxides of nitrogen, ozone, carbon monoxide, PAN and sulfur dioxide will be performed. The field program will be conducted during the summer of 1977 near a refinery that is isolated from other major hydrocarbon emission sources.
PROJECT MILESTONES: 03/79 Final report.
KEYWORDS: HYDROCARBONS;OZONE;PETROLEUM REFINERIES;ENVIRONMENTAL IMPACTS;AIR QUALITY;ECOLOGICAL CONCENTRATION;AEROSOL MONITORING;NITROGEN OXIDES;CARBON MONOXIDE;SULFUR DIOXIDE;ORGANIC CHLORINE COMPOUNDS

<071908>
TITLE: Field Evaluation of Source Sampling Technology for Trace Elements and POM
PROJECT NUMBER: G712B-BA-08
PRINCIPAL INVESTIGATOR: Bennett, R.L.;Knapp, K.T.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
77 FUNDING: Environmental Protection Agency FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of this task are to test collection methods for trace elements and organic materials from various types of sources. The collected sample will be used to help characterize the sources.
APPROACH: Samples are being collected on various types of filter material under various conditions. Both solid sorbent and impingers are being used for condensibles and organics. Currently, samples are being collected at oil-fired and coal-fired power plants and municipal incinerators.
PROJECT MILESTONES: 06/79 Final report.
KEYWORDS: TRACE AMOUNTS;ORGANIC COMPOUNDS;SAMPLING;AIR FILTERS;FOSSIL-FUEL POWER PLANTS;INCINERATORS;FLUE GAS;GASEOUS WASTES;MUNICIPAL WASTES;ENVIRONMENTAL IMPACTS;AIR POLLUTION;COAL;PETROLEUM;FUEL OILS;PARTICLES;AEROSOLS;EVALUATION;AEROSOL MONITORING;SORPTIVE PROPERTIES;ELEMENTS

<071909>
TITLE: Report on Sampling and Analysis Techniques for Condensable Emission from Stationary Sources
PROJECT NUMBER: G712B-BA-09
PRINCIPAL INVESTIGATOR: Bennett, R.L.;Knapp, K.T.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
77 FUNDING: Environmental Protection Agency FY77:$3,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this task is to prepare a review report on the progress of collection and analysis of vaporous emissions from stationary sources.
APPROACH: The task will include a careful study of the work on collection and analysis method for toxic organic and inorganic compounds that have vapor pressures sufficiently high so that filtration does not yield efficient collection. Included in this group are compounds of arsenic, selenium, lead and mercury. Currently, only information gathering is in progress. Industries under study are oil-fired power plants, coal-fired power plants, basic oxygen furnace and municipal incinerators.
PROJECT MILESTONES: 06/79 Final report.
KEYWORDS: SAMPLING;VAPOR CONDENSATION;CHEMICAL ANALYSIS;TECHNOLOGY ASSESSMENT;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;CHEMICAL EFFLUENTS;INCINERATORS;MUNICIPAL WASTES;ARSENIC;SELENIUM;LEAD;MERCURY;FOSSIL-FUEL POWER PLANTS;FUEL OILS;COAL;PETROLEUM;FURNACES;COMBUSTION PRODUCTS

<071910>
TITLE: Measurement of POM and Other Organic Pollutant Emissions
PROJECT NUMBER: G712B-BA-10
PRINCIPAL INVESTIGATOR: Jones, P.W.;Strup, P.E.;Wilkinson, J.E.;Jakobsen, R.J.;Graffeo, A.P.;Foltz, R.L.;Howes, J.E.
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bennett
77 FUNDING: Environmental Protection Agency FY77:$34,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of this program are to evaluate and make recommendations with regard to the present Battelle procedures for sampling and analysis of POM and other hazardous organic materials, in order to establish valid procedures which will result in a more unified and logical approach to the measurement of these species in a wide variety of industrial effluents.
APPROACH: The existing methods for sampling and analysis of POM will be evaluated and modified as necessary, and applied to other hazardous organic species, in order to provide reliable measurement methods for a wide range of such pollutants. The evaluation program will include measurement of representative organic emissions in the field, combined with state-of-the-art laboratory analytical techniques.
PROJECT MILESTONES: 09/79 Final report.
KEYWORDS: PARTICLES;AEROSOLS;HYDROCARBONS;SAMPLING;QUANTITATIVE CHEMICAL ANALYSIS;TECHNOLOGY ASSESSMENT

<071911>
TITLE: Sampling Technique for Measurement of Total Arsenic and Selenium
PROJECT NUMBER: G712B-BA-11
PRINCIPAL INVESTIGATOR: Peters
AFFILIATION: Little (Arthur D.), Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bennett
77 FUNDING: Environmental Protection Agency FY77:$33,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The purpose of this contractual effort is to develop original analytical methodology for the determination of NOx, NO plus NO2, in motor vehicle exhaust. The methodology must not be sensitive to other exhaust components such as oxygen, water vapor, hydrocarbons, carbon monoxide, carbon dioxide, and other nitrogen containing compounds. This analytical methodology will be used by the Environmental Protection Agency and other interested parties to define the magnitude of uncertainties associated with currently utilized NOx certification methodologies.
PROJECT MILESTONES: 10/77 Final report.
KEYWORDS: ARSENIC;SELENIUM;SAMPLING;AIR POLLUTION;NITROGEN OXIDES;NITROUS OXIDE;NITROGEN DIOXIDE;SENSITIVITY;EXHAUST GASES;AUTOMOBILES

<071912>
TITLE: Evaluation of EM Methods for Measurement of Airborne Asbestos Concentrations and Evolvement of an Optimal Procedure
PROJECT NUMBER: G712B-BA-14
PRINCIPAL INVESTIGATOR: Samudra, A.V.;Harwood, C.F.
AFFILIATION: IIT Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wagman, J.
77 FUNDING: Environmental Protection Agency FY77:$189,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Currently, the electron microscope is the only instrument capable of measuring the morphology, chemistry, and crystal structure of asbestos fibers. Several laboratories perform the analysis for airborne asbestos fibers, and while they have reasonable internal self consistency, the results obtained by the separate laboratories are often widely different. The objective of this program is to evaluate the various methods currently in use in the various laboratories, statistically evaluate the sub-procedure used, and arrive at an optimum composite procedure. The optimum procedures will be tested and statistically evaluated.
RESULTS: A handbook on the optimum procedure will be written in which detailed instructions on the method

will be given without any ambiguity. Samples will be sent out to other laboratories for analysis using the optimum procedure as described in the manual. The inter-laboratory results will then be evaluated.
PROJECT MILESTONES: 04/77 Draft final report.
KEYWORDS: ELECTRON MICROSCOPY;ASBESTOS;ECOLOGICAL CONCENTRATION;SAMPLING;OPTIMIZATION;AIR POLLUTION;EARTH ATMOSPHERE

<071913>
TITLE: Real-Time Monitor for Airborne Asbestos Fiber Concentration
PROJECT NUMBER: G712B-BA-15
PRINCIPAL INVESTIGATOR: Detenbeck, R.W.;Hemenway, D.R.
AFFILIATION: Vermont Univ., Burlington (USA). Coll. of Agriculture
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wagman, J.
77 FUNDING: Environmental Protection Agency FY77:$73,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Objective is to build a prototype instrument based on the use of light-scattering dissymetry measurements for real-time identification and counting of airborne fibers. A laboratory breadboard instrument is being assembled to demonstrate feasibility.
PROJECT MILESTONES: 12/77 Breadboard demonstration.
KEYWORDS: ASBESTOS;AIR POLLUTION MONITORS;REAL TIME SYSTEMS;FEASIBILITY STUDIES;DESIGN

<071915>
TITLE: Field Evaluation of a Prototype Acid Mist Monitor
PROJECT NUMBER: G712B-BA-23
PRINCIPAL INVESTIGATOR: Eaton
AFFILIATION: Rockwell International Corp., Anaheim, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Chency
77 FUNDING: Environmental Protection Agency FY77:$9,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Due to the requirements by EPA for the continuous monitoring of certain pollutants, and the consequent obligation to develop continuous monitoring methods, a contract has been awarded to Rockwell International Corporation for the fabrication of one prototype sulfuric acid mist monitor. As the instrument is nearing completion of fabrication by Rockwell and will soon be lab tested at their facility, it becomes necessary to test the performance of the instrument under field conditions. Since the instrument is a prototype, there is no previous data to indicate whether the measurement methodology involved will successfully monitor acid mist. The decision has been made to select a contractor to field evaluate and modify if necessary the prototype sulfuric acid mist monitor.
RESULTS: If successful, this instrumental design and technique can be used to continuously monitor acid mist emissions and make possible the compliance with EPA regulations.
KEYWORDS: SULFURIC ACID;VAPORS;MONITORING;AUTOMATION;AIR POLLUTION MONITORS;DESIGN;PERFORMANCE TESTING

<071916>
TITLE: Design and Construction of a Prototype X-ray Diffraction Instrument for Analysis of Asbestos Fibers in Air and Water
PROJECT NUMBER: G712B-BA-25
PRINCIPAL INVESTIGATOR: Birks, L.S.;Fatemi, M.;Johnson, E.T.;Whitlock, R.R.;Gilfrich, J.V.
AFFILIATION: Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Wagman, J.
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This is a follow-up to an earlier study that demonstrated the feasibility of an x-ray diffraction measurement technique for asbestos involving prealignment of fibers and direct measurement of mass concentrations.
APPROACH: Additional effort will be devoted to optimizing the sample preparation procedure, including the following steps: (1) Separation of the sample from the collection substrate, (2) Removal of non-asbestos material, (3) Fiber pretreatment to facilitate alignment, and (4) The alignment procedure itself, e.g., alignment medium, grid voltage, etc. Finally, a specially-designed x-ray diffraction analyzer will be fabricated for use by ESRL/RTP.
KEYWORDS: DESIGN;FABRICATION;AIR POLLUTION MONITORS;X-RAY DIFFRACTOMETERS;X-RAY DIFFRACTION;ASBESTOS;AIR;WATER;FEASIBILITY STUDIES;FIBERS

<071917>
TITLE: Development of Low Speed Gas Flow Measurement by Optical Convolution Velocimetry
PROJECT NUMBER: G712B-BA-29
PRINCIPAL INVESTIGATOR: Rudd, M.;Dubro, G.
AFFILIATION: Department of the Air Force, Washington, D.C. (USA); Bolt, Beranek, and Newman, Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The purpose of this project is to design and fabricate a prototype device based on optical convolution principles for the measurement of gas stream velocities in emission sources and to test its applicability at the Simulated Stationary Source Facility (SSSF), at the Environmental Protection Agency (EPA), Research Triangle Park (RTP), N.C. Air Force Flight Dynamics Laboratory (AFFDL) with its expertise will accomplish the design and fabrication of the prototype device by amending an AFFDL contract with Bolt, Beranek and Newman of Cambridge, Mass (B.B. and N.) to include the necessary effort.
APPROACH: AFFDL will evaluate the applicability of the prototype device to source emissions with tests

conducted at the Simulated Stationary Source Facility at EPA, N.C. and will provide consultative expertise, as appropriate, to EPA in the area of gas flow measurement technology using OCV principles.
PROJECT MILESTONES: 12/78 Final report.
KEYWORDS: EARTH ATMOSPHERE;MEASURING METHODS;AIR POLLUTION;STATIONARY POLLUTANT SOURCES;GASES;OPTICAL PROPERTIES;AIR POLLUTION MONITORS;DESIGN;FABRICATION

<071918>
TITLE: Electronics Engineering and Prototype Design/Fabrication Support
PROJECT NUMBER: G712B-BA-33
PRINCIPAL INVESTIGATOR: Harrison, J.W.;Brooks, A.D.;Andrews, J.E.
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Homolya, J.B.
77 FUNDING: Environmental Protection Agency FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this project is to provide electronics engineering, prototype instrument design and fabrication support for the Stationary Sources Emission Research Branch of the Environmental Protection Agency. The approach used is a work assignment (task) for specific instrument designs, analyses and/or fabrication.
PROJECT MILESTONES: 02/77 Design NH3 in water thermal convertor.
KEYWORDS: EQUIPMENT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;EARTH ATMOSPHERE;AIR POLLUTION;CHEMICAL ANALYSIS

<071919>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BA-35
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$77,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research; (2) Stationary source emissions research; (3) Gas Kinetics and physics research; (4) Special techniques research; (5) Aerosol research; (6) Air instrumentation development and testing; (7) Fluid modeling facility operation and testing; (8) Sampling and analysis methods research.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;GASES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;PERFORMANCE TESTING;FLUID FLOW;SAMPLING;CHEMICAL ANALYSIS

<071920>
TITLE: Dye Laser Lidar System for Remote Monitoring of Air Pollution Produced by Stationary Sources, Area Sources, and Present in Ambient Conditions
PROJECT NUMBER: G712B-BA-37
PRINCIPAL INVESTIGATOR: Ahmed, S.A.
AFFILIATION: City Univ. of New York, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Herget, W.F.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: A development program is proposed to define the working parameters for a practical lidar system for remote monitoring and tracking of specific air pollutants.
APPROACH: A multifrequency dye laser will be used to detect pollutants by measuring the differential absorption of atmospheric elastic backscatter on and off resonance absorption peaks. The proposed scheme therefore combines the sensitivity of resonance absorption measurements with range information to provide an accurate method of determining accurately pollutant concentration and its spatial distribution.
RESULTS: The system is designed to be of particular use in the monitoring and tracking of molecular pollutants produced by stationary and area sources as well as for measuring ambient pollution conditions.
PROJECT MILESTONES: 07/78 Final report.
KEYWORDS: LASERS;REMOTE SENSING;MONITORING;AIR POLLUTION;STATIONARY POLLUTANT SOURCES;REGIONAL ANALYSIS;OPTIMIZATION

<071921>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BA-57
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$65,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research; (2) Stationary source emissions research; (3) Gas Kinetics and physics research; (4) Special techniques research; (5) Aerosol research; (6) Air instrumentation development and

testing; (7) Fluid modeling facility operation and testing; (8) Sampling and analysis methods research.
PROJECT MILESTONES: Continuing.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;AIR POLLUTION;STATIONARY POLLUTANT SOURCES;MONITORING;GASES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;PERFORMANCE TESTING;FLUID FLOW;SAMPLING;CHEMICAL ANALYSIS

<071922>
TITLE: Development of Hydrogen Cyanide Monitors for Vehicle Emission
PROJECT NUMBER: G712B-BA-60
PRINCIPAL INVESTIGATOR: Burch, D.E.
AFFILIATION: Ford Motor Co., Dearborn, Mich. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Stump, F.
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective is to develop instruments for the real-time monitoring of hydrogen cyanide (HCN) in the exhaust of automotive engines.
APPROACH: The instrument is to make use of the unique infrared absorption properties of HCN and will employ a gas-filter cell filled with this gas species. This CTC will be the key component responsible for the sensitivity of the instrument to HCN as well as the discrimination against other gas species that occur in auto exhaust. An existing ETA instrument will be converted for use as an HCN monitor.
RESULTS: During this first phase of the contract, the instrument will be used to determine the optimum spectral bandpass, sample cell length, and other important parameters. This design information will then be used in the second phase to design, assemble, evaluate and deliver three (3) additional monitors for the same gas.
PROJECT MILESTONES: 09/77 Delivery of three instruments.
KEYWORDS: HYDROCYANIC ACID;AIR POLLUTION MONITORS;EXHAUST GASES;AUTOMOBILES;MONITORING;INFRARED SPECTRA;ABSORPTION SPECTROSCOPY;DESIGN;FABRICATION;PERFORMANCE TESTING

<071923>
TITLE: Measurement of Halogenated Pollutants and Other Trace Gases in the Troposphere In Situ by Long-Path Infrared Absorption Spectroscopy
PROJECT NUMBER: G712B-BB-02
PRINCIPAL INVESTIGATOR: Pitts, J.N.;Winer, A.M.;Graham, R.A.;Tuazon, E.C.
AFFILIATION: California Univ., Riverside (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Hanst, P.
77 FUNDING: Environmental Protection Agency FY77:$77,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: A quantitative characterization of ambient primary and secondary trace pollutant as a function of time (both diurnally and seasonally) and location (including urban areas and downwind receptor sites) is being conducted using in situ, long-path, high resolution Fourier transform infrared spectroscopy in conjunction with conventional state-of-the-art analytical methods for ambient gas phase and particulate pollutants.
APPROACH: Emphasis is being placed on the quantitative determination of products, labile intermediates, and primary pollutants for which little, if any, reliable ambient air data are currently available. These non-criteria pollutants include nitric acid, nitrous acid, halocarbons, halogenated acids, hydrogen peroxide, nitrosamines, alcohols, epoxides and organic acids, aldehydes, and other carbonyl compounds. These are of interest per se, may be toxic, and are also important for validating computerized kinetic smog models for control strategies.
RESULTS: Results of the first year of this program at Riverside include the first positive identification by spectroscopic techniques of formaldehyde and nitric acid in ambient photochemical smog, the measurement of low levels of formic acid, ammonia and a variety of halocarbons, and determination of upper limits for the possible presence of other trace contaminants. Studies will continue at Riverside and at a mid-basin site, approximately four to six hours upwind of Riverside, using the part-per-billion sensitivity afforded by a kilometer optical pathlength multiple reflection cell, and an FTS-14 Fourier transform infrared spectrometer (both of which are the property of the EPA and are on loan to SAPRC for this three-year project). Portable instrumentation currently employed in gas phase and particulate ambient air monitoring studies at SAPRC are operated in conjunction with the LPIR during selected smog episodes at the monitoring locations. This program is coordinated with ambient air monitoring studies at SAPRC supported by the California Air Resources Board and the development of an experimentally validated model for photochemical smog, funded through NSF-RANN.
PROJECT MILESTONES: 06/78 Final report.
KEYWORDS: ORGANIC HALOGEN COMPOUNDS;TRACE AMOUNTS;MONITORING;AIR POLLUTION MONITORS;INFRARED SPECTRA;FOURIER ANALYSIS;TECHNOLOGY ASSESSMENT;FOURIER TRANSFORMATION;NITRIC ACID;NITROUS OXIDE;ORGANIC ACIDS;ALCOHOLS;ALDEHYDES;ORGANIC NITROGEN COMPOUNDS;AMINES;SMOG;MATHEMATICAL MODELS;CHEMICAL REACTION KINETICS;TROPOSPHERE

<071924>
TITLE: Analysis of Nitrosamines
PROJECT NUMBER: G712B-BB-09
PRINCIPAL INVESTIGATOR: Fine, D.H.;Rounbehler, D.;Ross, R.;Fraim, F.;Huffman, F.N.
AFFILIATION: Thermo Electron Corp., Waltham, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Krost, K.
77 FUNDING: Environmental Protection Agency FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The contractor shall improve his existing TEC for sampling and analysis. Specifically, emphasis shall be placed on developing a 15 minute turnaround time for analysis of nitrosamine compounds at 0.25 micro-g/m/sup 3/ level sensitivity. After successfully completing this phase of the contract, the

contractor shall sample and analyze for nitrosamine compounds in the following environments: New York; Boston; New Jersey; Belle, West, Va.; and a clean environment to be later designated.
PROJECT MILESTONES: 05/79 Final report.
KEYWORDS: ORGANIC NITROGEN COMPOUNDS;AMINES;SAMPLING;CHEMICAL ANALYSIS;EARTH ATMOSPHERE;AEROSOLS;NEW YORK;MASSACHUSETTS;WEST VIRGINIA;NEW JERSEY

<071925>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BB-13
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and testing; (7) fluid modeling facility operation and testing; (8) sampling and analysis methods research.
PROJECT MILESTONES: Continuing
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;MOBILE POLLUTANT SOURCES;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;GASES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;PERFORMANCE TESTING;FLUID FLOW;SAMPLING;CHEMICAL ANALYSIS

<071926>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BB-14
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and testing; (7) fluid modeling facility operation and testing; (8) sampling and analysis methods research.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;MOBILE POLLUTANT SOURCES;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;GASES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;PERFORMANCE TESTING;FLUID FLOW;SAMPLING;CHEMICAL ANALYSIS

<071927>
TITLE: Report on Characterization of Toxic Trace Metals from Stationary Sources
PROJECT NUMBER: G712B-BD-06
PRINCIPAL INVESTIGATOR: Bennett, R.L.;Knapp, K.T.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this task is to prepare a summary report on the significant toxic metal data obtained during specified reporting periods from various source industries.
APPROACH: The data obtained from the in-house work on the toxic trace metal content of various source industries will be supplemented by contract and literature data and summary report. Currently, the data are being collected on oil-fired power plants, coal-fired power plants, basic oxygen furnaces and municipal incinerators.
PROJECT MILESTONES: 06/78 Final report.
KEYWORDS: STATIONARY POLLUTANT SOURCES;TOXICITY;TRACE AMOUNTS;METALS;FOSSIL-FUEL POWER PLANTS;FURNACES;INCINERATORS;MUNICIPAL WASTES;HEALTH HAZARDS;CHEMICAL EFFLUENTS;MONITORING;AIR POLLUTION;FUEL OILS

<071928>
TITLE: Report of Characterization of Organic Emissions from Petrochemical Sources
PROJECT NUMBER: G712B-BD-14
PRINCIPAL INVESTIGATOR: Barnes, H.M.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this task is to quantitatively and qualitatively determine the gaseous organic emissions from various petrochemical sources, principally those involving chemical processing.
APPROACH: Initial investigations involve studies at stationary sources emitting halocarbon compounds. The two sources examined thus far include a solvent degreaser using trichloroethylene and one using methylene chloride. Sequential samples are collected both at the point emission sources and at downwind fenceline locations and analyzed for halocarbons using GC/MS techniques.

RESULTS: Currently, a preliminary report on hydrocarbon characterization data available in the literature as well as a discussion of on-going programs within EPA was issued in 8/76. A halocarbon emissions measurement report will be issued in 7/77.
PROJECT MILESTONES: 07/78 Annual report.
KEYWORDS: PETROCHEMICALS;STATIONARY POLLUTANT SOURCES;ORGANIC HALOGEN COMPOUNDS;SOLVENTS;GAS CHROMATOGRAPHY;MASS SPECTROSCOPY;ENVIRONMENTAL IMPACTS

<071929>
TITLE: Laboratory and Field Evaluation of Hydrocarbon Classifier System
PROJECT NUMBER: G712B-BD-15
PRINCIPAL INVESTIGATOR: Homolya, J.B.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Nader, J.S.
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this task is to evaluate a prototype system for the determination of hydrocarbon emissions by class; i.e., paraffins, olefins, aromatics and oxygenates.
APPROACH: A laboratory study will be carried out using mixtures of known concentrations of hydrocarbons representative of each class fraction of interest. Upon demonstration of successful separation and quantification by sequential column chromatographic elution and FID analysis, a limited series of field experiments will be carried out.
RESULTS: Currently, the preliminary laboratory studies have been completed. The results indicate potential separation but not quantification of various classes of organics. The system is currently undergoing modification.
PROJECT MILESTONES: 10/77 Final field evaluation and emissions characterization.
KEYWORDS: HYDROCARBONS;CLASSIFICATION;QUANTITATIVE CHEMICAL ANALYSIS;PARAFFIN;ALKENES;AROMATICS;SEPARATION PROCESSES;CHROMATOGRAPHY;EVALUATION

<071930>
TITLE: Characterization of Gaseous Emissions from Stationary Sources by Remote Sensing
PROJECT NUMBER: G712B-BD-17
PRINCIPAL INVESTIGATOR: Herget, W.F.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Herget, W.F.
77 FUNDING: Environmental Protection Agency FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Use ground-based remote sensing methods to determine species identity and concentration of gaseous pollutants emitted by point and extended area stationary sources; determine optimum spectral regions for monitoring specific pollutants.
APPROACH: Longpath high resolution infrared spectroscopy will be used in absorption and emission to determine the spectral characteristics of gaseous pollutants emitted by a variety of sources. Laboratory spectra of various species will be obtained to assist in species identification and concentration determinations. Longpath gas-filter correlation methods will also be used.
RESULTS: Measurements using a grating spectrometer have been made at coal-burning power plants, incinerators, gas purification plants and carbon black plants. The grating spectrometer has been replaced with a Fourier transform spectrometer to greatly increase spectral resolution and sensitivity. A variety of sources will be studied in future years.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;MOBILE POLLUTANT SOURCES;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;GASES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;PERFORMANCE TESTING;FLUID FLOW;SAMPLING;CHEMICAL ANALYSIS

<071931>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BD-19
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in provided technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and testing; (7) fluid modeling facility operating and testing; and (8) sampling and analysis methods research.
KEYWORDS: STATIONARY POLLUTANT SOURCES;FLUE GAS;MONITORING;AIR POLLUTION;GASEOUS WASTES;REMOTE SENSING;FOSSIL-FUEL POWER PLANTS;COAL;INCINERATORS;NATURAL GAS;PURIFICATION;FOURIER TRANSFORMATION;FOURIER ANALYSIS;SPECTROMETERS

<071932>
TITLE: Polynuclear Aromatic Compounds--Synthesis and Purification
PROJECT NUMBER: G712B-BE-04
PRINCIPAL INVESTIGATOR: Eisenbraun, E.J.
AFFILIATION: Oklahoma State Univ., Stillwater (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Meeker, J.
77 FUNDING: Environmental Protection Agency FY77:$40,000

TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The synthesis and/or purification of high-purity (99.9 percent goal) polynuclear -romatic compounds, chiefly hydrocarbons, are of the types found in the products of incomplete combustion automobile exhaust gases, stack gases, coking operations), still bottoms, and heavy fuel oil from spills, nd hence appear as environmental pollutants.
APPROACH: In general, known synthesis routes will be used, but their improvement will be sought through use of new reagents and techniques. High-pressure liquid chromatography and/or zone refining will be included in the purification procedures. Modern analytical techniques (glc, lc, tlc, nmr, mass, and other spectrometric techniques) will be used for identifying compounds and establishing the purity of the synthesis products.
PROJECT MILESTONES: (1) 05/78 Delivery of compounds. (2) 05/79 Delivery of compounds. (3) 05/80 Delivery of compounds.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;PURIFICATION;AUTOMOBILES;EXHAUST GASES;COMBUSTION PRODUCTS;CHEMICAL REACTION KINETICS;STACK DISPOSAL;COKING;FUEL OILS;OIL SPILLS;ZONE REFINING;CHEMICAL ANALYSIS;SYNTHESIS;CHROMATOGRAPHY

<071933>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BE-05
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research; (2) Stationary source emissions research; (3) Gas Kinetics and physics research; (4) Special techniques research; (5) Aerosol research; (6) Air instrumentation development and testing; (7) Fluid modeling facility operating and testing; (8) Sampling and analysis methods research.
PROJECT MILESTONES: 11/78 Final report.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;GASES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;PERFORMANCE TESTING;FLUID FLOW;SAMPLING;CHEMICAL ANALYSIS

<071934>
TITLE: Ion Chromatography of Aromatic Amines
PROJECT NUMBER: G712B-BE-06
PRINCIPAL INVESTIGATOR: Frohliger, J.O.
AFFILIATION: Pittsburgh Univ., Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Mulik, J.
77 FUNDING: Environmental Protection Agency FY77:$44,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this research project is to develop a liquid chromatographic method for the separation and analysis of amines found in environmental samples.
APPROACH: The liquid chromatographic method to be utilized is a modification of ion chromatography as described by Small. The amines to be examined are aromatic amines, many of which are known or suspected carcinogens. The environmental samples to be utilized will be obtained on Hi-volume filters. These filters will be collected in the vicinity of sources of amines such as coke works and dye manufacturing facilities. Emissions from these types of sources have been implicated in lung and bladder cancers.
PROJECT MILESTONES: 03/79 Final report.
KEYWORDS: LIQUID COLUMN CHROMATOGRAPHY;SEPARATION PROCESSES;POLYCYCLIC AROMATIC HYDROCARBONS;OPTIMIZATION;COKING;DYES;CARCINOGENS;HEALTH HAZARDS;LUNGS;BLADDER;NEOPLASMS;INDUSTRY;AMINES;AIR POLLUTION;AROMATICS

<071935>
TITLE: Northrop Support Services
PROJECT NUMBER: G712-BE-07
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains Government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) Mobile source emissions research; (2) Stationary source emissions research; (3) Gas kinetics and physics research; (4) Special techniques research; (5) Aerosol research; (6) Air instrumentation development and testing; (7) Fluid modeling facility operating and testing; (8) Sampling and analysis methods research.
PROJECT MILESTONES: 09/79 Final report.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;GASES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;PERFORMANCE TESTING;FLUID FLOW;SAMPLING;CHEMICAL ANALYSIS

<071936>
TITLE: Sampling and Analysis of Organic and Inorganic Materials of High Physiological Impact
PROJECT NUMBER: G712B-BE-13
PRINCIPAL INVESTIGATOR: Sawicki, E.;Meeker, J.;Krost, K.;Wittgenstein, E.;Guyer, M.;Golden, C.;Mulik, J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Sawicki, E.
77 FUNDING: Environmental Protection Agency FY77:$26,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Develop methodology for the identification, characterization and measurement of gases, vapors and particulates of high physiological impact.
APPROACH: Develop new collection techniques based on either solid sorbents, filters, or impingers for various pollutants followed by the development of suitable analytical methods for the assay of the collected pollutants (e.g., hydrocarbons, alcohols, acids, amines, halogenated compounds, ethers, organic nitrogen compounds, organic sulfur compounds, phenols, metallorganic compounds and PAH. Also anion determination and analysis of sulfate and nitrate in urine and serum in conjunction with HERL.
RESULTS: Analytical techniques have been developed for many types of organic compounds, anions and cations. Preliminary data on new techniques for the collection and analysis of some ambient inorganic gases and indoor and outdoor organic gases, vapors and particulates look promising.
PROJECT MILESTONES: 06/77 Report. 06/78 Report. 06/79 Report. 06/80 Report.
KEYWORDS: ORGANIC COMPOUNDS;INORGANIC COMPOUNDS;SAMPLING;CLASSIFICATION;QUANTITATIVE CHEMICAL ANALYSIS;VAPORS;PARTICLES;AEROSOLS;AEROSOL MONITORING;HYDROCARBONS;ALCOHOLS;ORGANIC ACIDS;INORGANIC ACIDS;AMINES;ORGANIC HALOGEN COMPOUNDS;ETHERS;ORGANIC NITROGEN COMPOUNDS;ORGANIC SULFUR COMPOUNDS;PHENOLS;METALS;POLYCYCLIC AROMATIC HYDROCARBONS;SULFATES;NITRATES

<071937>
TITLE: Develop GC-MS Computer Instrumentation
PROJECT NUMBER: G712B-BE-14
PRINCIPAL INVESTIGATOR: Krost, K.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Sawicki, E.
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To have in-house capability for the characterization and determination of various organic gases, vapors and particles that are considered toxic or carcinogenic.
APPROACH: Primarily to collect samples on suitable solid sorbents (e.g., Tenax) and then assay by means of computer-GC-MS technology.
RESULTS: Two GC-MS systems have been installed and are nearly operational.
PROJECT MILESTONES: 12/78 Evaluate ambient air samples.
KEYWORDS: GAS CHROMATOGRAPHY;MASS SPECTROSCOPY;MASS SPECTROMETERS;ORGANIC COMPOUNDS;GASES;VAPORS;PARTICLES;AEROSOLS;TOXICITY;CARCINOGENS;MONITORING;CHEMICAL ANALYSIS;PERFORMANCE TESTING;MEASURING METHODS

<071938>
TITLE: Modification and Evaluation of New Procedures for the Assay of Several Poly Aromatic Hydrocarbons (PAH's)
PROJECT NUMBER: G712B-BE-16
PRINCIPAL INVESTIGATOR: Krost, K.;Mulik, J.;Golden, C.;Meeker, J.;Guyer, M.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Environmental Sciences Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Sawicki, E.
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Modify a new method developed by the NCI for the analysis of PAH's using liquid crystals. Develop some capillary columns for the better separation and determination of organic pollutants. Improve HPLC separations of organic pollutants.
APPROACH: The liquid crystal GC column used by NCI was found to have excessive bleed. An attempt will be made to find or synthesize a liquid crystal that is much more stable and still has the resolution necessary for PAH analysis. GC capillary and HPLC columns will also be developed and tested.
RESULTS: Several new liquid crystals have been purchased and a few synthesized. Testing has been started on several of the new liquid crystals but thus far none have been found satisfactory.
PROJECT MILESTONES: 12/78 Sampling and analysis of PAH associated particulates.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;QUANTITATIVE CHEMICAL ANALYSIS;ECOLOGICAL CONCENTRATION;SEPARATION PROCESSES;GAS CHROMATOGRAPHY;LIQUID CRYSTALS;PERFORMANCE TESTING;FEASIBILITY STUDIES

<071939>
TITLE: Engineering and Development of Dichotomous Sampler
PROJECT NUMBER: G712B-BE-26
PRINCIPAL INVESTIGATOR: Greene, M.;Morgan, J.L.;McFarland, A.
AFFILIATION: Beckman Instruments, Inc., Anaheim, Calif. (USA); Texas A and M Univ., College Station (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Stevens, R.K.
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To design and fabricate two low-cost manual dichotomous samplers and two low-cost automated dichotomous samplers.
APPROACH: To develop complete engineering drawings and design concepts to simplify the systems, reduce production cost by using molded parts, improve reliability and compatibility, with operation at

unprotected sites under full range of weather conditions.
RESULTS: Contract awarded to Beckman (4-20-77) to initiate development of manual sampler. Delivery due Jan. 15, 1977. Automated system to be funded FY-78 or sooner if resources available.
ECT MILESTONES: 06/78 First phototype delivered.
ORDS: AIR POLLUTION;AIR SAMPLERS;COST;DESIGN;OPERATION;FABRICATION;AEROSOLS

<071940>
TITLE: Developed Polymer Standards for Calibrating X-Ray Fluorescence Spectrometers
PROJECT NUMBER: G712B-DE-27
PRINCIPAL INVESTIGATOR: Yasuda, H.
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Dzubay, T.G.
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Develop thin films of known mass per unit area for calibrating x-ray fluorescence spectrometers.
APPROACH: Prepare thin films of cellulose acetate propionate that contain known amounts of organometallic compounds. Each film will contain 1 or 2 calibration elements. Using acetylacetonate compounds that are uniformly dissolved in the polymer film standards are to be made that contain Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ag, Cd, Zn, and Pb. Other compounds are to be selected for Rb, Sr, Mo, Ba, Hg, and W.
RESULTS: Initial work has demonstrated that uniform films containing V, Cu, Ni and Pb can be prepared. The same techniques are to be used to produce the complete set of standards.
PROJECT MILESTONES: 09/77 Report.
KEYWORDS: X-RAY FLUORESCENCE
ANALYZERS;CALIBRATION;POLYMERS;STANDARDS;TITANIUM;VANADIUM;CHROMIUM;MANGANESE;IRON;COBALT;NICKEL;COPPER;ZI C;SILVER;CADMIUM;ZINC;LEAD;RUBIDIUM;STRONTIUM;MOLYBDENUM;BARIUM;MERCURY;TUNGSTEN

<071941>
TITLE: Electronics Engineering, Prototype Design and Instrument Fabrication
PROJECT NUMBER: G712B-BE-28
PRINCIPAL INVESTIGATOR: Whisnant, R.A.;White, J.H.
AFFILIATION: Research Triangle Inst., Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Baumgardner, R.
77 FUNDING: Environmental Protection Agency FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this contract is to provide electronics engineering, prototype design and instrument fabrication on a task order basis to the Atmospheric Instrumentation Branch of ESRL.
APPROACH: The mechanism for this contract, task orders, allows RTI to respond to the needs of EPA personnel within the branch rapidly to minimize the delays usually inherent in procurring support from outside the agency. RTI has the personnel and facilities to provide the services upon request.
RESULTS: Typical of the tasks initiated under this contract are (a) design and fabrication of filter collection device for SO2; (b) modification of existing electronic hardware; (c) design and fabrication of a thermal converter for NH3 measurement; and (d) interfacing of hardware on existing data processing systems.
PROJECT MILESTONES: 10/76 Fabrication of 2 different ultra-ion concentration calibration systems.
KEYWORDS: AIR SAMPLERS;FABRICATION;CALIBRATION;SULFUR DIOXIDE;DESIGN;DATA PROCESSING;EQUIPMENT;AIR POLLUTION

<071942>
TITLE: Multiple Trace Gas Environmental Monitor by Mass Spectrometry
PROJECT NUMBER: G712B-BE-31
PRINCIPAL INVESTIGATOR: Wood, G.;Yeager, P.;Stevens, R.K.
AFFILIATION: National Aeronautics and Space Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Stevens, R.K.
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Fabricate a portable computer operated mass spectrometer capable of measuring sub-part-per-million concentrations of vinyl chloride and related halocarbons.
APPROACH: A specially designed low cost mass spectrometer using hyperbolic rods in a quadrupole orientation is to be fabricated and coupled to a microprocessor programmed to measure in real-time sub-part-per-million concentrations of vinyl chloride.
RESULTS: Program during FY-76 in design of the ion source and inlet resulting delay of fabrication of EOA analyzer.
PROJECT MILESTONES: 09/79 Final report.
KEYWORDS: MASS SPECTROMETERS;FABRICATION;COMPUTERS;ORGANIC HALOGEN COMPOUNDS;ORGANIC CHLORINE COMPOUNDS;MASS SPECTROSCOPY;DESIGN

<071943>
TITLE: Modify Eight Dichotomous Samplers
PROJECT NUMBER: G712B-BE-40
PRINCIPAL INVESTIGATOR: Peterson, C.M.
AFFILIATION: Environmental Research Corp., St. Paul, Minn. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Stevens, R.K.
FUNDING: Environmental Protection Agency FY77:$8,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To replace hot wire anemometer flow controller with differential flow controller.

APPROACH: Remove hot wire anemometer flow control and replace with differential flow control, then test flow regulation.
RESULTS: Fund Environmental Research Corp. to implement project to deliver working instruments by May 1977 and complete project by July 1977.
KEYWORDS: AIR POLLUTION;AIR SAMPLERS;MODIFICATIONS;FLOW RATE;DESIGN;ANEMOMETERS

<0719044>
TITLE: Develop Optical Method for Monitoring Nonmethane Hydrocarbons
PROJECT NUMBER: G712B-BE-44
PRINCIPAL INVESTIGATOR: Burch, D.E.
AFFILIATION: Ford Motor Co., Dearborn, Mich. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: McClenny, W.A.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To develop reliable optical techniques for measurement of nonmethane hydrocarbons.
APPROACH: To sponsor a contractual effort in which the optical detection technique of gas filter correlation (GFC) is used to monitor ambient levels of methane. This type of methane measurement along with a measurement of total hydrocarbons by flame ionization detection (FID) would then be combined to provide a nonmethane hydrocarbon (NMHC) measurement.
RESULTS: Current plans include: (1) the testing of the GFC-FID monitor for detection of NMHC; (2) the extension of optical detection techniques to other hydrocarbons. Progress during the immediate past has involved the initiation of the contractual process.
PROJECT MILESTONES: 01/79 Testing and comparison with existing instrumentation.
KEYWORDS: HYDROCARBONS;OPTICAL PROPERTIES;MONITORING;AIR POLLUTION MONITORS;DESIGN;AIR SAMPLERS

<0719045>
TITLE: Development of Automated Sampler-Concentration System for Halocarbons
PROJECT NUMBER: G712B-BE-49
PRINCIPAL INVESTIGATOR: Singh, H.B.
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Coleman, A.I.
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To develop automated sampling and preconcentration techniques for selected halocarbons to permit accurate determination of their atmospheric concentrations.
APPROACH: A preconcentration step is needed for those halocarbons in the atmosphere in concentrations more dilute than can be accurately determined by up-to-date gas chromatographic--electron capture technique. Methyl chloride, methylene chloride, chloroform, and Freon 22 have been selected for this study. In this work, the approach will be to employ sorption on glass surfaces at liquid nitrogen or oxygen temperatures. The procedure will be designed to produce a concentrated sample ready for injection into an analytical column. Probable interferences, especially water, will be studied. Means to eliminate the interferences will be devised.
RESULTS: The project will require eight months. The sampler--concentrator will be coupled in-house to a G.C. system to provide a complete analytical facility for the designated halocarbons.
PROJECT MILESTONES: 09/78 Final report.
KEYWORDS: AIR SAMPLERS;AUTOMATION;ORGANIC HALOGEN COMPOUNDS;ELECTRON CAPTURE;CHLOROFORM;FREONS;DESIGN

<0719046>
TITLE: Fabricate and Deliver Five Portable Aerosol Dosimeters
PROJECT NUMBER: G712B-BE-54
PRINCIPAL INVESTIGATOR: Peterson, C.M.
AFFILIATION: Environmental Research Corp., St. Paul, Minn. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bell, J.
77 FUNDING: Environmental Protection Agency FY77:$13,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To fabricate five portable aerosol dosimeters and associated flow meters.
APPROACH: A portable constant flow sampler will be connected to a filter holder designed to hold round or rectangular filters.
RESULTS: The instrument has been designed. Construction will be completed this month.
KEYWORDS: AEROSOL MONITORING;DOSEMETERS;FABRICATION;AIR POLLUTION MONITORS;MOBILITY

<0719047>
TITLE: Northrop Support Services
PROJECT NUMBER: G712B-BE-56
PRINCIPAL INVESTIGATOR: Coloff, S.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Bufalini, M.
77 FUNDING: Environmental Protection Agency FY77:$71,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The contractor, Northrop Services Inc., operates and maintains government provided facilities at EPA's Environmental Research Center, Research Triangle Park, North Carolina, in providing technical support to the Environmental Sciences Research Laboratory in the following activities: (1) mobile source emissions research; (2) stationary source emissions research; (3) gas kinetics and physics research; (4) special techniques research; (5) aerosol research; (6) air instrumentation development and

testing; (7) fluid modeling facility operating and testing; and (8) sampling and analysis methods research.
PROJECT MILESTONES: 11/77 Exercise option.
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCING;MOBILE POLLUTANT SOURCES;STATIONARY POLLUTANT SOURCES;AIR POLLUTION;GASES;CHEMICAL REACTION KINETICS;ENVIRONMENTAL TRANSPORT;AIR POLLUTION MONITORS;DESIGN;FABRICATION;PERFORMANCE TESTING;FLUID FLOW;SAMPLING;CHEMICAL ANALYSIS

<071948>
TITLE: ADP Technical Analysis and Programming Service
PROJECT NUMBER: G712B-BE-58
PRINCIPAL INVESTIGATOR: McCutchen
AFFILIATION: General Services Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Environmental Sciences Research Laboratory
MONITOR: Browning
77 FUNDING: Environmental Protection Agency FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The purpose of this understanding is to provide ADP technical analysis and programming services in support of data management projects involving both the Meteorology and Assessment Division (MD) and the Regional Air Pollution Study (RAPS). The agencies involved are the General Services Administration, Federal Data Processing Center, Post Office Box 1900, West Station, Huntsville, Alabama 35807, and the Environmental Protection Agency, Environmental Sciences Research Laboratory, Environmental Research Center, Research Triangle Park, North Carolina 27711. In the performance of work under this understanding, the GSA shall provide a supervisory systems analyst, a staff systems analyst, a senior programmer, and an assistant programmer. The estimated staffing date is 13 October 1975; an estimated 4160 hours is required for each position.
KEYWORDS: METEOROLOGY;AIR POLLUTION;REGIONAL ANALYSIS;DATA ANALYSIS;DATA PROCESSING;PERSONNEL

<072001>
TITLE: Development of Bioindicators to Nitrogen Dioxide and Sulfur Dioxide Exposures
PROJECT NUMBER: H601B-5104
PRINCIPAL INVESTIGATOR: Geller, I.;Greene, N.D.;Rowlands, C.J.
AFFILIATION: Southwest Foundation for Research and Education, San Antonio, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bruce, R.M.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The intention of this research effort is to examine the biochemical action of NO2 and SO2 on both lung metabolism and metabolism in general and develop alterations that occur into a type of dose-response bioindicator.
APPROACH: The first phase of this study will concentrate heavily on the effects of sulfur dioxide exposures on circulating lipids, proteins and immunological functions. The second phase, which combines years two and three, will be devoted to an in-depth study of the effect of SO2 and NO2 exposures upon altered immunological function and circulating hormone and biogenic amine levels. Starting with acute and chronic exposures, a specific detectable change or a series of detectable changes will be investigated in regard to its or their usefulness, over varying periods of exposure time and bracketing 0.14 ppM SO2 and 0.13 ppM NO2, as blood/urine bioindicator tests. The initial phase of this study was utilized in the development of methodology and in investigating the effects of SO2 on immunological functions and circulating lipids and proteins. The areas that demonstrated the most promise in the development of bioindicators following exposure include immunology, protein, hormones and biogenic amines. It is believed that SO2 stress does produce subtle changes in lipid metabolism; whether a bioindicator can be developed at this time, is open to question.
PROJECT MILESTONES: (1) 02/77 Screening of bioindicators responsive to SO2 exposure in animals. (2) 02/78 Effects of SO2 on selected bioindicators in rats.
KEYWORDS: BIOLOGICAL INDICATORS;NITROGEN DIOXIDE;SULFUR DIOXIDE;BIOLOGICAL EFFECTS;HEALTH HAZARDS;LUNGS;BIOLOGICAL EFFECTS;METABOLISM;BIOLOGICAL STRESS;TRANSPORTATION SYSTEMS;EXHAUST GASES;AIR POLLUTION;BIOCHEMICAL REACTION KINETICS

<072002>
TITLE: Effect of Controlled Exposure to H2SO4 Aerosol on Immune Response
PROJECT NUMBER: H601B-7102
PRINCIPAL INVESTIGATOR: Graham, J.A.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Graham, J.A.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this research is to determine what effects aerosols of H2SO4 have on the immune system. Since alternate energy sources are likely to liberate sulfur-bearing compounds that are easily converted to H2SO4, it becomes increasingly important to see what effect this pollutant has on one of the most important host defense systems.
APPROACH: The humoral immune system will be examined using the following parameters: (1) antibody production by spleen cells; (2) serum immunoglobulin titers; (3) nasal lga titers; and (4) ability of B lymphocytes to respond to mitogens. The cell mediated immune system will be examined by testing the ability of B lymphocytes to respond to mitogens.
PROJECT MILESTONES: (1) 06/77 Complete H2SO4 (0.3 micromole) exposure for immunology. (2) 11/77 Complete H2SO4 (0.3 micromole) exposure for hematology. (3) 11/79 Complete H2SO4 (ultrafine) exposure. (4) 11/80 Complete sulfate exposure.
KEYWORDS: SULFURIC ACID;AEROSOLS;IMMUNOLOGY;HEMATOLOGY;SULFATES;BIOLOGICAL EFFECTS;SULFUR;SPLEEN;ANTIBODIES;BLOOD SERUM;MITOSIS;AIR POLLUTION;BIOCHEMICAL REACTION KINETICS;TRANSPORTATION SYSTEMS

<072003>
TITLE: Toxicological Effects of Small Particle Sulfuric Acid Aerosol
PROJECT NUMBER: H601B-7103
PRINCIPAL INVESTIGATOR: O'Neil, J.J.;Stultz, S.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: O'Neil, J.J.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The respiratory effect of sulfuric acid aerosol will be determined in small animals. These studies will concentrate on the direct respiratory physiologic response to H_2SO_4 in normal animals and in animals with pre-existing pulmonary lesions (e.g., animals with chemically induced emphysema-like lesions) to determine the sensitivity of high risk groups to sulfur oxides.
APPROACH: Appropriate pulmonary function measurements will be made, such as: spirometry (lung volumes and capacities), mechanics (flow-volume relationships, dynamic and static compliance, pulmonary resistance), distribution of ventilation (N_2 washout, single breath oxygen test) and perfusion with greater sensitivity.
RESULTS: The role of H_2SO_4 aerosol size and mass concentration on these responses will be determined. Dose-response relationships will be investigated.
PROJECT MILESTONES: (1) 05/77 Hire a new principal investigator. (2) 06/78 Set up a pulmonary function laboratory for use with small animals.
KEYWORDS: TRANSPORTATION SYSTEMS;AIR POLLUTION;SULFURIC ACID;AEROSOLS;TOXICITY;PARTICLES;PARTICLE SIZE;PHYSIOLOGY;RESPIRATION;PATHOLOGY;LUNGS;BIOLOGICAL MODELS;DOSE-RESPONSE RELATIONSHIPS;ANIMALS;METABOLISM;BIOLOGICAL EFFECTS

<072004>
TITLE: Effects of Controlled Sulfuric Acid Mist on Human Immunity
PROJECT NUMBER: H601B-7104
PRINCIPAL INVESTIGATOR: Peterson, M.L.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Peterson, M.L.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Clinical tests will be made to assess the effects of sulfuric acid mist on cellular defense mechanisms in exposed human volunteers.
APPROACH: In vitro blood tests will measure changes occurring in the functional integrity of T and B lymphocytes and neutrophiles.
RESULTS: Data from this study will provide quantitative information on the immunologic effect of sulfuric acid mist for humans and aid in criteria development and evaluation of air quality standards for acid aerosol mist.
PROJECT MILESTONES: (1) 12/78 State of the art report. (2) 12/79 Immunological effects of H_2SO_4 mist in humans, preliminary report. (3) 12/81 Immunological effects of H_2SO_4 mist in humans, final report.
KEYWORDS: TRANSPORTATION SYSTEMS;AIR POLLUTION;SULFURIC ACID;TOXICITY;MAN;VAPORS;BLOOD SERUM;IMMUNOLOGY;LYMPHOCYTES;STANDARDS;PATIENTS;HEALTH HAZARDS;BIOLOGICAL EFFECTS

<072005>
TITLE: Clinical Chemical Effects of Sulfuric Acid Aerosol Mist Exposure on Humans
PROJECT NUMBER: H601B-7105
PRINCIPAL INVESTIGATOR: Bruce., R.M.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
DIVISION: Health Effects Research Laboratory
MONITOR: Bruce, R.M.
77 FUNDING: Environmental Protection Agency FY77:$60,000
PROJECT DESCRIPTION: Biochemical studies will concentrate on changes in blood and urine components occurring after human exposure to controlled levels of sulfuric acid aerosol mist. Enzymes, proteins and lipids would be studied in blood serum and formed elements while endogenous bioactive substances and their metabolites would be studied in the urine.
APPROACH: Enzymology, gas chromatography, electrophoresis and fluorescence will be utilized to detect any biochemical changes.
RESULTS: Data from this study will provide quantitative information on the effects of sulfuric acid aerosol exposure on respiratory and blood tissue in humans and aid in criteria development and evaluation of air quality standards for acid aerosol mist.
PROJECT MILESTONES: 06/78 Effects of sulfuric acid aerosol on biological parameters.
KEYWORDS: TRANSPORTATION SYSTEMS;AIR POLLUTION;BIOLOGICAL EFFECTS;SULFURIC ACID;TOXICITY;HEALTH HAZARDS;AEROSOLS;ENZYMES;PROTEINS;LIPIDS;BLOOD SERUM;QUANTITATIVE CHEMICAL ANALYSIS;METABOLISM;LUNGS;MAN

<072006>
TITLE: Study the Effects of Inhaled Sulfates Alone and in Combination with SO2 Pulmonary Defense
PROJECT NUMBER: H601B-7107
PRINCIPAL INVESTIGATOR: Brain, J.;Gardner, D.E.
AFFILIATION: Harvard Univ., Boston, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gardner, D.E.
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this project is to provide insights into how metallic sulfates, sulfur dioxide and sulfuric acid affect respiratory defense mechanisms, particularly the alveolar macrophage. With the current and proposed use of alternate energy sources, many of which contain sulfur compounds, this research becomes increasingly important, especially when one considers the current state of health effects information on these pollutants.

APPROACH: Hamsters, guinea pigs and rabbits will be exposed to aerosols of various sulfur-bearing materials, and the pulmonary deposition of these toxicants will be determined. The alveolar macrophages from these animals will then be examined in detail. The following parameters will be investigated: (1) morphology using histochemical and light and electron microscopic techniques; (2) total number and viability of cells lavagable from the lung; (3) biochemical alterations, particularly of intra- and extra-cellular enzymes and respiration; and (4) physiological functioning using both in vitro and in vivo phagocytic techniques and macrophage migration measurements.
PROJECT MILESTONES: 02/77 Contract started. 02/77 Installation and calibration of exposure chambers. 07/77 Developing and modifying specific techniques. 10/77 Begin initial testing of metallic sulfates.
KEYWORDS: SULFATES;INHALATION;TOXICITY;SULFUR DIOXIDE;SYNERGISM;TRANSPORTATION SYSTEMS;BIOLOGICAL EFFECTS;AIR POLLUTION;LUNGS;BIOLOGICAL MODELS;MORPHOLOGY;BIOCHEMICAL REACTION KINETICS;METALS;SULFURIC ACID;IMMUNOLOGY

<072007>
TITLE: Development of Sensitive Biochemical and Behavioral Indicators of Trace Substance Exposure
PROJECT NUMBER: H601B-7109
PRINCIPAL INVESTIGATOR: Hassard, E.
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Goldstein, G.M.
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: It is the purpose of this investigation to identify biochemical indicators of exposure to trace substances.
APPROACH: This task will be accomplished by evaluating the effects of trace substances in major metabolic pathways in the central nervous system; determination of the biotransformation of trace substance in adult and developing embryo-fetus animal model; and correlate the above mentioned effects with those of selected behavior in the adult and during postnatal development of offspring of treated mothers in appropriate animal models.
RESULTS: The resulting biochemical changes will be correlated with changes in behavior so as to increase our basic understanding of how these substances interact with the mammalian system.
PROJECT MILESTONES: 09/77 Completion of scientific effort. 01/78 Contract report.
KEYWORDS: TRANSPORTATION SYSTEMS;BIOLOGICAL EFFECTS;HEALTH HAZARDS;AIR POLLUTION;BIOLOGICAL INDICATORS;TRACE AMOUNTS;BEHAVIOR;METALS;TOXICITY;METABOLISM;BIOCHEMICAL REACTION KINETICS;TERATOGENESIS;EMBRYOS;FETUSES;ANIMALS

<072008>
TITLE: Study of the Use of Leucocyte Metabolism as a Health Effects Indicator
PROJECT NUMBER: H601B-7110
PRINCIPAL INVESTIGATOR: Lunan, K.
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Goldstein, G.M.
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Assessment of subtle biochemical and physiological changes induced by exposure to major catalytic convertor attrition products.
APPROACH: Work will include alteration of leucocyte and platelet metabolism, chromosomal aberrations, alteration of immunological response and PMN neutrophile phagocytosis. Enzyme changes in rabbit liver, kidney and heart exposed to varying doses of platinum will be studied, along with blood and urine levels of histamine.
PROJECT MILESTONES: 10/77 Completion of scientific effort. 01/78 Final report.
KEYWORDS: LEUKOCYTES;METABOLISM;BIOLOGICAL INDICATORS;TRANSPORTATION SYSTEMS;AIR POLLUTION;HEALTH HAZARDS;BIOLOGICAL EFFECTS;BIOLOGICAL MODELS;CHROMOSOMAL ABERRATIONS;IMMUNOLOGY;RABBITS;LIVER;KIDNEYS;HEART;PLATINUM;TOXICITY;BLOOD;URINE;HISTAMINE;QUANTITATIVE CHEMICAL ANALYSIS

<072009>
TITLE: Comparative Methylation Chemistry of Platinum, Palladium and Lead
PROJECT NUMBER: H601B-7112
PRINCIPAL INVESTIGATOR: Taylor, R.;Bruce, R.M.
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bruce, R.M.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To examine the biochemical methylation of platinum as an in vitro model of their potential biotransformations. This proposal focuses on the acute cellular toxicity and mutagenicity of at least one Me-Pt compound plus several related Pt-salt complexes.
APPROACH: In vitro biological experiments will employ cultured Chinese hamster ovary cells as a mammalian test system. Further chemical characterization of one Me-Pt compound prepared from K2PtC16 plus MeB-12 will be made and the isolation of Me-Pt products from Pt(SO4)2 plus MeB-12 will be attempted.
PROJECT MILESTONES: 10/76 Biochemical methylation of selected metals as an in vitro model. 12/77 Biochemical methylation of platinum and acute cellular toxicity.
KEYWORDS: PLATINUM;PALLADIUM;LEAD;METABOLISM;TOXICITY;BIOLOGICAL MODELS;METHYLATION;BIOCHEMICAL REACTION KINETICS;MUTAGENS;HAMSTERS;OVARIES;TRANSPORTATION SYSTEMS;CATALYTIC CONVERTERS;AIR POLLUTION ABATEMENT;AIR POLLUTION;COMPARATIVE EVALUATIONS;HEALTH HAZARDS

<072010>
TITLE: Compare Pulmonary Carcinogenicity of Pt-Group Compounds and of Pb in Association with Polynuclear Aromatics Using In Vivo Hamster System
PROJECT NUMBER: H601B-7115
PRINCIPAL INVESTIGATOR: Kuschner, M.;Waters, M.D.
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Waters, M.D.
77 FUNDING: Environmental Protection Agency FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this contract is to determine the biologic activity of platinum, specifically the metallic oxide on the induction of pulmonary neoplasia by a known hydrocarbon carcinogen, benzo(a)pyrene.
APPROACH: It is the purpose of the contract to examine the action of a lead compound in this same role. This investigation will thereby serve to compare the possible role as a cofactor in carcinogenesis of one of the presently emitted substances, lead, with a substance which might be added de novo to the exhaust stream as a consequence of mandated modifications in the automotive engine. This comparison will be augmented by an exposure group receiving ferric oxide plus Pb to serve as both a positive control in the system and as an index of the ability of either platinum or lead to replace Fe2O3 as a cofactor in the carcinogenesis model. This study is in its second year. The work is progressing on schedule.
RESULTS: The data derived from this investigation are to be used in evaluating the potential human health hazard associated with the use of an automotive engine employing a platinum catalytic muffler.
PROJECT MILESTONES: 12/77 Estimate final date for necropsy. 03/78 Final report available.
KEYWORDS: LUNGS;CARCINOGENS;PLATINUM;LEAD;HAMSTERS;POLYCYCLIC AROMATIC HYDROCARBONS;SYNERGISM;TOXICITY;BIOLOGICAL EFFECTS;METALS;BENZOPYRENE;CATALYTIC CONVERTERS;AIR POLLUTION ABATEMENT;AIR POLLUTION;HEALTH HAZARDS;TRANSPORTATION SYSTEMS;IRON OXIDES;CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS

<072011>
TITLE: Mucus Glycoproteins Secreted by Tracheal Explants from Rats Exposed to Pollutants
PROJECT NUMBER: H601B-7124
PRINCIPAL INVESTIGATOR: Last, J.A.
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Graham, J.A.
77 FUNDING: Environmental Protection Agency FY77:$36,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The effects of exposure of rats of ozone and sulfuric acid aerosols, pollutant gases that cause irritation to the airways, are being evaluated. Preliminary data suggest that there are qualitative and quantitative changes in glycoproteins secreted by cultured trachea from animals exposed to ozone or to mixtures of ozone and sulfuric acid. Interestingly, sulfuric acid and ozone appear to act synergistically.
APPROACH: To perform an experiment, we incubate excised trachea in organ culture in the presence of isotopically labeled precursor sugars or amino acids. The radioactive label allows to quantitate secreted glycoproteins, and relate those quantitative data to the pollutant regimen to which the rats had been exposed.
RESULTS: It is anticipated that these studies will add to our basic knowledge concerning reactions of the respiratory system with air pollutants, and of tracheal metabolism, with a focus on the most important secretory products of this organ, the mucus glycoproteins. Such knowledge is relevant to a better understanding of several human diseases, including chronic bronchitis, and a rational evaluation of the role(s), if nay, that exposure to air pollutants play(s) in the development of these diseases of the conducting airways.
PROJECT MILESTONES: 11/77 Award grant. 01/78 Begin exposures. 04/79 Complete initial in vivo exposures to O3 and H2SO4. 08/80 Complete exposures to combinations of O3 and H2SO4. 10/80 Final report.
KEYWORDS: TRANSPORTATION SYSTEMS;BIOLOGICAL EFFECTS;HEALTH HAZARDS;AIR POLLUTION;RATS;OZONE;SULFURIC ACID;TOXICITY;TRACHEA;LUNGS;SYNERGISM;LABELLED COMPOUNDS;RESPIRATORY SYSTEM;METABOLISM;PATHOLOGY;BRONCHITIS;ETIOLOGY;BRONCHI

<072012>
TITLE: Estimating Population at Risk to Various Air Pollution Exposures
PROJECT NUMBER: H601C-7213
PRINCIPAL INVESTIGATOR: Hollowell, C.D.;Merrill, D.W.;Austin, D.M.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Nelson, W.C.
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To provide population-at-risk estimates on a county basis for the United States population and selected demographic subsets for specified concentrations of the major air pollutants.
APPROACH: To obtain and combine existing population and air quality data sets to form a data base covering all counties in the contiguous U.S. and to utilize this data base to make population-at-risk estimates. Effort will be made to fill in gaps in the area coverage of the air monitoring data by investigating alternative data sources and by utilizing estimation procedures.
RESULTS: Appropriate data bases for population, air pollution, meteorology, socio-economic data, and mortality have been identified and obtained on the LBL computer. A data base management system has been developed to facilitate analysis.
PROJECT MILESTONES: 09/77 Acquire necessary data at LBL. 09/77 Provide planned county maps. 12/77 Develop estimation methodology required by missing data. 06/78 Perform statistical analyses. 10/78 Final report.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;HUMAN POPULATIONS;ECOLOGICAL CONCENTRATION;INFORMATION SYSTEMS;TOXICITY;METEOROLOGY;SOCIO-ECONOMIC FACTORS;MORTALITY;DATA PROCESSING;RISK ASSESSMENT;DATA ACQUISITION SYSTEMS;DATA COMPILATION;EPIDEMIOLOGY

<072013>
TITLE: SIMS Three Year Study on Statistics and Environmental Factors in Health
PROJECT NUMBER: H601C-7214
PRINCIPAL INVESTIGATOR: Thomsen, D.L.;Fleiss, J.L.;Goldstein, I.F.
AFFILIATION: Columbia Univ., New York (USA); Society for Industrial and Applied Mathematics, Philadelphia, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Nelson, W.C.
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: During 1976 SIMS will continue to coordinate the Study as outlined in the Proposal (February 1976).
APPROACH: This coordination will in part consist of ensuring communication between the Review Panel and the centers at Columbia and Stanford; it will also consist of ensuring direct communication between the two centers in the form of both personal visitations by members of the Study and seminars as appropriate. As soon as any technical reports and papers are produced as a result of the Study, SIMS will see that there is suitable distribution. COLUMBIA: The first steps will be taken towards the construction of a doubly stochastic Poisson process as a model for mortality and morbidity data in which the rate parameter is itself a random variable depending on time, weather, and pollution. Research will begin to develop sounder statistical methods than so far employed for detecting geographic areas in which there is nonrandom clustering of cases of a certain disorder, with proper control for such factors as size of population, proximity to treatment facilities, and utilization of those facilities. Principal components analysis for individual pollutants will begin of correlations, covariances, and raw cross-products between readings from the 40 monitoring stations in the New York City aerometric network. STANFORD: During the first year, research will include the following: The effects of time averaging on the distribution of pollutant concentration maxima; the relevance of probabilistic assumptions to the estimation of spatial pollutant distributions; the relation between spatial air pollution patterns and spatial health and mortality statistics; a retrospective look at the effects of the 1974 fuel crisis on air pollution and mortality statistics.
PROJECT MILESTONES: 07/77 SIMS technical progress report. 07/78 SIMS technical progress report.
KEYWORDS: HEALTH HAZARDS;STATISTICS;ENVIRONMENTAL IMPACTS;BIOLOGICAL EFFECTS;HUMAN POPULATIONS;MORTALITY;BIOLOGICAL MODELS;DATA ACQUISITION;DATA ANALYSIS;EPIDEMIOLOGY;AIR POLLUTION;POPULATION DYNAMICS;ENVIRONMENTAL TRANSPORT;SPATIAL DISTRIBUTION;ENERGY SHORTAGES;SOCIO-ECONOMIC FACTORS

<072014>
TITLE: ST Segment Analysis of Electrocardiogram in Subject Testing
PROJECT NUMBER: H601C-7215
PRINCIPAL INVESTIGATOR: Stacy, R.W.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Stacy, R.W.
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this study is to provide a non-invasive index, based on the conventional electrocardiogram and automatically derived by computer techniques, for evaluating ischemic changes to the myocardium resulting from exposure to environmental contaminants.
APPROACH: A computer program will be developed to analyze the 12-lead electrocardiogram of humans. This program will provide information regarding (a) S-T segment changes before, during, and after exercise stress testing, separately and in combination with exposure to environmental contaminants, and (b) arrhythmias occurring in a single lead electrocardiogram during such testing. The latter will identify unusual or abnormal cardiac rhythms.
RESULTS: The analytical program will provide for the quantitative measurement of the S-T segment voltage depression, the slope of the S-T segment, and the area under the S-T segment of the ECG. These quantities, along with the heart rate, will be continuously available to the investigator, so that he may intervene if cancerous conditions occur. The programs so developed will be implemented on the CLEANS Physiological Data Acquisition System computer. A parallel development will implement the same programs on microprocessors, which will tie up the PDAS computer for only a very small fraction of its time. The ultimate purpose of this project is to provide the capability of using the electrocardiogram (as easy parameter to measure) as a non-invasive indicator of insufficient myocardial blood flow brought on by toxicologic effects of atmospheric pollutants in combination with exercise stress testing.
PROJECT MILESTONES: 06/76 Acquisition and testing of analog measuring equipment. 12/76 Development and testing of programs on free standing computer. 07/77 Demonstration of use of programs on dogs exposed to CO and hypoxigenation. 12/77 Debugging and evaluation of exercise stress testing in CLEANS. 12/77 Acquisition of microprocessing equipment. 06/78 Incorporation of existing programs into CLEANS PDAS system. 12/78 Development and evaluation of microprocessors for ECG analysis.
KEYWORDS: CLEANS;MEASURING INSTRUMENTS;PERFORMANCE TESTING;DESIGN;COMPUTER CODES;DOGS;CARBON MONOXIDE;MAN;C CODES;BIOLOGICAL INDICATORS;BIOLOGICAL STRESS;HEART;MYOCARDIUM;ELECTROCARDIOGRAMS;DIAGNOSTIC TECHNIQUES;AIR POLLUTION;TOXICITY;MICROPROCESSORS;EQUIPMENT

<072015>
TITLE: Human Cardiopulmonary and Cytopathic Effects of O3, NO2, and Aerosols
PROJECT NUMBER: H601C-7216
PRINCIPAL INVESTIGATOR: Ketcham, B.T.;Malindzak, G.S.;Seal, E.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Ketcham, B.T.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective is to outline major human health effects associated with inhalation of known air pollutants.
APPROACH: Subject volunteers will be exposed to levels of ozone, NO2 and aerosols approximating safe maximal daily concentrations in polluted areas. Measurements will be made of changes in pulmonary function and on

the efficiency of exercise performance. Changes in airway resistance, spirometry function, oxygen uptake and cardiac performance will be determined. In addition, studies will be performed on circulating white blood cells and the possible adverse health effects of these pollutants on the infection-fighting role of these blood elements. Measurements will include those of lymphocyte transformation and phagocytic and chemotactic ability of polymorphs.
RESULTS: Information from this study will assist in assessing the physiologic and cellular impact of these pollutants on humans.
PROJECT MILESTONES: 02/78 Publication of health effects of 0.6 ppm ozone inhalation for 2 hours.
KEYWORDS: OZONE;NITROGEN DIOXIDE;AEROSOLS;AIR POLLUTION;PARTICLES;HEALTH HAZARDS;INHALATION;MAN;LUNGS;HEART;BLOOD;PHYSIOLOGY;BIOLOGICAL FUNCTIONS

<072016>
TITLE: Behavioral Effects of Oxidant, CO and NO2 on Human Subjects
PROJECT NUMBER: H601C-7217
PRINCIPAL INVESTIGATOR: Benignus, V.A.;Otto, D.A.;Prah, J.D.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Benignus, V.A.
77 FUNDING: Environmental Protection Agency FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To develop sensitive techniques to assess effects of oxidants, CO2, and NO2 on human performance central nervous system function as indexed by EEG and evoked brain potentials, olfactory function, subjective perception, and personality.
APPROACH: Vigilance, sensorimotor, and psychophysical tasks, personality inventories, psychophysiological recording procedures, and self-report scales will be used to evaluate toxicant effects. No impairment in vigilance performance has been observed at COHb levels up to 12%. Analysis of spectrum and evoked potential parameters of EEG data has not yet been completed. Construction of an olfactometer is nearing completion. Projected FY-78 studies include interactive studies of CO, ethanol, noise and parametric testing of olfactometer.
PROJECT MILESTONES: 01/78 Complete olfactometer development. 01/78 Initiate co-vigilance study/CLEANS chambers. 04/78 Complete baseline olfactory assessment and initiate ozone olfaction.
KEYWORDS: CLEANS;PHOTOCHEMICAL OXIDANTS;CARBON MONOXIDE;NITROGEN DIOXIDE;HEALTH HAZARDS;AIR POLLUTION;BIOLOGICAL EFFECTS;CENTRAL NERVOUS SYSTEM;OLFACTORY BULBS;BIOLOGICAL FUNCTIONS;ETHANOL;NOISE POLLUTION;OZONE

<072017>
TITLE: Effect of Etiologically-Defined Respiratory Infections on Lung Function and Its Growth in an Area of Low Air Pollution
PROJECT NUMBER: H601C-7221
PRINCIPAL INVESTIGATOR: Collier, A.M.
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Ketcham, B.T.
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this study is to provide baseline pulmonary function data on children living and growing in an area of low environmental pollution.
APPROACH: Children will be studied longitudinally to characterize pulmonary function changes associated with physical growth and documented upper respiratory infections. Children will be cultured for pathogens at two-week intervals regardless of symptomatology and measurements made will assess the impact of these infectious agents on pulmonary function.
RESULTS: This information will enable the design of better studies to assess the growth of lung function and impact of respiratory infections on young children living in areas of high air pollution.
PROJECT MILESTONES: 01/78 Publication of growth of lung function data of present study.
KEYWORDS: LUNGS;RESPIRATORY SYSTEM DISEASES;ETIOLOGY;EPIDEMIOLOGY;AIR POLLUTION;HEALTH HAZARDS;BIOLOGICAL FUNCTIONS;CHILDREN;METABOLISM

<072018>
TITLE: Pathophysiology of CO Exposure in Ischemic Heart Disease
PROJECT NUMBER: H601C-7222
PRINCIPAL INVESTIGATOR: McLaurin, L.P.;Foster, J.R.
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Wagner, M.T.
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The purpose of this investigation will be further assessment of the role of carbon monoxide (CO) as an aggravating factor in the pathophysiology of ischemic heart disease and acute myocardial infarction.
APPROACH: Animal studies assessing the effect of graded exposure to low levels of CO on regional myocardial blood flow, tissue oxygenation, and left ventricular function are planned. Further studies on ventricular fibrillation threshold and the genesis of arrhythmias will be performed. Human studies include assessment of CO as a factor limiting exercise performance, aggravating arrhythmias and compromising left ventricular function will be carried out. A long-term study of the relationship of carboxyhemoglobin level to myocardial infarction size, morbidity, and mortality from acute myocardial infarction is being undertaken in conjunction with the area emergency medical services and the Office of the State Medical Examiner.
PROJECT MILESTONES: 05/76 Grant award; obtain supplies and equipment. 10/76 Initiate pilot experiments. 07/77

Submit report of pilot studies. 07/77 Initiate dog studies. 01/78 Preliminary report on dog data. 07/78 Initiate human studies. 01/79 Final report on dog data. 04/79 Final report on human exposures.
KEYWORDS: CARBON MONOXIDE;HEALTH HAZARDS;TOXICITY;AIR POLLUTION;DOGS;MAN;PATHOLOGY;PHYSIOLOGY;HEART;MYOCARDIAL INFARCTION;LIMITING VALUES;ISCHEMIA;CARDIOVASCULAR DISEASES

<072019>
TITLE: Adaptation Effects of Low Level O3 Exposure on Normal Humans
PROJECT NUMBER: H601C-7225
PRINCIPAL INVESTIGATOR: Horvath, S.M.
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Ketcham, B.T.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this program is to provide information concerning the influence of two environmental contaminants (specifically, O3 and NO2 separately and in combination) with heat stress before and during moderate exercise, on cardiac, pulmonary and peripheral circulatory function. The combination effect of environmental contaminants and heat stress is not known at this time. Information regarding the pathophysiological interaction of these three factors will assist in assessing their precise effects on human health. In the first year of the research program, the effect of O3 (0.3-0.5 ppm, 2-4 hours/day) and heat stress (25 degree C-40 degree C) on cardiac, pulmonary and peripheral circulatory function will be studied on human subjects before and during moderate exercise. These responses will be compared with an identical schedule with the same subjects breathing clean air.
APPROACH: In the second year of the research program, the effect of NO2 (0.5-1.0 ppm for two hours daily) and heat stress (25 degree C-40 degree C) on cardiac, pulmonary and peripheral circulatory function will be studied on human subjects before, during and after moderate exercise. These responses will, in turn, be compared with an identical schedule with the same subjects breathing clean air. In the third and final year of the research program, the effects of O3 and NO2, in combination (levels dependent upon the outcome of the Year I (O3) study and Year II (NO2) study) and heat stress on cardiac, pulmonary and peripheral circulatory function will be studied on human subjects before and during moderate exercise. These responses will be compared with an identical schedule with the same subject breathing clean air.
RESULTS: Final report describing ozone effects in man.
PROJECT MILESTONES: 06/78 Report on ozone adaptation in humans.
KEYWORDS: OZONE;MAN;BIOLOGICAL ADAPTATION;NITROGEN DIOXIDE;TOXICITY;BIOLOGICAL STRESS;TEMPERATURE EFFECTS;PATHOLOGY;PHYSIOLOGY;CARDIOVASCULAR DISEASES;SYNERGISM

<072020>
TITLE: Operation and Maintenance of the Community Health Air Monitoring Program (CHAMP) Including Mobile Units
PROJECT NUMBER: H601C-7226
PRINCIPAL INVESTIGATOR: Sullivan, R.J.
AFFILIATION: Xonics, Inc., Los Angeles, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hinton, D.O.
77 FUNDING: Environmental Protection Agency FY77:$905,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To quantitatively characterize air pollutants in selected health study communities.
APPROACH: A CHAMP monitoring site (fixed or mobile) is located within each study community to obtain measurements representative of the air pollutant exposure of residents within the community.
RESULTS: The present status involves contract 68-02-2493 with Xonic, Inc. to operate stations, validate data and perform Quality Assurance to determine accuracy of data produced. This system utilizes automatic continuous air quality measurement instruments and real time data retrieval at 28 CHAMP sites. This contract provides for continuing operation and maintenance of the CHAMP system consisting of 23 semi-fixed stations and 5 mobile vans.
PROJECT MILESTONES: (1) Progress report due monthly; (2) quality control reports due periodically, not to exceed six month intervals; (3) determination of award fee semi-annually.
KEYWORDS: CHAMP;HEALTH HAZARDS;AIR POLLUTION;OPERATION;MAINTENANCE;MONITORING;COMPUTER CODES;C CODES;MOBILITY;HUMAN POPULATIONS;AUTOMATION;SITE SELECTION

<072021>
TITLE: Intramural Champ Activities Related to Environmental Monitoring Program
PROJECT NUMBER: H601C-7228
PRINCIPAL INVESTIGATOR: Mage, D.T.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Mage, D.T.
77 FUNDING: Environmental Protection Agency FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To quantitatively characterize the precision and accuracy of air pollutant exposure measurements through the evaluation of duplicate monitoring data and the evaluation of various operating parameters upon data collected from automated sensors in CHAMP.
APPROACH: With the continued use of duplicate monitors, it is intended to collect and evaluate data to determine the degree of precision and accuracy of the various manual methods used in population exposure studies. CHAMP automated monitors will be tested by varying critical operating parameters in the system to determine their effect upon pollutant data collected.
RESULTS: Data analyses will be conducted on collected information and a report will be prepared.
PROJECT MILESTONES: 02/77 Performed lab tests for ozone parameters. 04/77 Performed lab tests for NO2

parameters. 10/77 Performed lab tests for SO2 parameters. 11/77 Performed lab tests for HC parameters. 12/77 Complete computer analysis of collected data. 03/78 Write final report. 06/78 Analyze data from CHAMP particle collectors
KEYWORDS: CHAMP;AIR POLLUTION;MONITORING;AUTOMATION;COMPUTER CODES;C CODES;NITROGEN DIOXIDE;SULFUR DIOXIDE;HYDROCARBONS;OZONE;DATA ANALYSIS;PARTICLES;ERRORS;RELIABILITY;HUMAN POPULATIONS;HEALTH HAZARDS

<072022>
TITLE: Evaluation of Aerometric Sensors for the Champ System
PROJECT NUMBER: H601C-7229
PRINCIPAL INVESTIGATOR: Burton, R.M.;Barnard, W.F.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Burton, R.M.
77 FUNDING: Environmental Protection Agency FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective is to define precisely the accuracy of aerometric data obtained from the CHAMP network. Interferences, measurement difficulties, etc. shall be investigated and their impact upon collected data shall be known.
APPROACH: The approach of this task is to determine the optimal characteristics of the CHAMP system aerometric sensors and to provide evaluation of instrumentation for new CHAMP pollutant measurements.
RESULTS: Both laboratory and field projects will be carried out to determine operational parameter characteristics of the various sensors used in CHAMP. Specific sensors will be laboratory tested and all associated parameter values will be tested. In concert with the laboratory tests, the parameters will be field tested at existing CHAMP locations. From the test data obtained, recommendations will be made for setting operational parameters. In addition, feasibility studies will be performed to evaluate new sensors and methods.
PROJECT MILESTONES: 02/77 Parameter testing, field data collection. 03/77 SO2 sensor evaluation report. 02/77 Massive volume particulate sampler evaluation. 02/77 CHAMP aerosol instrument evaluation. 06/77 APCA presentation on parameter testing results and Massive volume sampler. 07/77 Hydrocarbon sensor evaluation. 09/77 Final report on hydrocarbon sensor evaluation. 10/77 Final report on CHAMP aerosol instrumentation operation. 12/77 Final report on massive volume sampler development and evaluation
KEYWORDS: CHAMP;AIR POLLUTION;MONITORING;AUTOMATION;COMPUTER CODES;C CODES;SULFUR DIOXIDE;AEROSOLS;AIR POLLUTION MONITORS;HYDROCARBONS;SAMPLERS;EVALUATION

<072023>
TITLE: Effects of Air Pollutants on Respiratory Defense Mechanisms
PROJECT NUMBER: H601C-7233
PRINCIPAL INVESTIGATOR: Gardner, D.E.;Blommer, E.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gardner, D.E.
77 FUNDING: Environmental Protection Agency FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this research will be to evaluate the effects of inhalation of various gaseous pollutants on the pathogenesis of pulmonary disease by means of an experimental animal model.
APPROACH: The parameters which may be studied, but not limited to, are: (A) Alteration of Susceptibility to Infection: (1) Mortality to infection; (2) Growth and persistence of microorganisms in the lung of exposed animals; (3) Invasion of the blood. (B) Alteration in Bodies Defensive Mechanisms: (1) Pulmonary Macrophage System: (a) Alveolar macrophage stability; (b) Cell viability; (c) Morphological alterations; (d) Phagocytic function; (e) Enzyme competence. (2) Alteration in Humoral Defenses: (a) Antibody production; (b) Antibody persistence; (c) Immunoglobulin assay. (3) Alteration in a cellular Milieu: (a) Surface active properties; (b) Protective nature. (C) Alteration in Mechanical Defenses: (1) Muccociliary clearance; (2) Effect on mucus production. (D) In Vitro Exposure: (1) Alveolar macrophage. It is expected that by integrating the biochemical, physiological, and morphological data, a better understanding of the relationship of air pollution with the pathogenesis of lung injury will emerge.
PROJECT MILESTONES: 11/77 Continue to acquire dose-rate data for NO2 long-term exposure. 11/77 Short term NO2 exposure studying exposure sequence. 12/77 Combination of NO2 plus O3 will begin
KEYWORDS: AIR POLLUTION;RESPIRATORY SYSTEM;RESPIRATORY SYSTEM DISEASES;IMMUNOLOGY;NITROGEN DIOXIDE;OZONE;SYNERGISM;HEALTH HAZARDS;TOXICITY;PATHOGENESIS;CHRONIC INTAKE;INHALATION;BIOCHEMICAL REACTION KINETICS;PHYSIOLOGY;MORPHOLOGY;LUNGS;ANIMALS;BIOLOGICAL MODELS

<072024>
TITLE: Effect of CO, O3, NO2 and Aerosols on Human Cardiovascular Physiology
PROJECT NUMBER: H601C-7234
PRINCIPAL INVESTIGATOR: Haak, E.D.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Haak, E.D.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To determine the cardiovascular effects of photochemical oxidants acid aerosol and carbon monoxide in human exposure studies in man.
APPROACH: To monitor the cardiovascular effects of these pollutants exposures by means of ECG analysis, echocardiography and non-invasive cardiac output during exercise stress using clinical studies in man.
RESULTS: A data base which can be used by the agency in determining the cardiovascular health effects of

these pollutants in man. Annual reports are prepared at the end of each clinical study.
PROJECT MILESTONES: 11/77 Quarterly and annual reports as well as publications
KEYWORDS: CARBON MONOXIDE;OZONE;NITROGEN DIOXIDE;TOXICITY;CARDIOVASCULAR DISEASES;ETIOLOGY;PHYSIOLOGY;PATHOLOGY;PHOTOCHEMICAL OXIDANTS;HEART;INFORMATION SYSTEMS;HEALTH HAZARDS;AIR POLLUTION;AEROSOLS

<072025>
TITLE: Interaction of Various Pollutants on Causation of Pulmonary Disease
PROJECT NUMBER: H601C-7235
PRINCIPAL INVESTIGATOR: Fenters, J.
AFFILIATION: IIT Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gardner, D.R.
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: This contract is an extension of a previous EPA contract which will utilize an experimental animal model system for studying the interaction between a variety of interacting atmospheric pollutants and infectious agents (bacterial and viral).
APPROACH: Animal (mice) will be exposed to either SO2, NO2, O3 and particulates alone and in combination for various periods of time. Temperature and relative humidity will be varied. When a minimum effective dose is found for each of the above individual exposures, the pollutants will then be combined and longer, lower levels of exposure will commence. The parameters for measuring the development and severity of the disease will be mortality rate, mean survival time, lung lesion scores, pulmonary clearance of labelled microorganisms, total number of alveolar macrophages, as well as phagocytic and bactericidal capability. Various tissues and cells of the lungs will be examined by scanning electron microscopy and/or transmission electron microscopy. On long-term exposures, additional parameters will be measured. They include: serum neutralization or hemoagglutination-inhibition titration, cell mediated immunity, and immunoglobulin levels (IgA, IgM, IgG, IgG2). This contract will supply us with information concerning the health effects resulting from inhalation of complex, interacting atmospheres that closely resemble that found in a community.
PROJECT MILESTONES: 11/77 Short-term exposure to complex mixtures-NO2-O3-SO/sub x/. 11/77 Begin long-term exposure to NO2 + O3. 12/77 Annual report
KEYWORDS: RESPIRATORY SYSTEM DISEASES;LUNGS;NITROGEN DIOXIDE;OZONE;SULFUR DIOXIDE;CHRONIC INTAKE;INHALATION;PHOTOCHEMICAL OXIDANTS;ANIMALS;PARTICLES;AEROSOLS;SYNERGISM;PHYSIOLOGY;PATHOLOGY;HEALTH HAZARDS

<072026>
TITLE: Studies on the Effects of Air Pollution Exposures on Mortality Variation in Major Metropolitan Areas
PROJECT NUMBER: H601C-7241
PRINCIPAL INVESTIGATOR: Riggan, W.B.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Riggan, W.B.
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: A series of studies of the effect of air pollution exposures on daily mortality variation in selected major metropolitan areas is continuing. Special consideration is given to adjustments for weekly and annual cycle, temperature precipitation, influenza outbreaks, accidental deaths and holidays.
RESULTS: The findings will be presented in a series of reports.
PROJECT MILESTONES: 10/77 Los Angeles report. 05/78 Philadelphia report
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;HUMAN POPULATIONS;MORTALITY;URBAN AREAS;ANNUAL VARIATIONS;DAILY VARIATIONS;TEMPERATURE EFFECTS;ATMOSPHERIC PRECIPITATIONS;DISEASES;ACCIDENTS;RECREATIONAL AREAS;STATISTICS

<072027>
TITLE: Incidence of Chromosomal Aberrations in the Peripheral Lymphocytes of College Students as a Function of Photochemical Air Pollution
PROJECT NUMBER: G601C-7245
PRINCIPAL INVESTIGATOR: Nagie, A.R.
AFFILIATION: Loma Linda Univ., Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Calafiore, D.
77 FUNDING: Environmental Protection Agency FY77:$133,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To compare whether the experience, as determined by the incidence of peripheral chromoscmal aberrations, of young adults emigrating from and immigrating to an area with perpetually high levels of photochemical air pollutants differs significantly from students already living in the respective areas. Secondary objectives include the influence of a change in residence on the incidence of chromosomal aberrations, the persistence of chromosomal aberrations already present at the time of immigration, and the effect of other environmental and lifestyle factors.
APPROACH: 400 non-smoking, non-imbiding, non-drug-using new students (ages 17 to 22) at two Seventh-day Adventist colleges were pre-selected for this study. Objectivity in preparation of blood culture and evaluation for chromosomal aberration is assured since neither collaborating laboratory knows the origin of the samples. Chromosomes of each student are evaluated for the frequency of breaks, gaps, isogaps, hypo- and hyper-diploidy, undoreduplications, terminal blebs, and stable changes such as dicentrics, quadriradials, inversion, and translocation.
RESULTS: Lifestyle and demographic characteristics of the subjects have been analyzed. Three blood sampling periods have been completed. The frequency of chromosomal aberrations from the first blood samples are being statistically evaluated. Chromosome scoring of the other samples is currently in progress. It is

planned to follow this group of students into their child-bearing years to determine if observed chromosomal aberrations have any correlation with the outcome of pregnancies.
PROJECT MILESTONES: 07/76 Award grant. 07/77 Progress report and continuation. 11/78 Final report
KEYWORDS: CHROMOSOMAL ABERRATIONS;HUMAN POPULATIONS;ADULTS;AIR POLLUTION;GENETIC EFFECTS;PHOTOCHEMICAL OXIDANTS;SOCIAL IMPACT;POPULATION DYNAMICS;SOCIOLOGY;LYMPHOCYTES;HEALTH HAZARDS

<072028>
TITLE: Pilot Study of Acute Bronchitis and Its Relation to Air Pollution
PROJECT NUMBER: H601C-7252
PRINCIPAL INVESTIGATOR: Deane, M.;Goldsmith, J.R.
AFFILIATION: California Dept. of Health, Berkeley (USA). Epidemiological Studies Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Calafiore, D.C.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objectives of this project are to develop and compare two or more strategies to examine the possible relationship between community air pollution and acute bronchitis. The project includes a pilot field study in which the strategies would be compared with respect to willingness of subjects to participate and effectiveness in measuring incidence or prevalence of acute bronchitis. Analysis of data would include testing, on a demonstration basis, the null hypothesis based upon whether exposure to air pollution in the South Coast Air Basin affects the incidence or prevalence of chronic bronchitis.
APPROACH: (1) An interview survey asking about episodes during a defined period, such as the preceding six or twelve months. This would be timed so as to follow closely the season of heaviest pollution and might be repeated one or more times; and (2) enrollment of a panel of subjects who would be asked to record symptoms on a daily basis or who might be contacted periodically by telephone, mail, or in person to elicit symptoms.
RESULTS: Geographic areas and population samples will be selected. A questionnaire and diary will be designed and pre-tested. A pilot study will be conducted.
PROJECT MILESTONES: 11/77 Award grant. 06/78 Final report.
KEYWORDS: AIR POLLUTION;BIOLOGICAL EFFECTS;HEALTH HAZARDS;RESPIRATORY TRACT CELLS;NICKEL;CADMIUM;LEAD;OZONE;NITROGEN DIOXIDE;SULFUR DIOXIDE;IMMUNE REACTIONS;IMMUNOSUPPRESSION;SENSITIVITY;LUNGS;MACROPHAGES;LEUKOCYTES;ANTIGEN-ANTIBODY REACTIONS;PATHOLOGICAL CHANGES;TOXICITY

<072029>
TITLE: Effects of Pollutants on Immunological Functioning at the Primary Site of Oxidant Impact--Pulmonary Cells
PROJECT NUMBER: H601C-7259
PRINCIPAL INVESTIGATOR: Graham, J.A.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Graham, J.A.
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The effects of oxidants on pulmonary immunological mechanisms will be investigated. A number of air pollutants (Ni, Cd, Pb, O3, NO2, and SO2) have been shown to have adverse effects on systemic immune systems; however, little research has been directed at pulmonary systems.
APPROACH: Since the lung is the primary site of pollutant impact, it is probable that more profound immunosuppression occurs at this site. Due to the importance of the pulmonary immune system, any alteration of this mechanism would be ominous to the host.
RESULTS: Sensitive models will be developed and used to determine the influence of oxidants on: (1) pulmonary inflammatory responses, using chemotaxis of alveolar macrophages and polymorphonuclear leukocytes as the principal technical approach; and (2) immunological functioning of alveolar macrophages, using the ability of these cells to process antigen and produce factors which stimulate lymphocyte functioning.
PROJECT MILESTONES: 11/77 Complete development of 3 models. 12/77 Complete O3 dose-response studies for 1st model. 03/78 Complete development of the 3rd model. 03/78 Complete O3 dose-response on the 2nd model. 06/78 Complete development of the 4th model. 11/78 Complete O3 dose-response on 3rd and 4th model.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;MAN;BRONCHITIS;ETIOLOGY

<072030>
TITLE: Nasal-Pharyngeal Uptake of O3 and NO2
PROJECT NUMBER: H601C-7260
PRINCIPAL INVESTIGATOR: Miller, F.J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Miller, F.J.
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Since nasal-pharyngeal uptake of gaseous pollutants may be experimentally determined and must be accounted for in a complete modeling approach to the problem of evaluating pulmonary effects of gaseous pollutants, this study has as its objective the empirical determination of the nasal-pharyngeal uptake of O3 and NO2 in various laboratory animals (rabbits, guinea pigs and rats).
APPROACH: The pollutant gas is drawn through the nares and exhausted through a tracheal cannula of an anesthetized and surgically prepared animal. The chamber and tracheal concentrations are monitored continuously by the chemiluminescent method. From the resulting data, the relationship between the tracheal and inhaled concentration of pollutant may be obtained.
RESULTS: The data obtained from experiments using these animals can be compared with already existing data on other species to better assess the role the nasal-pharyngeal area plays in pollutant exposures. Also, the data will serve as a building block in the development of a complete lung moel for the uptake of O3 and other gaseous pollutants.
PROJECT MILESTONES: 10/76 Complete rabbit and guinea pig upper airway exposures. 01/77 Final analysis of

results. 05/77 Final manuscript on nasopharyngeal removal of O3 in guinea pigs. 10/77 Begin upper airway exposures at elevated flow of O3. 05/78 Complete exposures begun 10/77. 06/78 Begin NO2 nasopharyngeal exposures. 09/78 Final manuscript on nasopharyngeal removal of O3 with elevated flow rates. 01/79 Begin NO2 nasopharyngeal studies with elevated flow rates
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;GUINEA PIGS;NITROGEN DIOXIDE;OZONE;PHARYNX;UPTAKE;PHYSIOLOGY;BIOCHEMICAL REACTION KINETICS

<072031>
TITLE: Effects of Controlled Ozone Exposure on Human Immunity
PROJECT NUMBER: H601C-7262
PRINCIPAL INVESTIGATOR: Peterson, M.L.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Peterson, M.L.
77 FUNDING: Environmental Protection Agency FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Clinical tests will be made to assess the effects of ozone on cellular defense mechanisms in exposed human volunteers. In vitro blood tests will identify changes in lymphocyte and neutrophile populations in peripheral blood based on cellular properties such as DNA and RNA synthesis, membrane receptor quality, lymphokinase activity, cytotoxicity and phagocytosis.
RESULTS: Data from this study will provide quantitative information on the immunologic effects of ozone for humans and aid in criteria development and evaluation of air quality standards for photochemical oxidants.
PROJECT MILESTONES: 12/76 Immunologic effects of one 4-hour exposure to 0.4 ppm ozone. 12/77 Immunologic effects of one 2-hour exposure to 0.6 ppm ozone. 12/78 Immunologic effects of multiple exposure to 0.4 ppm ozone. 12/80 Immunologic effects of multiple exposure to 0.4 ppm ozone
KEYWORDS: OZONE;AIR POLLUTION;HEALTH HAZARDS;IMMUNOLOGY;MAN;DNA;RNA;PHOTOCHEMICAL OXIDANTS;TOXICITY;STANDARDS

<072032>
TITLE: Clinical Chemical Effects of Oxidant Exposure in Humans
PROJECT NUMBER: H601C-7263
PRINCIPAL INVESTIGATOR: Bruce, R.M.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
DIVISION: Health Effects Research Laboratory
MONITOR: Bruce, R.M.
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Biochemical studies will concentrate on changes in blood and urine components occurring after human exposure to controlled levels of oxidants.
APPROACH: Enzymes, proteins and lipids would be studied in blood serum and formed elements while endogenous bioactive substances and their metabolites would be studied in the urine. Enzymology, gas chromatography, electrophoresis and fluorescence will be utilized to detect any biochemical changes.
RESULTS: Data from this study will provide quantitative information on the effects of oxidant exposure on respiratory and blood tissue in humans and aid in criteria development and evaluation of air quality standards for oxidants.
PROJECT MILESTONES: 11/76 Development of biological indicators in humans sensitive to ozone. 08/77 Baseline studies and stress effects on biological parameters. 08/78 Sensitivity of bio-indicators to ozone adaptation studies in humans. 09/79 Screening for bio-indicators sensitive to other oxidants
KEYWORDS: PHOTOCHEMICAL OXIDANTS;HEALTH HAZARDS;MAN;BIOLOGICAL INDICATORS;OZONE;SENSITIVITY;TOXICITY;BIOCHEMICAL REACTION KINETICS;STANDARDS

<072033>
TITLE: Analysis of Chromosomal Abnormalities in Persons Exposed to O3, NO2 and H2SO4 Aerosols
PROJECT NUMBER: H601C-7268
PRINCIPAL INVESTIGATOR: McKenzie, W.
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: This study will assess the incidence of chromosomal abnormalities of persons exposed to levels of O3, NO2, and H2SO4 aerosol approximating daily maximum concentrations in the natural environment. Information gathered in this study will enable us to better understand the role of these agents in mutagenesis and cellular toxicity as it relates to humans.
APPROACH: Analysis of bloods drawn from exposed human subjects.
RESULTS: Reports of chromosomal abnormalities, if any, from the contractor upon completion of each exposure study.
PROJECT MILESTONES: 11/77 Final report on H2SO4 exposed human subjects. 11/78 Final report on ozone exposed human subjects.
KEYWORDS: CHROMOSOMAL ABERRATIONS;OZONE;NITROGEN DIOXIDE;SULFURIC ACID;AEROSOLS;PARTICLES;AIR POLLUTION;HEALTH HAZARDS;MAN;GENETIC EFFECTS

<072034>
TITLE: Development of Chronoepidemiologic Methods with Reference to Cardiopulmonary Conditions
PROJECT NUMBER: H601C-7280
PRINCIPAL INVESTIGATOR: Halberg, F.;Reinberg, A.;Halberg, E.;Tong, L.;Cornelissen, G.;Lee, J.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
77 FUNDING: Environmental Protection Agency FY77:$53,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Existing data from selected studies of cardiopulmonary conditions (e.g., panel studies of air pollution effects) will be analyzed by methods acknowledging the existence of biological as well as environmental periodicities. Recommendations will be developed for the design and analysis of future

epidemiologic studies so that predictable biologic variability (rhythms and trends) can be separated from effects of environmental factors.
APPROACH: Statistical methods (including the least-squares fitting of cosine models) will be used to quantitatively define characteristics of resolvable rhythms, preferably circadian, about-weekly (circaseptan), circannual rhythms as well as rhythms with other periods in circulatory and respiratory function of healthy subjects living in relatively pollution-free environments. Extensive time series (e.g., measurements of heart rate, blood pressure and peak expiratory flow 5 or more times daily for several years) are already available for this purpose. Morbidity data (e.g., from appropriate panel studies sponsored by the Environmental Protection Agency) will be analyzed against this background, using rhythmometric and other statistical procedures (e.g., cross spectral analysis).
RESULTS: On the basis of this experience, a flow chart will be developed integrating old and new computer programs and providing indications for the design and analysis of epidemiologic time series in general. Primary emphasis will be placed on chronoepidemiologic studies permitting the inferential statistical isolation of rhythms. Such chronoepidemiologic criteria should be particularly pertinent and sensitive for air pollution monitoring with a view of health and disease.
PROJECT MILESTONES: 06/76 Grant awarded. 06/77 Progress report and grant continuation. 06/78 Progress report and grant continuation application. 06/79 Final report.
KEYWORDS: EPIDEMIOLOGY;CARDIOVASCULAR DISEASES;RESPIRATORY SYSTEM DISEASES;PATHOLOGY;PHYSIOLOGY;MAN;STATISTICS;COMPUTER CODES;AIR POLLUTION;HEALTH HAZARDS

<072035>
TITLE: Chemical Analysis and Characterization of Ambient Particulate Matter
PROJECT NUMBER: H601C-7283
PRINCIPAL INVESTIGATOR: Henry, W.
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Burton, R.M.
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective is to develop chemical methods for the analysis and characterization of ambient particulate matter.
APPROACH: This task is a continuation of 7356 and will place emphasis on development of chemical methods for the identification and quantification of organic compounds found in ambient particulate matter.
RESULTS: Currently the solicitation is in final negotiation with the chosen contractor. Description and validity of methods developed along with analyses from ambient particle samples shall be accomplished.
PROJECT MILESTONES: 04/78 Continue chemical characterization with emphasis on organic methods. 08/78 Finalize methods of analysis. 09/78 Perform organic analysis on collected ambient samples. 03/79 Final report.
KEYWORDS: CHEMICAL ANALYSIS;PARTICLES;AEROSOLS;ORGANIC COMPOUNDS;HYDROCARBONS;AIR POLLUTION;MONITORING

<072036>
TITLE: Incidence of Chronic Disease in Humans Exposed to Photochemical Air Pollution
PROJECT NUMBER: H601C-7286
PRINCIPAL INVESTIGATOR: Abbey, D.E.;Nagie, A.R.;Hodgkin, J.E.;Phillips, R.L.
AFFILIATION: Loma Linda Univ., Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
77 FUNDING: Environmental Protection Agency FY77:$82,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The major objective of this study is to determine if prolonged exposure to high levels of air pollutants in urban areas of California is associated with increased risk of chronic diseases. This study objective arose out of the need to document in a scientific manner, the disease effects associated with air pollution in urban areas of California. The high pollution areas will be defined by the ambient levels of SO2, ozone, particulate matter, and NO2.
APPROACH: The population group to be studied (Seventh-Day Adventists) has inherent controlled parameters as a result of its lifestyle. In this study a smog questionnaire is being mailed to the study subjects. It includes questions designed to determine the prevalence of Chronic Obstructive Pulmonary Disease (COPD) in the polluted areas of the South Coast Air Basin and to estimate the prevalence of COPD in the rest of California, as well as estimate the relative exposure to air pollutants based on differing lifestyle habits.
PROJECT MILESTONES: 05/77 Grant award. 05/78 Final report due.
KEYWORDS: CHRONIC INTAKE;MAN;DISEASES;URBAN AREAS;CALIFORNIA;PHOTOCHEMICAL OXIDANTS;HEALTH HAZARDS;EPIDEMIOLOGY;SMOG;DIET;SOCIOLOGY;CARDIOVASCULAR DISEASES

<072037>
TITLE: Isolated Test Systems--Development of In Vitro and In Vivo-In Vitro Systems for Determining Potential Toxicity of Environmental Agents
PROJECT NUMBER: H601D-7311
PRINCIPAL INVESTIGATOR: Huisingh, J.L.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Huisingh, J.L.
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this task is to determine the influence of environmental pollutants on cells and organ cultures in vitro and when obtained from exposed animals.
APPROACH: Animal, human and microbial cells or organ fragments will be cultured in vitro and subsequently exposed to a wide range of pollutants. Gross morphological, subcellular and molecular changes in the exposed preparations will be monitored using the following parameters: cell viability, total cell number, morphology, physiological function, growth kinetics, macromolecular biosynthetic activity, intracellular and extracellular release of enzymes, cations, etc. In order to relate cytotoxicity evaluations to potential carcinogenic and mutagenic effects of environmental pollutants, the assesssment of the following parameters will be developed: microsomal enzyme activity and induction (e.g., aryl hydrocarbon hydroxylase, epoxide hydrase, p-nitroanisole demethylase), induction of unscheduled DNA synthesis, induction of membrane damage and alterations of transport, effects on DNA, RNA and protein synthesis, etc.

These parameters will be assessed in the pulmonary cell types (rabbit alveolar macrophages and WI-38 cells) currently in use as in vitro screening systems. Several epithelial cell systems including primary rat liver hepatocytes will be developed as in vitro screening systems. Initially a series of potentially carcinogenic metals (e.g., As, Cr, Cd, etc.) and polycyclic aromatic hydrocarbons will be studied alone and in combination. The effect of preinduction of metal binding proteins (e.g., by Cu and Cd) on the subsequent toxicity of a series of metals including potentially carcinogenic metals will be studied.
PROJECT MILESTONES: 04/77 M-1 Implementation of liver culture system. 10/77 M-2 Develop biochemical indicators of liver cell toxicity. 10/77 M-3 Evaluation of a series of toxic and potentially carcinogenic indicators. 01/78 M-4 Evaluation of a series of organic toxic and potentially carcinogenic indicators.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;TOXICITY;BIOLOGICAL INDICATORS;LIVER;PATHOLOGICAL CHANGES;ANIMAL CELLS;MORPHOLOGY;BIOCHEMICAL REACTION KINETICS;CARCINOGENS;MUTAGENS;RABBITS;RATS;ARSENIC;CHROMIUM;CADMIUM;POLYCYCLIC AROMATIC HYDROCARBONS;COPPER;PHYSIOLOGY

<072038>
TITLE: Bio-indicators of the Effect of Cations Associated with Sulfate Particle Aerosols
PROJECT NUMBER: H601D-7313
PRINCIPAL INVESTIGATOR: Menzel, D.B.;Gardner, D.E.
AFFILIATION: Duke Univ., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gardner, D.E.
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The toxic effect of sulfate aerosols is an important air pollution problem related intimately with the production of energy. Prior studies have shown that sulfate ion is removed from the airways and taken up by lung cells. The processes of removal of sulfate ion from the lung may be related to the toxic effects of sulfate aerosols via histamine release.
APPROACH: To provide clearer kinetic evaluations of the mechanisms of sulfate uptake by the lung, viable lung cells will be prepared by enzymatic digestion. The isolated cells will be characterized by cell type using marker enzymes. The mechanism of sulfate transport into these cells will be elucidated. The effects of cyclic nucleotides and chloride transport inhibitors will be investigated.
RESULTS: These results will be correlated with in vivo inhalation models of sulfate aerosol toxicity.
PROJECT MILESTONES: 12/76 Acquire and install cell culture equipment. 02/77 Complete media and culture condition selection. 03/77 Perform preliminary sulfate ion uptake experiments. 04/77 Begin cloning and animal age experiments. 06/77 Begin 63 Ni uptake studies in vivo for comparison with cells. 12/77 Complete 63 Ni studies in vivo as a pilot indicator of heavy metals. 00/00 Complete kinetic characterisitics of sulfate ion uptake.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;TOXICITY;BIOLOGICAL INDICATORS;SULFATES;CLONING;AGE DEPENDENCE;NICKEL 63;UPTAKE;LUNGS;METABOLISM;BIOCHEMICAL REACTION KINETICS;CHLORIDES;CATIONS;PARTICLES;AEROSOLS

<072039>
TITLE: Ultrastructure and X-Ray Microanalysis of Macrophages Exposed to Noncriteria Pollutants with Emphasis on Certain Metal Compounds
PROJECT NUMBER: H601D-7316
PRINCIPAL INVESTIGATOR: Shelburne, J.D.;Waters, M.D.
AFFILIATION: Duke Univ., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Waters, M.D.
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: A critical problem in correlating the results of chemical analyses and biological screening tests with respect to the potential biohazards of a given crude sample is the degree to which the biological availability of the sample is understood. That is, we need to know the nature of surface chemistry and the potential of a complex sample to release components to biological fluids and tissues. Our objective is to expose rabbit alveolar macrophages (RAMs) in vitro to a variety of elements (specifically cadmium, vanadium, nickel, manganese, chromium, iron, lead, copper and zinc) at differing concentrations and times, and to a variety of particles (both fly-ash particles coated with known elements and representative elements selected from urban air) in order to define morphologically the subcellular reaction of these macrophages to injury. Electron probe microanalysis will be used to study the morphology and distribution of the toxic elements in question. Consequently a parallel and important objective of this work will be to examine in detail the limitations and usefulness of a number of microhistological techniques from a qualitative and semi-quantitative point of view in order to optimize techniques for the identification, localization and distribution of these elements.
PROJECT MILESTONES: 11/77 Project not yet initiated. Anticipated award.
KEYWORDS: RABBITS;BIOLOGICAL INDICATORS;HEALTH HAZARDS;TOXICITY;CADMIUM;VANADIUM;NICKEL;MANGANESE;CHROMIUM;IRON;LEAD;COPPER;ZINC;URBAN AREAS;MORPHOLOGY;METABOLISM;X RADIATION;CHEMICAL ANALYSIS

<072040>
TITLE: Influence of Particulate Physico-Chemical Characteristics on Pulmonary Cell Systems
PROJECT NUMBER: H601D-7317
PRINCIPAL INVESTIGATOR: Aranyi, C.;Gardner, D.E.;Huisingh, J.L.
AFFILIATION: IIT Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gardner, D.E.
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The purpose of this project will be to determine the comparative toxicity of particulates to macrophages when exposed in vitro and in vivo.
APPROACH: Chemically characterized crude particulates from industrial processes of respirable size and other particulate samples will initially be screened for relative cytotoxicity to the alveolar macrophage exposed in vitro. From this initial screening in vitro, particulate samples of high, moderate and low toxicity will be selected for in vivo inhalation exposures. Macrophages isolated from these exposed animals will then be examined for a number of parameters including total numbers, viability, ATP content,

phagocytic ability, and bacteriocidal activity.
RESULTS: Results from in vivo exposures will be correlated with results from strictly in vitro exposures in order to validate in vitro findings. Furthermore, in vivo studies, when warranted, will examine the effect of these particulates on animals subsequently challenged with a bacterial infection.
PROJECT MILESTONES: 03/77 Award grant. 05/77 Initiate work. 11/77 Primary screening of particles. 05/78 Secondary screening of particles. 03/78 Annual report. 08/78 Aerosol methodology established. 03/79 Annual report. 10/79 In vivo exposures for macrophage studies completed. 03/80 Infectivity studies completed. 06/80 Final report.
KEYWORDS: PARTICLES;CARDIOVASCULAR SYSTEM;INFECTIVITY;TOXICITY;AEROSOLS;AIR POLLUTION;INHALATION;ANIMALS;MACROPHAGES;TOLERANCE;AIR POLLUTION;HEALTH HAZARDS;PHYSIOLOGY

<0720041>
TITLE: In Vitro and In Vivo-In Vitro Systems for Determining Potential Carcinogenicity and Co-Carcinogenicity of Environmental Agents
PROJECT NUMBER: H601D-7318
PRINCIPAL INVESTIGATOR: Waters, M.;Nesnow, S.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Nesnow, S.
77 FUNDING: Environmental Protection Agency FY77:$135,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this task is to study the carcinogenicity and co-carcinogenicity of envircnmental agents by use of in vitro and combined in vivo-in vitro test systems.
APPROACH: Emphasis during this first year of the task will be on implementation of existing neoplastic cellular transformation assay systems for studies on the co-carcinogenicity of selected refined particulates with and without known carcinogens. The C3H 10T1/2C18 and hamster embryo systems are currently being established. A focus assay has been established using hamster embryo cells. Known carcinogens, benzo(a)pyrene, 3-methyl cholanthrene and N-methyl-N-nitro-N-nitrosoguanidine have been employed as standards. Studies with refined particulate materials are being initiated in the hamster embryo system.
PROJECT MILESTONES: 08/77 Complete validation of HE system. 07/77 Complete testing of BaP coated Fe2 03 particles. 10/77 Establish C3H 10T1/2C18 system. 07/77 Establish BaP metabolite profile assay.
KEYWORDS: HEALTH HAZARDS;AIR POLLUTION;CARCINOGENS;SYNERGISM;IRON OXIDES;PARTICLES;AEROSOLS;HAMSTERS;EMBRYOS;BENZOPYRENE;POLYCYCLIC AROMATIC HYDROCARBONS;STANDARDS;TOXICITY

<0720042>
TITLE: Isolated Test Systems--In Vitro and In Vivo-In Vitro Systems for Determining Potential Mutagenicity of Environmental Agents
PROJECT NUMBER: H601D-7319
PRINCIPAL INVESTIGATOR: Waters, M.D.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Waters, M.D.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this task is to study the mutagenicity of environmental agents by use of in vitro and combined in vivo-in vitro test systems.
APPROACH: Emphasis during the first year of the task will be on implementation and validation of existing mammalian cell mutagenesis systems. The L5176Y mouse lymphoma forward mutation assay will be combined with a mammalian metabolic activation system to evaluate the mutagenic potential of chemicals in a mammalian cell system. After validation with known mutagens, pesticides, heavy metals, asbestos and other environmental agents will be studied in this system. Emphasis in this project will be in evaluating mammalian mutagenesis as a screening system for environmental carcinogens and mutagens. Pesticides and other agents now being assayed in a tiered test series will be studied in this system. Environmental agents for which the microbial mutagenesis test system is not sensitive (e.g., metals, chlorinated hydrocarbons, etc.) will also be studied. Other mammalian cell systems which are being considered are the V79 cells, Chinese hamster ovary cells, diploid human lymphoblasts and hamster embryo cells. These systems would be employed with and without metabolic activation as may be provided by mammalian liver microsomes or mammalian liver cells.
PROJECT MILESTONES: 07/77 M-1 Validation of 15178Y bioassay with EMS and MNNG. 08/77 M-2 Validation of 15178Y with metabolic activation systems. 10/77 M-3 Validation of 15178Y test systems. 05/77 M-4 Implementation of Salmonella bioassay for macrophage activation. 07/77 M-5 Implementation of Salmonella as an indicator of mutagen activity.
KEYWORDS: AIR POLLUTION;MUTAGENS;HEALTH HAZARDS;MICROORGANISMS;BIOLOGICAL INDICATORS;MAMMALS;HAMSTERS;EMBRYOS;LIVER;METABOLISM

<0720043>
TITLE: Effects of H2SO4 and Other Toxicants on Immunological Responses in Laboratory Animals
PROJECT NUMBER: H601D-7327
PRINCIPAL INVESTIGATOR: Graham, J.A.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Graham, J.A.
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The effects of H2SO4 mist (.3 to .4 micron m in diameter) on circulating immunoglobulins

in rabbits will be investigated. If adverse effects are found at 1 mg/cubic m H_2SO_4, dose response studies will be conducted and the time required for recovery will be determined.
PROJECT MILESTONES: 11/77 Complete study on the effects of H_2SO_4 on immunoglobulin titers.
YWORDS: SULFURIC ACID;AIR POLLUTION;RABBITS;IMMUNOGLOBULINS;DOSE-RESPONSE RELATIONSHIPS;BIOLOGICAL RECOVERY;HEALTH HAZARDS;TOXICITY

<072044>
TITLE: To Evaluate the Health Effects of Controlled Low Levels of Sulfuric Acid Aerosol Exposure in Man
PROJECT NUMBER: H601D-7329
PRINCIPAL INVESTIGATOR: Hazucha, M.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hazucha, M.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: In the next few years, sulfuric acid aerosol may be generated in increasingly large amounts with the use of the present catalytic converters on automobiles. This research program will provide: (1) information as to some of the human health effects associated with sulfuric acid aerosol exposure over the concentration range of 0 to 100 microns g/cubic m and a particle size of 0.1 to 0.3 microns m, and (2) relate the human health effects to specific concentrations of sulfuric acid aerosol and thereby contribute to the data base required in formulating criteria for standards.
APPROACH: The study will be conducted in young healthy male volunteers exposed to these concentrations for a period of two hours. The following parameters will be investigated: (1) pulmonary function studies; (2) immune response studies; (3) biochemical studies; (4) cytogenetic screening studies; (5) blood clotting studies; (6) cardiac monitoring.
RESULTS: The first study should be completed with a report of the findings in the fall of 77.
PROJECT MILESTONES: (1) 11/77 1st phase clinical study completed and reported; (2) 11/78 2nd phase clinical study completed and reported; (3) 11/79 3rd phase clinical study completed and reported; and (4) 11/80 4th phase clinical study completed and reported.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;SULFURIC ACID;TOXICITY;AUTOMOBILES;CATALYTIC CONVERTERS;MALES;MAN;LUNGS;BIOLOGICAL FUNCTIONS;CYTOLOGY;GENETIC EFFECTS;BIOCHEMICAL REACTION KINETICS;BLOOD;FIBRINOGEN;HEART;MONITORING;AEROSOLS

<072045>
TITLE: Operation and Maintenance of the Community Health Air Monitoring Program to Quantitate Air Pollution Exposure in Selected Health Study Areas
PROJECT NUMBER: H601D-7337
PRINCIPAL INVESTIGATOR: Sullivan, R.J.
AFFILIATION: Xonics, Inc., Los Angeles, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hinton, D.O.
77 FUNDING: Environmental Protection Agency FY77:$490,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To quantitatively characterize air pollutants in selected health study communities.
APPROACH: A CHAMP monitoring site (fixed or mobile) is located within potential study communities to obtain measurements representative of the air pollutant exposure to select populations at risk for prospective health studies.
RESULTS: The present status involves contract 68-02-2493 with Xonics, Inc. to operate stations, validate data and perform Quality Assurance to determine accuracy of data produced. This system utilizes automatic continuous air quality measurement instruments and real-time data retrieval at 28 CHAMP sites. This contract provides for continuing operation and maintenance of the CHAMP system consisting of 23 semi-fixed stations and 5 mobile vans.
PROJECT MILESTONES: (1) Progress report due monthly. (2) Quality control reports due periodically--not to exceed six month intervals. (3) Determination of award fee semi-annually.
KEYWORDS: CHAMP;AIR POLLUTION;HEALTH HAZARDS;COMMUNITIES;AEROSOL MONITORING;MAINTENANCE;OPERATION;QUANTITATIVE CHEMICAL ANALYSIS;SITE SELECTION;HUMAN POPULATIONS;RISK ASSESSMENT;QUALITY ASSURANCE;AEROSOLS;AIR POLLUTION MONITORS;MOBILITY

<072046>
TITLE: Impact of Environmental Pollutants on the Plasma Membrane of Alveolar Macrophages
PROJECT NUMBER: H601D-7341
PRINCIPAL INVESTIGATOR: Hadley, J.G.
AFFILIATION: Duke Univ., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hadley, J.G.
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this program is to develop a highly sensitive indicator of pollutant effect on the prime mediator of pulmonary defense mechanism--the alveolar macrophage.
APPROACH: Studies will be conducted to examine cell membrane structures on alveolar macrophages obtained from control or low-level pollutant exposed animals.
RESULTS: Examination of the effect of pollutant exposure on the binding characteristics of specific, radiolabeled membrane probes is expected to yield a powerful tool for assessing pollutant damage to the macrophage. The membrane probe proving most sensitive in these studies will be further employed in combination with affinity chromatography techniques in an attempt to isolate and identify those structures of the macrophage membrane which are most sensitive to pollutant exposure. It is believed that these studies will help elucidate the mechanisms by which pollutant exposure can impair host defense systems.
PROJECT MILESTONES: (1) 07/77 Manuscript prepared on Phase 1 of study; (2) 06/77 complete O3 exposures for

membrane receptor study; (3) 09/77 complete cytotoxicity study; and (4) 08/77 initiate NO2 exposures for membrane receptor study.
KEYWORDS: AIR POLLUTION;BIOLOGICAL INDICATORS;RISK ASSESSMENT;HEALTH HAZARDS;BIOLOGICAL EFFECTS;OZONE;NITROGEN DIOXIDE;TOXICITY;IMMUNOLOGY;BIOCHEMICAL REACTION KINETICS;LUNGS;BIOLOGICAL FUNCTIONS;BIOCHEMISTRY

<072047>
TITLE: Comparative Particulate Deposition and Clearance in Laboratory Animals
PROJECT NUMBER: H601D-7342
PRINCIPAL INVESTIGATOR: Hu, P.;McNeal, C.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hu, P.C.
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The proposed research is designed to test the effects of air pollutants (SO2, NO2, O3, etc.) on the host-parasite interaction during respiratory infections using Mycoplasma pneumoniae infection of Syrian hamsters as the experimental model. The objectives of this work are three fold: (1) to determine how various air pollutants affect the deposition and clearance of M. pneumoniae from the pulmonary tract, (2) to examine the effect of air pollutants on the histopathological changes of pulmonary tissue during the course of disease production, and (3) to establish a model system for evaluation of the effect of air pollutants on the development of protective immunity against a respiratory surface antigen.
APPROACH: Radioactive-labeled M. pneumoniae organisms will be used to study the respiratory tract of Syrian golden hamster. The use of radioactive-labeled M. pneumoniae will also permit us to determine the geographical distribution of the microorganisms in the respiratory tract which will be correlated to the histological data. A solid-phase radioimmunoassay will be developed to measure the antibody level in the respiratory tract of the infected animals under the stress of air pollutants.
RESULTS: During the first year the model will be developed and validated. In following years, the effects of O3, NO2, and SO2 will be examined to elucidate the dose-response relationship.
PROJECT MILESTONES: (1) 06/77 Completion of experimental design of exposure chamber; (2) 01/78 preliminary tests on the deposition and clearance pattern of M. pneumoniae; (3) test of the effects of gaseous or particulate pollutant; (4) 09/78 completion of deposition and clearance pattern studies; (5) 06/79 completion of the proposed studies; and (6) 10/79 final report.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;PARTICLES;AEROSOLS;DEPOSITION;CLEARANCE;METABOLISM;SULFUR DIOXIDE;NITROGEN DIOXIDE;OZONE;MYCOBACTERIUM;RADIOIMMUNOASSAY;RESPIRATORY SYSTEM DISEASES;INFECTIOUS DISEASES;RESPIRATORY SYSTEM

<072048>
TITLE: Biological Effects of Sulfates
PROJECT NUMBER: H601D-7343
PRINCIPAL INVESTIGATOR: O'Neil, J.J.;Stultz, S.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: O'Neil, J.J.
77 FUNDING: Environmental Protection Agency FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The biological effects of the exposure to an aged aerosol of SO2-O3-olefin mixture will be investigated in a manner to elucidate dose-response relationships. This mixture has been shown to result in the formation of substantial quantities of sub-micron size sulfuric acid aerosol. The quantity and size of the sulfuric acid aerosol which is produced is dependent upon the relative concentration of the three pollutants, the reaction time, and physical environmental conditions, i.e. temperature and water vapor. These components are thought to play a principal role in the formation of atmospheric sulfate in smog.
APPROACH: The biological response to inhalation of these atmospheres will be determined using small laboratory animals (rats and guinea pigs). Estimates of changes in pulmonary function, histopathology, and pulmonary biochemistry will be made to evaluate the acute consequences of inhalation of such atmospheres. The response of high risk or compromised groups, such as animals with chemically produced emphysema-like lesions will also be made. The biologic response to this complex atmosphere will also be compared to the response to H_2SO_4 aerosol generated directly from the chemically pure compound. A 51.3 cubic foot, insulated reaction chamber has been constructed and is undergoing pre-test operational evaluation. The generation of a sub-micron size aerosol with SO2-O3-trans-2-butene has been verified experimentally. The chemical characterization of the gas and particulate phase components of the atmosphere are being characterized prior to the commencement of biological testing.
PROJECT MILESTONES: (1) 05/77 Hire a new principal investigator and (2) 06/78 Set up a pulmonary function laboratory for use with small animals.
KEYWORDS: LUNGS;SULFUR DIOXIDE;OZONE;ALKENES;AIR POLLUTION;HEALTH HAZARDS;BIOLOGICAL EFFECTS;SULFATES;SULFURIC ACID;AEROSOLS;SMOG;RATS;GUINEA PIGS;BIOLOGICAL MODELS;TOXICITY;BUTENES;RESPIRATORY SYSTEM DISEASES;EMPHYSEMA;ETIOLOGY

<072049>
TITLE: Biological Effects of Sulfates
PROJECT NUMBER: H601D-7345
PRINCIPAL INVESTIGATOR: Hillard, H.;Kirtz, M.
AFFILIATION: Northrop Services, Inc., Research Triangle Park, N.C. (USA); Winston-Salem State Univ., N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Kirtz, M.
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The purpose of this project is the generation of sulfate-laden atmospheres for use in biological testing.
APPROACH: Two types of atmospheres are currently being generated. One involves the reaction of ozone, sulfur

dioxide, and an olefin (trans-2-butene) to produce a sulfate aerosol, and the other involves the direct generation of a sulfuric acid aerosol by an evaporation-condensation process. In addition, other individual sulfate compounds may be generated at a later date.
/ECT MILESTONES: Provides service on routine basis.
/ORDS: SULFATES;TOXICITY;BIOLOGICAL EFFECTS;AIR POLLUTION;AEROSOL GENERATORS;OZONE;SULFUR)IOXIDE;ALKENES;BUTENES;PHOTOCHEMICAL OXIDANTS

<072050>
TITLE: Physical-Chemical Behavior and Respiratory Effects of Oxides of Sulfur Aerosol Mixtures
PROJECT NUMBER: H601D-7346
PRINCIPAL INVESTIGATOR: Frank, R.;Gardner, D.E.
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: O'Neil, J.J.
77 FUNDING: Environmental Protection Agency FY77:$121,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objectives of this research are as follows: (1) Determine the acute respiratory physiologic response of guinea pigs to sulfuric acid aerosol inhalation. Conduct dose-response experiments to determine the minimum mass concentration of sulfuric acid which induces an altered respiratory physiologic response. Evaluate this data to determine the appropriate mass concentration of H_2SO_4 aerosol to which human subjects should be exposed. (2) Determine the amount of ammonia in exhaled air from human subjects. From this data develop a mathematical model to predict the amount of ammonia which exists in the alveolar region of the lung. Develop formulas for determining the ability of ammonia to neutralize H_2SO_4 under different respiratory physiologic conditions. Test the validity of the model predictions under simulated conditions of the respiratory system. (3) Determine the influence of exercise on the human response to SO_2-NaCl aerosol inhalation. Also determine the response of humans with pre-existing respiratory disease, i.e., chronic bronchitis and asthma, to SO_2-NaCl inhalation. Initiate a study of the acute human pulmonary physiologic response to sulfuric acid inhalation. Conduct dose-response experiments to determine the minimum mass concentration of H_2SO_4 inhalation which will elicit an alteration in pulmonary physiologic response.
PROJECT MILESTONES: (1) 00/76 Estimated thresholds to SO_2 and NaCl (accumulation mode) in guinea pigs; (2) 04/77 completed study in guinea pigs with SO_2 and droplet Na_2SO_4; (3) 07/77 studied dose response to H_2SO_4 in guinea pigs; (4) 01/77 studied response to SO_2 and droplet NaCl in humans at rest and during exercise; and (5) studied response to SO_2 and droplet NaCl in human patients.
KEYWORDS: SULFUR DIOXIDE;SULFURIC ACID;BIOLOGICAL EFFECTS;SODIUM CHLORIDES;MAN;PATIENTS;GUINEA PIGS;INHALATION;AIR POLLUTION;HEALTH HAZARDS;RESPIRATORY SYSTEM;BIOLOGICAL MODELS;AMMONIA;BIOLOGICAL ACCUMULATION;PHYSIOLOGY;BIOCHEMICAL REACTION KINETICS;RESPIRATORY SYSTEM DISEASES;PATHOLOGICAL CHANGES;BRONCHITIS;ASTHMA;LUNGS

<072051>
TITLE: Determine Effect of Interaction of Oxidant and Sulfate on Production of Lung Lesions from Acute and Chronic Exposures
PROJECT NUMBER: H601D-7352
PRINCIPAL INVESTIGATOR: Freeman, G.;Juhos, L.T.;Evans, M.;Robbins, R.C.
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Reseach Laboratory
MONITOR: O'Neil, J.J.
77 FUNDING: Environmental Protection Agency FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: This study is designed to determine the interaction of sulfate and oxidant on the production of lung lesions.
APPROACH: Rats and monkeys will be exposed to a combination of ozone and small particle sulfuric acid aerosol. The contractor shall furnish long term exposure chambers equipped with the necessary chemical instrumentation for accurate control of pollutants on a 24 hr/day schedule over long periods and into which new features such as controlled humidity levels and particulate concentrations can easily be introduced. The contractor shall continue experimental exposure of rats to combined gas and aerosols including SO_2, acid mist, and ammonia to determine the minimal effective doses and combination of these agents which induce tissue injury. The principal response parameters will be pulmonary physiology and microscopic pathology. Electron microscopy will be employed where indicated. The exposures will include acute, sub-acute and chronic exposures up to one year. The monkeys will be exposed to a combination of NO_2 and O_3 starting with a concentration of 0.9 ppm--O_3 and 2 to 3.5 ppm NO_2 and pulmonary physiological performance tests made. Additional studies will be designed on the basis of these measurements so that the reaction of monkeys can be compared to man on the basis of pulmonary physiological response. Monkeys may be exposed at a combination of ozone and sulfur oxide for similar comparison.
PROJECT MILESTONES: (1) 11/77 Complete 10-year exposure of monkeys to 2 ppm NO_2; (2) 11/77 complete 20-month exposure of monkeys to 0.9 ppm O_3; (3) 12/78 complete terminal studies on above animals and controls; and (4) 06/79 final report due at termination of contract.
KEYWORDS: PHOTOCHEMICAL OXIDANTS;SULFATES;LUNGS;BIOLOGICAL MODELS;HEALTH HAZARDS;AIR POLLUTION;INHALATION;CHRONIC INTAKE;BIOLOGICAL EFFECTS;PATHOLOGICAL CHANGES;SYNERGISM;MONKEYS;NITROGEN DIOXIDE;OZONE;MAN;SULFUR DIOXIDE

<072052>
TITLE: Chemical Analysis of Respirable Particulate Matter
PROJECT NUMBER: H601D-7356
PRINCIPAL INVESTIGATOR: Henry, W.;Burton, R.M.
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Burton, R.M.
/ FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective is to develop chemical methods for the analysis and characterization of ambient particulate matter. The analysis shall include compound, ion and molecular identification and concentration.
APPROACH: The toxic nature of sulfate aerosols has been shown to be detrimental to human health. In order to

fully assess the impact of these particles, generated in great part by the utilization of sulfur-containing coals, a precise measurement and complete characterization of the chemical composition of sulfate materials must be made.
RESULTS: A request for procurement has been let to develop methods and analyze for chemical composition, ambient aerosol samples collected by the EPA Massive Volume Sampler. EPA will make available for the contractor size selected particulate matter samples in gram quantities. The initial analytical effort shall be directed toward broad-based information on a maximum number of samples, but shall also promote quantitative data accompanied by method description and accuracy of measurement documentation and definition. Emphasis shall also be placed on interferences and inter-reactions that occur in performing the analysis.
PROJECT MILESTONES: (1) 04/77 Award contract; (2) 05/77 work plan completed; (3) 06/77 tasks begin--methods developments and analysis; (4) 05/78 final report--1st year's work; (5) 06/78 expansion of effort and more detailed development of organic analysis; and (6) 06/79 final report and analysis results.
KEYWORDS: PARTICLES;AEROSOLS;BIOASSAY;QUANTITATIVE CHEMICAL ANALYSIS;QUALITATIVE CHEMICAL ANALYSIS;IONS;MOLECULES;TOXICITY;SULFATES;HEALTH HAZARDS;RISK ASSESSMENT;COAL;CHEMICAL COMPOSITION;MEASURING METHODS;ORGANIC COMPOUNDS

<072053>
TITLE: Distribution of Cadmium Levels in Biologic Samples--A Cooperative International Study of Significance of Cd in Air Pollution (Abbrev)
PROJECT NUMBER: H601E-7806
PRINCIPAL INVESTIGATOR: Johnson, D.E.;Tillery, J.B.;Prevost, R.J.;Camann, D.E.;Petty, C.S.;Galke, W.
AFFILIATION: Southwest Research Inst., San Antonio, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Galke, W.
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: In cooperation with Japan and Sweden, various studies are being carried out in these countries to evaluate body burdens and metabolism of cadmium. The activity of the U.S. is limited to the collection and analysis of autopsy tissue and tissue from living persons in the Dallas metropolitan area. The autopsy collection will consist of 30 sets of each of the five decades 10-59. The tissue to be collected are: abdominal fat from the umbilical area; psoas muscle; right lobe of the liver; tail of the pancreas; and kidney cortex.
APPROACH: The metals to be analyzed are: cadmium, zinc, lead, and mercury. Twenty-four hour urine and fecal samples from 80 non-occupationally exposed males in Dallas will be collected under a joint Swedish, Japanese, American protocol and analyzed for cadmium.
PROJECT MILESTONES: 10/77 Acceptance final report.
KEYWORDS: CADMIUM;AIR POLLUTION;ECOLOGICAL CONCENTRATION;JAPAN;SWEDEN;USA;BODY BURDEN;METABOLISM;AUTOPSY;TEXAS;ZINC;LEAD;MERCURY;QUANTITATIVE CHEMICAL ANALYSIS

<072054>
TITLE: Kinetics, Distribution and Biochemical Studies of Heavy Metals
PROJECT NUMBER: H601E-7824
PRINCIPAL INVESTIGATOR: Rehnberg, G.;Laskey, J.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Laskey, J.W.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Age-related whole body retention factors for ingested heavy metals in laboratory rats chronically exposed to excess Mn, As, Se and Mo administered in the diet or drinking water will be evaluated.
APPROACH: Specific attention will be given to the placental transfer, milk transfer, accumulation in the young (pre-weaning) and pregnant animal. Particular attention will be given to known target organs for each metal in addition to liver, kidney, testes and regional distribution in the brain.
RESULTS: Data acquisition will be completed by 12/77. Currently, analytical data is being processed for statistical evaluation.
PROJECT MILESTONES: 01/77 Initiate major study. 09/77 Complete animal exposures. 12/77 Complete analysis of tissues and serum samples. 06/78 Final report.
KEYWORDS: METALS;BIOLOGICAL ACCUMULATION;BIOCHEMICAL REACTION KINETICS;BIOASSAY;TISSUES;BLOOD SERUM;MANGANESE;ARSENIC;SELENIUM;MOLYBDENUM;DIET;DRINKING WATER;WATER QUALITY;FOOD CHAINS;LIVER;KIDNEYS;TESTES;BRAIN;DATA ACQUISITION;INGESTION;CHRONIC INTAKE;ECOLOGICAL CONCENTRATION;TISSUE DISTRIBUTION

<072055>
TITLE: Kinetic, Distribution and Biochemical Studies of Heavy Metals
PROJECT NUMBER: H601E-7826
PRINCIPAL INVESTIGATOR: Elder, J.A.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Elder, J.A.
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective is to study the effect of Mn on liver, kidney and brain mitochondria.
APPROACH: The Clark oxygen electrode will be used to measure the rate of respiration, respiratory control and oxidative phosphorylation in mitochondria from rats treated with Mn. Experiments will start in October

1976.
PROJECT MILESTONES: 06/77 Interim report. 10/78 Report on Mn.
KEYWORDS: BIOCHEMICAL REACTION KINETICS;TISSUE DISTRIBUTION;LIVER;KIDNEYS;BRAIN;MITOCHONDRIA;MANGANESE;BIOLOGICAL EFFECTS;RATS;INHALATION;INGESTION;HEALTH HAZARDS;AIR POLLUTION;METABOLISM

<072056>
TITLE: Development of Kinetic Isotope Techniques for Evaluation of Organ Function
PROJECT NUMBER: H601E-7827
PRINCIPAL INVESTIGATOR: Kirk, W.P.;Rehnberg, B.F.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Kirk, W.P.
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of the project is to identify kinetic isotope techniques developed for use in humans or large mammals and modify them for use in small laboratory animals to nondestructively assay selected physiological parameters in the living animal following exposure of the animal to environmental pollutants. Examples of such studies are blood flow and perfusion in various organs, pulmonary ventilation, clearance rates of labeled compounds by kidney or liver, etc.
APPROACH: Initial studies will concentrate on detection of defects in pulmonary ventilation using short-term 85Kr or 133Xe washout curves or breath by breath exhalation data. This is a new study that will commence this FY. Most equipment is on hand from previous isotope studies but an appropriate laboratory will have to be identified and proper ventilation and regulated power lines installed.
PROJECT MILESTONES: 10/77 Complete facility. 01/78 Feasibility testing of short-term 85Kr clearance.
KEYWORDS: ORGANS;BIOLOGICAL FUNCTIONS;BIOLOGICAL MODELS;BIOCHEMICAL REACTION KINETICS;MAN;MAMMALS;KRYPTON 85;FEASIBILITY STUDIES;XENON 133;BIOASSAY;BLOOD SERUM;LUNGS;CLEARANCE;EXHALATION;TRACER TECHNIQUES;RADIOISOTOPES;RADIONUCLIDE KINETICS

<072057>
TITLE: Teratologic, Reproductive, Genetic and Pathologic Effects of Heavy Metal
PROJECT NUMBER: H601E-7828
PRINCIPAL INVESTIGATOR: Chernoff, N.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Chernoff, N.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: This project involves the study of the fetotoxic potential of manganese and manganese-containing pesticides. Studies on the perinatal effects of both the inorganic salt and the pesticide Maneb are planned.
APPROACH: Animals will be treated during gestation and fetuses examined before birth for toxic manifestations including birth defects. Pregnant animals will also be allowed to go to term to enable the testing of neonates for possible postnatal function alterations. Other heavy metals may also be studied both alone and in combination with manganese.
PROJECT MILESTONES: 07/77 Litters of rats from manganese-treated animals pre-dosed. 01/78 Litters of manganese rats analyzed. 01/78 Maneb postnatal studies completed.
KEYWORDS: HEALTH HAZARDS;TERATOGENESIS;REPRODUCTION;GENETIC EFFECTS;PATHOLOGICAL CHANGES;MANGANESE;PESTICIDES;INORGANIC COMPOUNDS;SALTS;TOXICITY;SYNERGISM;METALS

<072058>
TITLE: Hypertensive Effects of Chronic Low-Level Exposure of Rhesus Monkeys to Cadmium
PROJECT NUMBER: H601E-7829
PRINCIPAL INVESTIGATOR: Hinkle, D.K.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hinkle, D.K.
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Observe the cardiovascular effects of chronic low-level oral Cd administration in an animal model phylogenetically closely related to man, and of sufficient size to permit chronic surgical implants to monitor hemodynamic alterations.
APPROACH: Mature adult rhesus monkeys will be surgically instrumented with implanted blood flow probes on descending aortic vessels including hepatic and/or renal vasculature. Both intravascular and extravascular pressure recordings are planned. All measurements will be made on conscious subjects trained to passively accept a brief restraint chair environment. Experimental subjects have been acquired and project will commence in late 1976.
PROJECT MILESTONES: 09/77 Preliminary test of extravascular blood pressure recording system. 10/77 Initiate daily dosing of rhesus monkey subjects. 12/77 Surgical implants of blood flow devices. 06/78 Completion of data gathering on blood flow and pressure. 09/78 Data evaluation and preliminary results reported.
KEYWORDS: HYPERTENSION;CHRONIC INTAKE;MONKEYS;CADMIUM;TOXICITY;HEALTH HAZARDS;AIR POLLUTION;CARDIOVASCULAR DISEASES;BIOLOGICAL MODELS;INGESTION;ADULTS;FOOD CHAINS

<072059>
TITLE: Mutigenerational Exposure of Animals to Se and Effects on Growth, Development, and Reproduction
PROJECT NUMBER: H601E-7831
PRINCIPAL INVESTIGATOR: Laskey, J.W.;Rehnberg, G.L.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Laskey, J.W.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Determine the effects of continuous multigenerational exposure of animals to Cd, As, Ni, Mo or Se and its effects on growth, development, and reproduction.
APPROACH: Cd, As, Ni, Mo or Se will be administered in the drinking water or the diet continuously through the second generation. Growth and reproductive system development and adult reproductive function will be evaluated by appropriate methods. Pilot experiments are planned to start 10/77.
PROJECT MILESTONES: 10/77 Initiate pilot studies and literature search. 01/78 Major study initiated. 06/78 Complete animal exposures. 12/78 Complete analysis of tissue and serum samples. 06/79 Final report.
KEYWORDS: ANIMAL GROWTH;REPRODUCTION;SELENIUM;HEALTH HAZARDS;TOXICITY;DATA COMPILATION;TISSUE DISTRIBUTION;BLOOD SERUM;TISSUES;ARSENIC;NICKEL;MOLYBDENUM;CADMIUM;DRINKING WATER;DIET;GENETIC EFFECTS;RISK ASSESSMENT

<072060>
TITLE: Development and Application of Reproductive Hormonal Screening Techniques for Heavy Metal and Organic Exposure Studies
PROJECT NUMBER: H601E-7833
PRINCIPAL INVESTIGATOR: Laskey, J.W.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Laskey, J.W.
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: At critical times during male reproductive development, serum samples will be taken for determination of circulating hormones (FSH, LH) and testosterone.
APPROACH: This information will be correlated and evaluation of the sampling times for screening the effects of heavy metal and organic exposure will be made.
RESULTS: This study has begun and data collection is proceeding. Interim report is due 9/77.
PROJECT MILESTONES: 10/76 Initiate serum sample collection. 10/77 Contractor completion of analysis and final report.
KEYWORDS: REPRODUCTION;HORMONES;BLOOD SERUM;MALES;TESTOSTERONE;FSH;LH;GONADOTROPINS;ORGANIC COMPOUNDS;METALS;HEALTH HAZARDS;TOXICITY;GENETIC EFFECTS

<072061>
TITLE: Development and Application of Mammalian Oviculture Techniques for Toxicologic Screening
PROJECT NUMBER: H601E-7834
PRINCIPAL INVESTIGATOR: Berman, E.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Berman, E.
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To assemble equipment and the laboratory skill for the use of conventional methods of rodent oviculture and to convert the techniques to toxicologic screening.
APPROACH: Using short-term training at various labs employing oviculture in this geographic area, one technical person will become sufficiently familiar with these techniques.
RESULTS: Major equipment has been purchased.
PROJECT MILESTONES: 04/77 Learn techniques. 08/77 Begin tests.
KEYWORDS: RATS;OVARIES;TOXICITY;BIOASSAY;TRACER TECHNIQUES;DESIGN;QUANTITATIVE CHEMICAL ANALYSIS;QUALITATIVE CHEMICAL ANALYSIS

<072062>
TITLE: Immunologic Effects of Heavy Metals
PROJECT NUMBER: H601E-7836
PRINCIPAL INVESTIGATOR: Liddle, C.G.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Liddle, C.G.
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To examine the effects of chronic exposure to heavy metals on the immune defense mechanism.
APPROACH: The circulating antibody titers of mice chronically exposed to heavy metals will be measured following immunization with Streptococcus pneumoniae antigen.
RESULTS: Several groups are being chronically exposed to manganese and, after an equilibrium state is reached, will be immunized and the circulating antibody titers will be measured. A preliminary study suggested that there may be an increase in the antibody titers among the animals receiving manganese. If there is evidence of an alteration in the antibody response, plans are to expose animals to different

levels in an attempt to determine a dose response curve. Other heavy metals will also be studied.
PROJECT MILESTONES: 06/77 Final report on manganese and immune defense. 09/78 Final report on selenium and immune defense.
--YWORDS: MANGANESE;SELENIUM;TOXICITY;CHRONIC INTAKE;MICE;STREPTOCOCCUS;PNEUMONIA;ANTIGEN-ANTIBODY REACTIONS;DOSE-RESPONSE RELATIONSHIPS;METALS;POLLUTION;HEALTH HAZARDS;IMMUNOLOGY

<072063>
TITLE: Potential Amplification of Effects of Pb Exposure in High Risk Populations
PROJECT NUMBER: H601E-7837
PRINCIPAL INVESTIGATOR: Reiter, L.W.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Reiter, L.
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The purpose of this project is to study the potential amplification of lead (Pb) toxicity with concomitant undernutrition.
APPROACH: Using rats as a model, the consequences of chronic lead exposure in undernourished populations will be assessed in terms of central nervous system development. Neurological and behavioral development as well as maternal, social, and sexual behavior will be examined. Undernutrition will be produced by systematically varying the litter size and thus controlling the growth rates.
RESULTS: The results should provide data helpful in assessing nervous system effects in high risk populations.
PROJECT MILESTONES: 12/77 Complete experiments. 04/78 Final report.
KEYWORDS: LEAD;TOXICITY;RISK ASSESSMENT;HEALTH HAZARDS;HUMAN POPULATIONS;NUTRITION;SYNERGISM;CHRONIC INTAKE;CENTRAL NERVOUS SYSTEM;BEHAVIOR;REPRODUCTION;FEMALES;BIOLOGICAL EFFECTS

<072064>
TITLE: Application of Motor Activity to Screening of Sub-Acutely Exposed Neonates
PROJECT NUMBER: H601E-7840
PRINCIPAL INVESTIGATOR: Reiter, L.W.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Reiter, L.W.
77 FUNDING: Environmental Protection Agency FY77:$6,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The developing nervous system is particularly sensitive to a number of toxic materials such that short-term exposure to these agents during critical periods of development will cause marked effects on behavior.
APPROACH: Using the techniques developed under this project (EPA project No. 601E, C04(3)), a variety of agents including heavy metals (Pb, Mn) and pesticides (Mirex, Kepone) will be examined for their potential developmental toxicity.
PROJECT MILESTONES: Continuing
KEYWORDS: MIREX;KEPONE;NEONATES;CENTRAL NERVOUS SYSTEM;TOXICITY;BEHAVIOR;LEAD;MANGANESE;PESTICIDES;MUSCLES;PHYSIOLOGY

<072065>
TITLE: Neurophysiologic and Behavioral Studies
PROJECT NUMBER: H601E-7841
PRINCIPAL INVESTIGATOR: Gray, L.E.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gray, L.E.
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Experiments are in progress investigating the effects of lead (lead acetate) on the social behavior of the house mouse, Mus musculus (CD-1, Charles River). Social behaviors under investigation include aggressive behavior, sex behavior, and diet activity. In addition, other developmental data is being collected including the age of eye-opening, age at puberty, reproductive success and growth rates. In these experiments, it seems particularly important to control for the undernutrition and retarded growth caused by administering lead acetate in the drinking water. The proper control animals are generated by pair-feeding litters not on lead acetate. Similar experiments have been designed to investigate the toxicity of manganese.
PROJECT MILESTONES: 03/77 Final report on Pb--an evaluation of the hyperactive mouse model. 09/77 Final report on Mn--a description of the behavioral effects of M.
KEYWORDS: NEUROLOGY;PHYSIOLOGY;BEHAVIOR;MICE;BIOLOGICAL MODELS;LEAD;MANGANESE;TOXICITY;SOCIAL IMPACT;DIET;REPRODUCTION;ANIMAL GROWTH;DRINKING WATER;FOOD CHAINS

<072066>
TITLE: Operant Behavior of Primates and Rodents Exposed to Heavy Metals
PROJECT NUMBER: H601E-7842
PRINCIPAL INVESTIGATOR: Gage, M.I.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gage, M.I.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Animals will be examined for their ability to learn and repeatedly perform various specific behavioral tasks designed to investigate a variety of aspects of behavioral and neural

functioning. These animals will then be exposed to pollutants including heavy metals (such as manganese) and organics (including pesticides) to determine threshold levels of these substances that alter the specific data on some substances will be available within one year.
PROJECT MILESTONES: 10/77 Start primate training. 03/78 Start pollutant exposures. 09/78 Report on one pollutant. 01/80 Terminate experiment.
KEYWORDS: RATS;BEHAVIOR;BRAIN;NEUROLOGY;MANGANESE;PESTICIDES;ORGANIC COMPOUNDS;EDUCATION;TOXICITY

<072067>
TITLE: Neurochemical Effects of Heavy Metals and Organics--Neurophysiologic and Behavioral Studies
PROJECT NUMBER: H601E-7843
PRINCIPAL INVESTIGATOR: Bursian, S.J.;Ward, T.R.
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA). Health Effects Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Bursian, S.J.
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Determine the effects of heavy metals and organic exposure on catecholamine levels and catecholamine metabolism in various organs of the rat as well as the effect on acetylcholinesterase activity.
APPROACH: The toxic compounds will be administered via feed and/or water at relatively low levels over an extended period of time. Animals will be sacrificed at various times during the exposure regime and the neurochemical analyses performed. Catecholamine levels and the metabolism of catecholamines (NE, E, DA) will be examined in discrete brain regions, the heart and adrenal glands. Acetylcholinestera activity will be measured in discrete brain regions.
PROJECT MILESTONES: 09/77 Interim report on Mn. 09/78 Interim report. 09/79 Interim report.
KEYWORDS: NEUROLOGY;PHYSIOLOGY;BEHAVIOR;MANGANESE;ORGANIC COMPOUNDS;CATECHOLAMINES;METABOLISM;TOXICITY;BRAIN;CENTRAL NERVOUS SYSTEM;POLLUTION;HEALTH HAZARDS;FOOD CHAINS;DRINKING WATER;DIET;HEART;ADRENAL GLANDS

<072068>
TITLE: Provide Information on the Characteristics of Ambient Organic Vapors in High Chemical Production
PROJECT NUMBER: H601P-7752
PRINCIPAL INVESTIGATOR: Pellizzari, E.D.;Smith, D.
AFFILIATION: Research Triangle Inst., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Burton, R.H.
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This research program will involve the sampling and analysis for ambient organic vapor with primary emphasis on carcinogenic substances.
APPROACH: The technique will utilize a system composed of gas chromatography/mass spectrometry/computer utilizing sampling techniques developed under previous contracts. Ambient air samples will be passed through Tenax GC glass cartridges in order to collect hazardous organic vapors from areas involved in high chemical production. Emphasis will be placed on the identification of all the components present with the quantification of the type specific components. The major emphasis will be on carcinogenic and mutagenic pollutants present at each of these sites throughout the continental U.S.
PROJECT MILESTONES: 03/77 Contract award. 03/78 Final Report.
KEYWORDS: ORGANIC COMPOUNDS;AIR POLLUTION;SAMPLING;CHEMICAL ANALYSIS;GAS CHROMATOGRAPHY;MASS SPECTROSCOPY;CARCINOGENS;MUTAGENS;CHEMICAL INDUSTRY;USA;HUMAN POPULATIONS;CARCINOGENESIS;TOXICITY;HEALTH HAZARDS

<072069>
TITLE: Assessment of the Relationship Between Cancer Mortality and Population Exposure to Selected Environmental and Industrial Factors
PROJECT NUMBER: H601P-7754
PRINCIPAL INVESTIGATOR: Preuss, P.W.;Paulson, G.;Burke, T.;Cohen, W.
AFFILIATION: New Jersey Dept. of Environmental Protection, Trenton (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Nelson, K.
77 FUNDING: Environmental Protection Agency FY77:$73,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The proposed project will correlate the geographic patterns of cancer mortality with environmental and industrial data.
APPROACH: (1) Statewide environmental and industrial data will be collected for as far back in time as the sources permit. (2) A list of approximately 600 environmental and industrial variables will be identified to be correlated to the cancer mortality data. (3) These variables will be correlated with the cancer mortality data. The mathematical techniques will include bivariate correlation and factor analysis. Bivariate correlation is a statistical tool for measuring the relationship between two variables. Factor analysis provides a measure of the extent to which groups of different variables correlate. Through the use of these techniques, both individual and groups of factors which correlate with cancer mortality will be identified. (4) From the results of the correlation of the 600 variables, a list of those 20 to 40 which correlate most strongly with cancer mortality will be generated. (5) Intensive data searches will be conducted in order to reconstruct a 30-year period of population exposure to the 20 to 40 selected variables. (6) Annual exposure rates will then be correlated to annual mortality data to determine if relationships exist between exposure and mortality. In performing these correlations the 20 to 30 year latency period for cancer will be considered.
RESULTS: A final report will be prepared explaining all findings and recommending future courses of action.
PROJECT MILESTONES: 10/77 Award grant. 10/78 Final report due.
KEYWORDS: MAN;CARCINOGENESIS;NEOPLASMS;MORTALITY;DOSIMETRY;ENVIRONMENTAL TRANSPORT;INDUSTRY;ENVIRONMENTAL IMPACTS;DATA COMPILATION;DOSE-RESPONSE RELATIONSHIPS;EPIDEMIOLOGY

<072070>
TITLE: Fourier Transform NMR of Metals of Environmental Significance
PROJECT NUMBER: H615A-7531A
INCIPAL INVESTIGATOR: Ellis, P.D.;Odom, J.D.
AFFILIATION: South Carolina Univ., Columbia (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Wilson, N.K.
77 FUNDING: Environmental Protection Agency FY77:$41,000
PROJECT DESCRIPTION: Characterize in detail the NMR parameters (chemical shifts, lower limits of sensitivity, spin coupling constants, realization times and their respective mechanisms) of the organometallic and coordination compounds of the metals cadmium, tin, mercury, and lead in solution, following the interaction of these metals within metalloproteins.
APPROACH: This will involve the direct observation of the metal in a metalloprotein. Design experiments to observe the metal in the protein while the protein is involved in a catalytic role.
PROJECT MILESTONES: 12/76 Build and test multinuclear probe. 12/76 Observe cadmium-113 resonances in a metalloprotein. 03/77 Identify binding sites of cadmium in Con-A. 03/77 Preliminary experiments on cadmium and bovine superoxide dismutas. 06/77 Initial experiments on mercury-199. 09/77 Initial experiments on lead-207. 12/77 Initial experiments on tin-119. 03/78 Observation of above metal resonances in a metalloprotein.
KEYWORDS: METALS;CADMIUM;MERCURY;LEAD;TIN;CADMIUM 113;MERCURY 199;LEAD 207;TIN 119;TOXICITY;NUCLEAR MAGNETIC RESONANCE;EXPERIMENT PLANNING;PROTEINS;CATALYSTS;FOURIER ANALYSIS;COWS

<072071>
TITLE: Compare Effects of Respirable Particles, Gases and Mists Using Small Airway Resistance in Donkeys as the Model for Pulmonary Irritation
PROJECT NUMBER: H625-6704
PRINCIPAL INVESTIGATOR: Lippmann, M.
AFFILIATION: New York Univ., N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: O'Neil, J.J.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The investigations of the effects of (NH4)2 SO4 and H2SO4 aerosols on pulmonary function, regional deposition, and bronchial clearance will be continued in order to clearly establish the nature of the effects produced and their dose-response relationships. This will provide a sound basis for subsequent tests with the same aerosols on human volunteers.
APPROACH: Airway resistance, dynamic compliance, and regional particle deposition were selected as sensitive indicators of physiological response. They will indicate transient effects attributable to the inhalation of airborne irritants at levels which produce no pathological effects. Effects on these physiological functions in donkeys should be essentially similar to those produced by the same irritants in humans. A major purpose is therefore to clarify the dose-response relationship for pulmonary irritation resulting from transient elevations in the ambient pollution aerosol concentration. The intrabronchial deposition patterns of (NH4)2 SO4 and H2SO4 aerosols will also be measured in hollow bronchial casts of donkeys and human airways. The rate of water vapor concentration on aerosol growth and subsequent deposition in hollow casts will be tested in order to evaluate mathematical predictions of droplet growth from physiochemical factors.
PROJECT MILESTONES: 05/77 Completed tracheal clearance and pulmonary function studies. 04/78 Complete chronic exposure of four donkeys to H2SO4. 04/78 Complete tracheal clearance studies on donkeys exposed to H2SO4. 04/78 Complete tracheal clearance studies and pulmonary function studies. 04/78 Start measurements of tracheo-bronchial transport response to H2SO4. 06/78 Final report due at termination of contract.
KEYWORDS: PARTICLES;AEROSOLS;GASES;VAPORS;BURROS;TRACHEA;CLEARANCE;LUNGS;SULFURIC ACID;AMMONIUM SULFATES;DOSE-RESPONSE RELATIONSHIPS;BIOLOGICAL INDICATORS;PHYSIOLOGY;TOXICITY;HEALTH HAZARDS;BIOLOGICAL EFFECTS

<072072>
TITLE: Effect of Material from Alternate Energy Sources on Whole Animal Defense Systems
PROJECT NUMBER: H625-6708
PRINCIPAL INVESTIGATOR: Gause, E.;Graham, J.A.
AFFILIATION: Southwest Foundation for Research and Education, San Antonio, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Graham, J.A.
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: As energy sources and energy production technologies change to adjust to the demands of expanding population, new stresses are generated with respect to the health and life expectancy of the population. Not only will the patterns and character of the emissions from these alternate energy sources be different, but ever-increasing numbers of people will be exposed to these agents for an expanding percentage of their life years. The possibility that inhalation of particles from these alternate energy sources in the size ranges which permit deposition in the deep alveoli (i.e., from approximately two microns to submicron sizes) may result in subtle or overt impairment of macrophage function and, subsequently, concomitant alteration in other respiratory defense mechanisms forms the basis for these studies. Such perturbations may, in turn, adversely affect overall particle clearance mechanisms predisposing the host to tissue injury and disease.
APPROACH: Animals will be exposed to various doses of these particles and the following parameters will be assayed: (1) ability of alveolar macrophages to function (viability, phagocytosis, respiration numbers, morphology response to macrophage migration inhibition factor, bacteriocidal activity, lysosomal enzymes, and AHH activity); (2) induction of autoimmunity directed against lung tissue; (3) nucleic acid synthesis in alveolar macrophages; and (4) cyclic AMP levels in pulmonary tissue.
RESULTS: A draft research protocol for fuel and fuel additives will be prepared.

PROJECT MILESTONES: 09/77 Complete draft, research fuel and fuel additive protocol. 01/78 Complete acute exposures on first pollutant sample. 05/80 Complete chronic exposures on first pollutant sample. 01/81 Complete acute exposures on second pollutant sample.
KEYWORDS: PARTICLES;AEROSOLS;INHALATION;LUNGS;HEALTH HAZARDS;TOXICITY;BIOLOGICAL MODELS;BACTERIA;FUELS;ADDITIVES;IMMUNOLOGY;AMP;ENZYMES;NUCLEIC ACIDS;BIOSYNTHESIS

<072073>
TITLE: Effect of Pollutants from Coal Burning and Coal Gasification on the Immune System
PROJECT NUMBER: H625-6709
PRINCIPAL INVESTIGATOR: Zarkower, A.;Graham, J.A.
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Graham, J.A.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The influence of effluents from alternate energy production on the immune system will be investigated.
APPROACH: Mice will be exposed to the pollutant for various time periods. The animals will then be examined for alterations in the immune system (particularly the respiratory immune system). Cell mediated immunity will be tested using the following assays: mixed lymphocyte cultures, functioning of effect on (killer) cells, and mitogen induced transformation. Humoral immunity will be tested using mitogen induced transformation, antibody production by lymphocytes and antibody titers. To correlate functional changes in the immune system with morphologic changes, histologic techniques will also be utilized.
RESULTS: Studies will also be included to identify the quantity and locality of any environmental particulates used in this investigation. The project will also define dose-response relationships using the most sensitive parameters.
PROJECT MILESTONES: 04/78 Complete initial testing of 1st pollutant sample. 08/78 Complete testing of 1st pollutant sample. 08/79 Complete testing of 2nd pollutant sample. 02/80 Complete testing of 3rd pollutant sample.
KEYWORDS: COAL INDUSTRY;COMBUSTION PRODUCTS;COAL GASIFICATION;COMBUSTION;HEALTH HAZARDS;ENVIRONMENTAL IMPACTS;ENERGY;CHEMICAL EFFLUENTS;AEROSOLS;PARTICLES;AIR POLLUTION;IMMUNOLOGY;DOSE-RESPONSE RELATIONSHIPS;TOXICITY;MICE;BIOLOGICAL MODELS

<072074>
TITLE: Evaluate Effects of Chronic or Intermittent Exposure to Respirable Particles and Mists Using Mouse Pulmonary Infectivity Model
PROJECT NUMBER: H625-6711
PRINCIPAL INVESTIGATOR: Ehrlich, R.;Gardner, D.E.
AFFILIATION: IIT Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gardner, D.E.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: This contract will examine the effect of acute, chronic and intermittent exposure to respirable particles (carbon) and acid mists (H_2SO_4) on the resistance of mice to pulmonary infection.
APPROACH: Exposure will be for 6 hr/day. At various times during these exposures, animal will be removed and challenged with an infectious microorganism. A no-effect level will be determined. The parameters to be measured will include: mortality rates; mean survival time, wet-dry weight ratio of lung tissue, and pathology. Other measurements of host defense alteration will include humoral and cell-mediated immunity response, phagocytic and bactericidal activity of lung defense cells.
PROJECT MILESTONES: 06/77 Final report--contract terminates.
KEYWORDS: PARTICLES;VAPORS;AEROSOLS;MICE;INHALATION;TOXICITY;LUNGS;INFECTIVITY;BIOLOGICAL MODELS;CARBON;SULFURIC ACID

<072075>
TITLE: Determination of the Effects of Material from Alternate Energy Sources on Upper Respiratory Tract Clearance Mechanisms
PROJECT NUMBER: H625-6712
PRINCIPAL INVESTIGATOR: Adalis, D.;Gardner, D.E.
AFFILIATION: Ball State Univ., Muncie, Ind. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gardner, D.E.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this contract is to screen a variety of substances for their toxic effect on mucociliary activity using an in vitro model system.
APPROACH: Since cilia play a significant role in pulmonary clearance, proper functioning is essential for defense against various environmental insults. However, ozone, nitrogen dioxide, nickel and cadmium have an adverse effect on this system. Therefore, it becomes increasingly important to determine if alternate energy sources such as shale oil and coal gasification and liquefaction on particulate effluents from power stations, stationary engines or mobile sources produce pollutants toxic to the mucociliarly escalator. Due to the above considerations isolated hamster tracheal rings will be exposed to pollutants in vitro. Parameters to be measured are: (1) effect on ciliary beat frequency; (2) effect on the energy source (ATP) of beating; (3) effect on ciliary and tracheal morphology; and (4) recovery of the tracheal rings after exposure. In all cases, parameters will be tested for dose-response effects.
PROJECT MILESTONES: 01/77 Continual biological screening of particles from alternated energy sources.
KEYWORDS: ENERGY SOURCES;HEALTH HAZARDS;BIOLOGICAL EFFECTS;RESPIRATORY SYSTEM;TOXICITY;OZONE;NITROGEN DIOXIDE;NICKEL;CADMIUM;SHALE OIL;COAL GASIFICATION;COAL LIQUEFACTION;POWER PLANTS;CHEMICAL EFFLUENTS;ENGINES;LUNGS;BIOLOGICAL MODELS

<072076>
TITLE: Implementation of Screening Tests for Potentially Hazardous Airborne Particulate Materials Using the Alveolar Macrophage Test System
PROJECT NUMBER: H625P-7150
PRINCIPAL INVESTIGATOR: Campbell, J.A.;Huisingh, J.;Waters, M.D.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Waters, M.D.
77 FUNDING: Environmental Protection Agency FY77:$350,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To study the nature of the surfaces of particles and the resulting effects of the in vitro exposure of these particles to alveolar macrophage. The biological endpoints form the basis of a valuable screening system for potentially hazardous airborne particulate materials.
APPROACH: In collaboration with analytical chemists who are able to define the surface chemical properties of particulate samples, we will carry out a systematic screening effort to define the biological response of the alveolar macrophage to phagocytized particles in vitro. We will focus on the propensity of crude particles to promote cell lysis, to affect phagocytic activity (as determined by depression in adenosine triphosphate levels), to alter the integrity of the lysosomes and to induce enzyme system capable of activating potentially carcinogenic compound such as the polynuclear aromatics which may be adsorbed to particulate surfaces. We will study the influence of the nature of the surface of standard particles on the extent of adsorption of materials. Furthermore, we will study the influence of internal and external surface area on the time course of release of adsorbed components and the effects of surface chemical components on the biological endpoints measured.
PROJECT MILESTONES: (1) 09/77 Evaluate ATP as a bio-indicator of toxicity in effluents; (2) 08/77 test effluents from fluidized bed combustion pilot study; and (3) 10/77 test effluent from coal gasification pilot study.
KEYWORDS: TOXICITY;CALCIUM;VANADIUM;NICKEL;MERCURY;PARTICLES;AEROSOLS;HEALTH HAZARDS;COAL INDUSTRY;AIR POLLUTION;LUNGS;BIOLOGICAL MODELS;POLYCYCLIC AROMATIC HYDROCARBONS

<072077>
TITLE: Improved Scoring of Chemical Transformation of C3H/10T1/2 Cells
PROJECT NUMBER: H625P-7153
PRINCIPAL INVESTIGATOR: Heidelberger, C.;Mondal, S.;Baker, R.F.
AFFILIATION: University of Southern California, Los Angeles (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Waters, M.D.
77 FUNDING: Environmental Protection Agency FY77:$270,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: We plan to improve the quantitative oncogenic transformation by chemical carcinogens and score for transformation at earlier times so that the system can be useful as a rapid pre-screen for environmental pollution. Individual compounds, as well as mixtures, will be studied.
APPROACH: The use of single cells in individual dishes as the basic system will be improved, and the inhibitory influence of cell density on transformation frequency will be accurately quantitated. Transformed C3H/10T1/2 cells have a different morphology in the scanning electron microscope.
RESULTS: This property will be used to develop an alternative assay for transformation and to determine at what time after carcinogen treatment cells become transformed.
PROJECT MILESTONES: 08/77 Project to be funded.
KEYWORDS: CARCINOGENESIS;PATHOLOGICAL CHANGES;BIOLOGICAL INDICATORS;BIOLOGICAL MODELS;INHIBITION;BIOASSAY;BIOCHEMICAL REACTION KINETICS;ANIMAL CELLS

<072078>
TITLE: Enzymatic Characterization of Metabolic Activation and DNA Binding of Presumptive Carcinogens in Short-Term Assay Systems
PROJECT NUMBER: H625P-7156
PRINCIPAL INVESTIGATOR: Weinstein, I.B.;Grunsberger, D.;Jeffrey, A.M.;Huisingh, J.L.
AFFILIATION: Columbia Univ., New York (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Huisingh, J.L.
77 FUNDING: Environmental Protection Agency FY77:$90,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this proposal is to examine the modified DNA from cells used in these assays after exposure to the ubiquitous carcinogen benzo(a)pyrene (BP).
APPROACH: The approach will be to incubate tritium labeled BP with microsomes and Salmonella typhimurium tester strains, or with various mammalian cell lines. Cellular DNA will then be extracted, analyzed for radioactivity and fluorescence, and then hydrolyzed to nucleosides which will be analyzed by high pressure liquid chromatography, utilizing appropriate BP-nucleoside derivatives prepared chemically as markers to determine the nature of the BP-nucleoside adducts present. Parallel assays will be done for mutagenicity and transformation and of aryl hydrocarbon hydroxylase and epoxide hydratase activities.
RESULTS: The data will be correlated with our results obtained in intact human tissues where it has been possible to determine the structure of the major adduct formed. This application does not involve recombinant DNA.
PROJECT MILESTONES: 09/77 Initiate project.
KEYWORDS: ENZYMES;BIOCHEMICAL REACTION KINETICS;DNA;CARCINOGENS;METABOLISM;BIOLOGICAL MODELS;MUTAGENS;RATS;BENZOPYRENE;METABOLISM;CARCINOGENESIS;TRITIUM COMPOUNDS

<072079>
TLE: Studies on the Relationship Between Carcinogen Metabolism in the Alveolar Macrophage and the Industion of Lung Cancer
...OJECT NUMBER: H625P-7157
PRINCIPAL INVESTIGATOR: Garrett, N.
AFFILIATION: Northrop Services, Inc., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Waters, M.D.

77 FUNDING: Environmental Protection Agency FY77:$350,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this task is to study the relationship between carcinogen metabolism in the alveolar macrophage and the induction of lung cancer.
APPROACH: Using in vitro methods the course of metabolic activation/detoxification of procarcinogens will be investigated in alveolar macrophages obtained from rats and hamsters. Biochemical methods will be used in monitoring induction of metabolic activation/detoxification systems. Microbial mutagenesis will be used to monitor the extent of metabolic activation detoxification by macrophages. Once the conditions for maximal activation/detoxification of carcinogens have been established using in vitro methods, whole animal studies will be initiated employing intratracheal instillation techniques to administer particulates and appropriate procarcinogens. The metabolic activation of procarcinogens will be monitored as described above using macrophages obtained by saline lavage of carcinogen-exposed animals. When optimal conditions have been established, experiments will be performed to demonstrate the relationship between elicitation of macrophage influx, metabolic activation/detoxification of carcinogens and the induction of lung tumors in animals. This is a long-range project that will be approached sequentially with continuation from year to year being dependent upon demonstrated success of initial studies.
PROJECT MILESTONES: (1) 07/77 Implement microbial mutagenesis as an indicator of macrophages; (2) 09/77 procure macrophages from several rodent species for evaluation; (3) 11/77 utilization of microbial mutagenesis in screening for carcinogens; and (4) 01/78 expose macrophages in culture to carcinogens.
KEYWORDS: CARCINOGENS;METABOLISM;LUNGS;NEOPLASMS;ETIOLOGY;MUTAGENESIS;CARCINOGENESIS;BIOLOGICAL MODELS;METABOLISM;MACROPHAGES;AIR POLLUTION;HEALTH HAZARDS

<072080>
TITLE: Effects of Sulfuric Acid Aerosol Upon Respiratory Function in Normal Human Subjects
PROJECT NUMBER: H625F-7160
PRINCIPAL INVESTIGATOR: Kerr, H.D.;McAlhany, M.L.;Swidersky, P.;Kulle, T.;Swift, D.
AFFILIATION: Maryland Univ., Baltimore (USA); Johns Hopkins Univ., Baltimore, Md. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Haak, E.D.
77 FUNDING: Environmental Protection Agency FY77:$230,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To determine the effects of low concentration (100 micro gram/m3) H2SO4 aerosol of small particle size (0.1-0.3 micro gram) on the mechanical factors of breathing in normal human subjects.
APPROACH: A modified double-blind study is planned. Subjects will be studied in pairs and will spend 6 hours daily in a Class 100 environmentally controlled chamber on 3 successive days. They will not be told which day the 4-hour exposure to H2SO4 aerosol will occur nor which 2 days they will simply breathe filtered clean air. Pulmonary function tests will be done immediately before entering the chamber and every 2 hours thereafter.
RESULTS: Smokers and non-smokers will be studied. Pulmonary function tests will include the following: (a) Spirometry; (b) plethysmographic determination of specific airway conductance and FRC; (c) closing volume and nitrogen plateau; and (d) dynamic compliance.
PROJECT MILESTONES: (1) 06/78 1st phase clinical studies reported; (2) 06/79 2nd phase clinical studies reported; and (3) 06/80 3rd phase clinical studies reported.
KEYWORDS: SULFURIC ACID;RESPIRATION;HEALTH HAZARDS;LUNGS;AEROSOLS;INHALATION;TOXICITY;BIOLOGICAL MODELS;TOBACCO SMOKES;PHYSIOLOGY;MAN;AIR POLLUTION;BIOLOGICAL EFFECTS

<072081>
TITLE: Effect of Low Levels of Sulfuric Acid Mist Exposure on Human Pulmonary Function
PROJECT NUMBER: H625F-7161
PRINCIPAL INVESTIGATOR: Horvath, S.M.;Polinsbee, L.J.;Bedi, J.F.
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Haak, E.D.
77 FUNDING: Environmental Protection Agency FY77:$230,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The aim of this investigation is to examine the effects of acute exposure to H2SO4 mist in humans and some of the factors affecting toxicity--temperature, humidity, and duration of exposure.
APPROACH: The subjects will be exposed in an environmental chamber to either filtered air .20 mg/m3 or .40 mg/m3 of H2SO4 under four conditions of temperature and humidity: 18 degrees C, 45 percent rh; 35 degrees C, 85 percent rh; 35 degrees C, 45 percent rh; and 35 degrees C, 88 percent rh. Subjects will exercise intermittently at 25 percent of their maximum capacity during the exposure period. Pulmonary function tests will be performed before, during, and after the exposure. Some aspects of cardiovascular performance will be assessed during the exposure exercise periods.
RESULTS: The final report of this study will provide the Agency with important information on the effects of acid aerosol exposure in man.
PROJECT MILESTONES: (1) 06/78 1st annual report on human studies planned for that year; (2) 06/79 2nd annual report on human studies planned for that year; and (3) 06/80 3rd annual report on human studies planned for that year.
KEYWORDS: SULFURIC ACID;MAN;LUNGS;PHYSIOLOGY;TOXICITY;BIOLOGICAL MODELS;CARDIOVASCULAR DISEASES;TEMPERATURE EFFECTS;HUMIDITY;AGE DEPENDENCE;TIME DEPENDENCE

<072082>
TITLE: Effect of Coal Gasification Products on the Pulmonary Defense System Against Infectious Disease (Bacterial)
PROJECT NUMBER: H625F-7162
PRINCIPAL INVESTIGATOR: Aranyi, C.
AFFILIATION: IIT Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Graham, J.A.
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The impact of pollutants from alternate energy sorces (primarily coal gasification) on pulmonary defense systems against infectious bacterial disease will be investigated. Animal will be exposed to respirable-sized aerosols of the pollutant in a manner to elucidate dose response relationships.

APPROACH: The following parameters will be used in the investigation: (1) mortality and mean survival time following aerosols of pathogenic bacteria; (2) pulmonary bactericidal responses; (3) pulmonary cell populations; and (4) functioning of alveolar macrophages. If adverse effects are found, the influence of article size and duration of exposure will be tested using the most sensitive parameters. The time equired for recovery from adverse effects will also be determined.
PROJECT MILESTONES: (1) 08/77 Award grant, provide 1st test sample; (2) 08/78 complete acute exposures of 1st test sample; (3) 08/78 submit annual report; (4) 08/79 complete acute exposures of second test sample; (5) 10/79 submit annual report; (6) 08/80 complete chronic exposures; and (7) 10/80 submit final report.
KEYWORDS: COAL GASIFICATION;GASEOUS WASTES;INFECTIVITY;BACTERIA;LUNGS;CHRONIC INTAKE;ENERGY SOURCES;AEROSOLS;DOSE-RESPONSE RELATIONSHIPS;PATHOLOGICAL CHANGES;BIOLOGICAL EFFECTS;HEALTH HAZARDS;BIOLOGICAL MODELS;COAL INDUSTRY;AIR POLLUTION

<072083>
TITLE: Determine Effects of Pollutants from Alternate Energy Sources on Pulmonary Antiviral Mechanisms
PROJECT NUMBER: H625F-7163
PRINCIPAL INVESTIGATOR: Schiff, L.
AFFILIATION: IIT Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Graham, J.A.
77 FUNDING: Environmental Protection Agency FY77:$270,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective of this project is to determine the toxicity of effluents from alternate energy sources on the respiratory epithelium during and after exposure to infectious agents (influenza virus).
APPROACH: Whole tracheal organ cultures from 2-4 day old and 4 week old hamsters will be exposed in vitro to the appropriate pollutants, with and without influenza virus. The parameters to be measured include: (1) ciliary activity as observed by light microscopy; (2) viral replication and interferon product ion; (3) cellular sites and distribution of viral replication; (4) cytopathologic changes of the epithelium using light, transmission and scanning electron microscopy.
RESULTS: Once adverse effects are found, studies will elucidate dose-response relationships.
PROJECT MILESTONES: (1) 08/77 Complete H2SO4 and carbon exposure, with and without virus; (2) 01/79 complete studies on pollutant sample; (3) 06/79 complete studies to determine the effects of virus; and (4) 02/80 complete studies of the interaction of virus and pollutant
KEYWORDS: LUNGS;INFECTIVITY;SULFURIC ACID;CARBON;VIRUSES;SYNERGISM;TOXICITY;BIOCHEMICAL REACTION KINETICS

<072084>
TITLE: Air Pollution and Cardiopulmonary Functions
PROJECT NUMBER: H625F-7166
PRINCIPAL INVESTIGATOR: Nostardi, R.A.;Richardson, E.L.;Atwood, G.T.
AFFILIATION: Akron Univ., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Riggan, W.B.
77 FUNDING: Environmental Protection Agency FY77:$154,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The basic structure of this experimental design is to examine the effects of air pollution on various cardiopulmonary parameters.
APPROACH: The design will involve both longitudinal and cross-sectional applications and include a number of age groups. Three geographic locations will be selected and include: (1) an area of heavy population, (2) an area of intermediate or varying population, and (3) a clean area. In each of the areas a minimum of 150 volunteers within each age group will be tested. The various tests which will be conducted and other data collected include: (1) vital data, (2) pulmonary function testing, (3) maximal expiratory flow volume curves, (4) multiple-load exercise test, (5) alpha-1-antitrypsin, (6) methemoglobin, (7) carboxyhemoglobin, (8) mercury and cadmium in blood, (9) mercury and arsenic in urine, (10) tracemetals in hair, and (11) a questionnaire completion. Aerometric monitoring will be carried out at multiple sites within each of the three areas and will include: (1) total suspended particulate, (2) SO2, (3) NOx, (4) hydrocarbons, (5) ozone, (6) trace metals, and (7) meteorological data. The data collected will be analyzed among and between the age groups using multiple linear regression and analysis of variance models.
PROJECT MILESTONES: 11/76 Grant award. 11/78 Progress report. 11/79 Final report.
KEYWORDS: AIR POLLUTION;LUNGS;CARDIOVASCULAR SYSTEM;BIOLOGICAL FUNCTIONS;HEALTH HAZARDS;BIOLOGICAL EFFECTS;CARBON;MERCURY;CADMIUM;ARSENIC;TISSUE DISTRIBUTION;BIOLOGICAL ACCUMULATION;PARTICLES;AEROSOLS;SULFUR DIOXIDE;NITROGEN OXIDES;HYDROCARBONS;OZONE;METALS;METEOROLOGY

<072085>
TITLE: Operation and Maintenance of the Community Health Air Monitoring Program to Quantitate Air Pollution Exposure in Selected Health Study Areas
PROJECT NUMBER: H625F-7167
PRINCIPAL INVESTIGATOR: Sullivan, R.J.
AFFILIATION: Xonics, Inc., Los Angeles, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hinton, D.O.
77 FUNDING: Environmental Protection Agency FY77:$400,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: To quantitatively characterize air pollutants in selected health study communities.
APPROACH: A CHAMP monitoring site (fixed or mobile) is located within potential study communities to obtain measurements representative of the air pollutant exposure to select populations at risk for prospective health studies.
SULTS: The present status involves contract 68-02-2493 with Xonics, Inc. to operate stations, validate data and perform Quality Assurance to determine accuracy of data produced. This system utilizes automatic continuous air quality measurement instruments and real time data retrieval at 28 CHAMP sites. This contract provides for continuing operation and maintenance of the CHAMP system consisting of 23 semi-fixed

stations and 5 mobile vans.
PROJECT MILESTONES: (1) Progress report due monthly. (2) Quality control reports due periodically--not to exceed six month intervals. (3) Determination of award fee semi-annually.
KEYWORDS: CHAMP;OPERATION;MAINTENANCE;COMMUNITIES;HUMAN POPULATIONS;HEALTH HAZARDS;MONITORING;AIR POLLUTION;RISK ASSESSMENT;SITE SELECTION

<072086>
TITLE: Biological Assessment of Exposure to Sulfur Dioxide and Acid Sulfate
PROJECT NUMBER: H625F-7187
PRINCIPAL INVESTIGATOR: Rajagopalan, K.V.
AFFILIATION: Duke Univ., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hayes, C.G.
77 FUNDING: Environmental Protection Agency FY77:$105,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This project will explore the possibility of developing sensitive tests for the presence of SO2 and acid sulfate in blood of animals exposed to various levels of SO2. Procedures for assessing exposure to acid sulfate may also be possible to develop. Since sulfite oxidase is an enzyme capable of detoxifying SO2, methods for epidemiological testing of sulfite oxidase in human populations will also be investigated.
PROJECT MILESTONES: 11/77 Award grant. 11/78 Progres report. 11/79 Progress report--grant continuation application. 11/80 Final report.
KEYWORDS: SULFUR DIOXIDE;RISK ASSESSMENT;SULFURIC ACID;COAL INDUSTRY;HEALTH HAZARDS;ENVIRONMENTAL IMPACTS;HUMAN POPULATIONS;CHEMICAL EFFLUENTS;TOXICITY;EPIDEMIOLOGY

<072087>
TITLE: Environmental Mutagens Studies Utilizing a Drosophila Test System
PROJECT NUMBER: H625F-7189
PRINCIPAL INVESTIGATOR: Baum, J.W.
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Hayes, C.G.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this interagency agreement is to conduct environmental mutagen studies of air pollutants using a Drosophila test system.
APPROACH: These studies will be coordinated with an ongoing effort to determine the presence of mutagenic agents in ambient air in which the National Institute for Environmental Health Sciences, DHEW, Brookhaven National Laboratories, ERDA, and the Health Effects Research Laboratory, EPA are collaborating.
PROJECT MILESTONES: 09/77 Initiate series of studies. 09/78 Progress report. 09/79 Progress report. 09/80 Final report.
KEYWORDS: DROSOPHILA;MUTAGENS;AIR POLLUTION;HEALTH HAZARDS;DOSE-RESPONSE RELATIONSHIPS

<072088>
TITLE: In Vitro Screening of Selected Air Pollutants for Potential Carciogenicity
PROJECT NUMBER: H625F-7190
PRINCIPAL INVESTIGATOR: Schechtman, L.M.;Kouri, R.E.;Waters, M.D.
AFFILIATION: Microbiological Association, Inc., Bethesda, Md. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Waters, M.D.
77 FUNDING: Environmental Protection Agency FY77:$47,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The purpose of this contract is to provide the capability for in vitro screening of selected environmental pollutants for potential carcinogenicity.
APPROACH: The contractor shall employ the established BALB/c 3T3 and 10T1/2 bioassay systems for determining morphologic cellular transformation. Metabolic activation systems shall be implemented for employment with the BALB/c 3T3 cells initially and eventually also with the 10T1/2 cells. These activation systems shall be established by use and the correlated with mutagenesis of microbial (Salmonella typhimurium) and mammalian (V79) cell systems.
PROJECT MILESTONES: 03/77 Preliminary report on metabolic activation in V-79 and BALB/3T3c. 08/77 Final report on metabolic activation in V-79, BALB/3T3 and 10T1/2. 10/77 Completion of testing of 10 substances with and without metabolic.
KEYWORDS: AIR POLLUTION;CARCINOGENS;HEALTH HAZARDS;METABOLISM;ANIMAL CELLS;BIOASSAY;MUTAGENESIS;CARCINOGENESIS;BIOLOGICAL MODELS;MICROORGANISMS;MAMMALS;SALMONELLA TYPHIMURIUM

<072089>
TITLE: Development of an In Vitro Test System for the Evaluation of Teratogens
PROJECT NUMBER: H629A-7910
PRINCIPAL INVESTIGATOR: Beaudoin, A.R.;Courtney, K.D.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Reseach Laboratory
MONITOR: Courtney, K.D.
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This project will utilize an in vitro culture system for mammalian embryos. The embryos will be cultured during development of the neural tube and early somites. Embryos will be exposed to known teratogens, pesticides or other toxic agents in vivo prior to explant and culture. The rate of development will be monitored for effects of the agents. This system will reduce the amount of time required for

screening agents for embryolethal or teratogenic action.
PROJECT MILESTONES: 09/77 Method has been standardized and screening has begun. 10/78 Evaluate aminothiodiazole, arsenic, lead, PBB, hydrocyurea.
KEYWORDS: TERATOGENESIS;ARSENIC;LEAD;POLYCYCLIC AROMATIC HYDROCARBONS;PESTICIDES;BIOLOGICAL INDICATORS;HEALTH HAZARDS;BIOLOGICAL EFFECTS;THIADIAZOLES;AMINES

<072090>
TITLE: Studies to Improve the Reliability and Sensitivity of Bacterial Mutagenesis as a Screen for Environmental Carcinogens
PROJECT NUMBER: H629A-7911
PRINCIPAL INVESTIGATOR: Commoner, B.;Vithayathil, A.;Kemaryrsky, M.;Hair, S.;Waters, M.D.
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Waters, M.
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The proposed program of research is designed to improve the reliability and sensitivity of the bacterial mutagenesis techniques as a screen for the detection of environmental carcinogens. In order to achieve this objective the research is concentrating on elucidating the mechanism of microsomal activation which occurs in this technique and of improving the specificity of this process.
APPROACH: The basic approach employed in this research program is to analyze the biochemical mechanisms involved in microsomal activation.
RESULTS: Current research plans are designed to elucidate further our recent discovery that microsome preparations are themselves capable of inducing a significant increase in the mutation rates of two strains of Salmonella, TA-1533 and TA-98. Specifically, we plan to describe the biochemical processes carried out by the microsomes that mediate this effect and the substances in the bacterial cells that are acted upon.
PROJECT MILESTONES: 07/77 Report on the use of the Salmonella typhimurium liquid suspension. 08/77 Report on the microsomal effect with strain IA 1538. 01/78 Report on preliminary results of mutagenesis screening of urine.
KEYWORDS: BACTERIA;MUTAGENESIS;SENSITIVITY;RELIABILITY;BIOLOGICAL INDICATORS;CARCINOGENS;SALMONELLA TYPHIMURIUM;TOXICITY;URINE;BIOCHEMICAL REACTION KINETICS;CHEMICAL EFFLUENTS;POLLUTION;HEALTH HAZARDS;BIOASSAY

<072091>
TITLE: Mutagenic Screening of Environmental Chemicals Using Drosophila
PROJECT NUMBER: H629A-7913
PRINCIPAL INVESTIGATOR: Valencia, R.;Waters, M.D.
AFFILIATION: WARF Inst., Inc., Madison, Wis. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Walters, M.D.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this research is to examine the mutagenic activity of pesticides and other toxic substances in genetic variants of Drosophila melanogaster.
APPROACH: The sex-linked recessive lethal test shall be performed on all substances. It is expected that most tests will be done on post-meiotic sperm stages but enough pre-meiotic stages shall be tested to detect extremely sensitive pre-meiotic effects. Positive recessive lethal tests shall be repeated to show that the mutagenic effect is dose related. The number of cultures examined shall be sufficient in all cases to detect a trebling in mutation rate relative to control. Variations in exposure, selection of alternative genetic schemes, and examination of germ cell stages other than specified above shall be considered.
PROJECT MILESTONES: 06/77 Final report on mutagenesis evaluation of environmental chemicals
KEYWORDS: DROSOPHILA;TOXICITY;CHEMICAL EFFLUENTS;MUTAGENS;PESTICIDES;BIOLOGICAL INDICATORS;MUTAGENESIS

<072092>
TITLE: Carcinogenesis and Mutagenesis Research on Pesticides and/or Toxic Substances--Development of an Inhalation Toxicology Program
PROJECT NUMBER: H630B-7650
PRINCIPAL INVESTIGATOR: Jackson, C.D.;Cranmer, M.;Knelson, J.H.
AFFILIATION: Department of Health, Education, and Welfare, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Curley, A.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: (a) To conduct multi-disciplinary carcinogenesis research on selected pesticides and/or toxic substances suspected of producing neoplasms by a direct or indirect normonal effect, (b) to conduct multi-disciplinary mutagenesis research involving the development, validation, evaluation and standardization of testing techniques, and (c) to determine feasibility of establishing an Inhalation Toxicology program.
APPROACH: (a) In vivo bioassays shall be conducted in laboratory animals with trasplacental and oral exposures. Hormonal effects and pharmacodynamics shall be evaluated. (b) Validation of heritable translocation and CHO/HG PRT assays, including modification of CHO/HG PRT to detect promutagens by complying with standard microsomal activation are underway. (c) A and E study and expert panel evaluation of Inhalatien Toxicity Program.
RESULTS: (a) Carcinogenic and estragenic effects of rotenone for human risk assessment. (b) Collaborative assistance in developing registration guidelines for mutagenesis testing and risk assessment. (c) Establish feasibility of developing Inhalation Toxicology Research program at NCTR.
OJECT MILESTONES: 03/78 Rotenone: Dosage--rangefinding and acute toxicity. 12/80 Rotenone: chronic

carcinogenicity studies. 01/79 Mutagenesis: acquisition of data from EMS exposed animals. 10/78 Mutagenesis: development of systems and validation. 03/78 Inhalation Toxicology: conducts meetings with inhalation experts. 06/78 Inhalation Toxicology: submit final report on recommendations.
KEYWORDS: CARCINOGENESIS;MUTAGENESIS;PESTICIDES;HAZARDOUS MATERIALS;TOXIC MATERIALS;INHALATION;LUNGS;RISK ASSESSMENT;HEALTH HAZARDS;TRANSLOCATION;NEOPLASMS;BIOLOGICAL MODELS;BIOASSAY

<072093>
TITLE: Determination of the Effects of Material from Alternate Energy Sources on Upper Respiratory Tract Clearance Mechanisms
PROJECT NUMBER: H625-6712
PRINCIPAL INVESTIGATOR: Adalis, D.;Gardner, D.E.
AFFILIATION: Ball State Univ., Muncie, Ind. (USA)
MONITORING AGENCY: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
DIVISION: Health Effects Research Laboratory
MONITOR: Gardner, D.E.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this contract is to screen a variety of substances to their toxic effect on mucociliary activity using an in vitro model system.
APPROACH: Isolated hamster tracheal rings will be exposed to pollutants in vitro. Parameters to be measured are: (1) effect on ciliary beat frequency; (2) effect on the energy sources (ATP) of beating; (3) effect on ciliary and tracheal morphology; and (4) recovery of the tracheal rings after exposure. In all cases, parameters will be tested for dose-response effects.
PROJECT MILESTONES: 01/77 Continual biological screening of particles from alternated energy sources.
KEYWORDS: ENERGY SOURCES;RESPIRATORY SYSTEM;CLEARANCE;LUNGS;METABOLISM;TOXIC MATERIALS;OZONE;NITROGEN DIOXIDE;NICKEL;CADMIUM;SHALE OIL;COAL GASIFICATION;COAL LIQUEFACTION;POWER PLANTS;ENGINES;HAMSTERS;ENVIRONMENTAL IMPACTS;DOSE-RESPONSE RELATIONSHIPS;HEALTH HAZARDS;INDUSTRY;AIR POLLUTION;INHALATION

<072301>
TITLE: Biosynthesis of N-nitroso Compounds from Trace-Level Precursors
PROJECT NUMBER: J-601-F5
PRINCIPAL INVESTIGATOR: Epstein, S.S.;Iqbal, Z.M.
ADDRESS: School of Public Health, Chicago, IL 60680
AFFILIATION: Illinois Univ., Chicago (USA). Medical Center
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Morgan, George B.
TYPE OF FUNDING: Grant No.-R805431-01
77 FUNDING: Environmental Protection Agency FY77:$35,600
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS/Pesticides (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To study the in vivo biosynthesis of N-nitroso compounds from trace level precursors under conditions reflecting environmental exposure.
APPROACH: These studes are based on the quantitative identification of the biosynthesized N-nitroso compounds using the thermal energy analyzer techniques which are sensitive to ppt levels. Included are time- and dose-dependence of dimethyl nitrosamine following administration of nitrite and dimethylamine and Ziram, respectively, and biosynthesis of di-n-propylnitrosamine, N-nitrosocarbaryl and N-nitrosoatrazine following gavage with nitrite and Treflan, carbaryl and atrazine respectively. Studies also included to investigate biosynthesis following inhalation exposure of mice to NO/sub x/ and gaseous amines; modifying effects of catalysts and inhibitors on kinetics of biosynthesis.
RESULTS: Annual progress reports on kinetics of biosynthesis.
PROJECT MILESTONES: (1) 9/78 Report on analytical method for detection of nitrosoamines. (2) 9/79 Report on biosynthesis of dimethyl nitrosamine in the mouse following administration of sodium nitrite and selected nitrosatable amines. (3) 12/79 Report on a strategy for carcinogen precursor exposure monitoring.
KEYWORDS: CARCINOGENS;PESTICIDES;ORGANIC NITROGEN COMPOUNDS;BIOSYNTHESIS;NITROGEN OXIDES;METABOLISM;MICE;INHALATION;RESPONSE MODIFYING FACTORS;BIOCHEMICAL REACTION KINETICS

<072302>
TITLE: Determine Chemical Forms and Transport Phenomena in Soil for Mercury
PROJECT NUMBER: J-602-C-6
PRINCIPAL INVESTIGATOR: Rogers, R.D.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Wiersma, G.B.
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$13,100
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Alloy (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine the factors that influence mercury movement in three soil types.
APPROACH: Three soil types were studied, a sand, loam, and clay. The soils were amended with mercuric nitrate and resultant production of different mercury compounds was monitored. Factors that were considered were soil texture, temperature, pH, organic matter content, time, and microbiological activity. Analyses were

conducted by gas chromatography and Isotope Zeeman Atomic Absorption Spectrophotometry.
RESULTS: Mercury was transformed from the inorganic form to an organic form. This transformation was found to be an abiological phenomena. The methylating factor was isolated to organic acid fraction of the soil.
PROJECT MILESTONES: (1) 12/76 Methylation of mercury in agricultural soils. Journal of Environmental Quality 4): 454-458. (2) 1/77 Abiological methylation of mercury in soil. EPA-600/3-77-007
KEYWORDS: MERCURY;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;SOILS;CHEMICAL REACTION KINETICS;LOAM;CLAYS;SAND;METHYLMERCURY

<072303>
TITLE: Determine Kinetics of Methylmercury Formation in Various Soil Types
PROJECT NUMBER: J-602-C-7
PRINCIPAL INVESTIGATOR: Rogers, R.D.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Wiersma, G.B.
TELEPHONE: F595-2969 ext.394
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$13,100
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Heavy (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine rates and factors influencing these rates of mercury loss from soil.
APPROACH: Three soil types were amended with mercuric nitrate. Volatility and species identification were made using mercury traps and the Isotope Zeeman Atomic Absorption Spectrophotometer. In addition, mercury solubility in soil systems was tested using a variety of solvents and also using mercury-203.
RESULTS: Properties affecting mercury loss from soil have been identified in part and solubility versus volatility is currently underway.
PROJECT MILESTONES: (1) 9/75 Methylation of mercury in a terrestrial environment. International Conference on Environment. (2) 9/77 Physical and chemical soil properties affecting movement and loss of mercury.
KEYWORDS: METHYLMERCURY;SOILS;NITROGEN COMPOUNDS;BIOCHEMICAL REACTION KINETICS

<072304>
TITLE: Evaluate Significance of Mercury as a Foliar Pollutant
PROJECT NUMBER: J-602-C-8
PRINCIPAL INVESTIGATOR: Gay, D.D.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Wiersma, G.B.
TELEPHONE: F595-2969 ext.394
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$13,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Heavy (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to determine the interaction of mercury with plants both as assimilation of airborne mercury compounds and the release of mercury products to the air from plants.
APPROACH: Peas were exposed to mercury in exposure chambers designed to allow plant exposure to mercury vapors by air and not by roots. The chambers were further modified so that air samples could be withdrawn directly from the chamber. Special analytical equipment was developed and modified with capability of separating organic mercury compounds and detecting mercury at the picogram level.
RESULTS: Peas have been exposed and equipment built. The presence of volatile organic mercury compounds including methyl, dimethyl, and ethylmercury has been confirmed after exposure to ionic and elemental mercury.
PROJECT MILESTONES: (1) 7/76 Biotransformation and chemical form of mercury in plants. EPA 600/3-76-082. (2) 11/77 Dimethyl mercury: volatilization from plants. ICESA. New Orleans. (3) 12/77 Development of a practical GC-MES detector for trace metal determination. (4) 12/77 Movement of mercury-203 in plants.
KEYWORDS: MERCURY;ENVIRONMENTAL TRANSPORT;PLANTS;AEROSOLS;PARTICLE RESUSPENSION;PEAS;METABOLISM;LEAVES;GASEOUS WASTES;BIOLOGICAL EFFECTS

<072305>
TITLE: Determine Chemical Form and Pathway of Mercury in Plants
PROJECT NUMBER: J-602-C-9
PRINCIPAL INVESTIGATOR: Gay, D.D.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
TORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory, Pollutant Pathways Branch
MONITOR: Wiersma, G.B.
TELEPHONE: F595-2969 ext.394
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$13,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)

ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Heavy (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the chemical forms of mercury in plants in relation to route of entry and plant metabolism.
APPROACH: Peas (Pisum sativum) were exposed to mercury both via the roots and leaves. Methods were developed to measure and analyze the mercury levels which were at very low levels. Techniques developed included gas chromatography, direct current--plasma emission, and gas chromatography--microwave emission spectrometry.
RESULTS: The presence of methylmercury in plant tissues after exposure to roots and leaves has been confirmed. Further, analysis of plant systems has proceeded to understand the biological factors involved in the methylation procedure.
PROJECT MILESTONES: (1) 5/76 Methylmercury: formation in plant tissues. EPA 600/3-76-049. (2) 5/77 Ethylmercury formation in plant tissues. International Conference on Heavy Metals.
KEYWORDS: MERCURY;ENVIRONMENTAL TRANSPORT;ENVIRONMENTAL EXPOSURE PATHWAY;CHEMICAL REACTION KINETICS;COAL LIQUEFACTION;COAL GASIFICATION;PLANTS;METABOLISM;PEAS;ROOTS;LEAVES;CHROMATOGRAPHY;MASS SPECTROSCOPY;METHYLMERCURY

<072306>
TITLE: Aircraft Support for Special RAPS Field Studies
PROJECT NUMBER: J-603-B-10
PRINCIPAL INVESTIGATOR: Snelling, R.N.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Snelling, Robert N.
TELEPHONE: F595-2969 ext.333
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$155,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/O3;NOXIOUS GAS/CO;NOXIOUS GAS/NO;NOXIOUS GAS/NO2;NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To provide aircraft support for RAPS field study during the period October--November 1976. Data collected provides vertical extension of RAMS ground-based monitoring stations. To provide all data collected over the 3-year RAPS study period.
APPROACH: Two Sikorsky S-58 helicopters, instrumented for measurement of O3, CO, NO, NO2, SO2, visibility, temperature, dewpoint, particulates and navigational parameters will be used to collect three-dimensional air mass data. All data will be computer processed and provided on magnetic tape to the RAPS data base.
RESULTS: (1) Final report for RAPS aircraft monitoring describing procedures and indexing avalable data. (2) Aircraft monitoring data in computer compatible format for inclusion in RAPS data base.
PROJECT MILESTONES: (1) 6/77 Final data tapes delivered to RAPS data base. (2) 9/77 Final report describing procedures and indexing available data.
KEYWORDS: OZONE;CARBON MONOXIDE;NITROGEN OXIDES;SULFUR DIOXIDE;AERIAL MONITORING;AIRCRAFT;AIR POLLUTION;AIR POLLUTION MONITORS;METEOROLOGY

<072307>
TITLE: Technical Support in Air Quality Monitoring and Assessment
PROJECT NUMBER: J-606-B-11
PRINCIPAL INVESTIGATOR: Snelling, R.N.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
TELEPHONE: F595-2969 ext.333
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/NO (65%);PARTICULATES/Dust (35%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific Hawaii
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To provide monitoring support to Regional and Program Offices through developmental application of specialized air quality monitoring systems and procedures.
APPROACH: (1) Anaconda Copper Smelter Study--Plume characterization study of Copper Smelter using helicopter sampling platform and portable ground-based monitoring systems. (2) Hawaii Power Plant Study--Air quality monitoring and modeling to develop emission regulations for modification of State Implementation Plan. (3) Region IX Quality Assurance--Provide field calibrations of continuous monitoring station in the states of Arizona and Nevada.
RESULTS: (1) Final report--Anaconda Smelter Study. (2) Final report--Hawaii Power Plant Study. (3) Annual report--Field Calibrations.
PROJECT MILESTONES: (1) 9/77 Anaconda Final Report. (2) 6/78 Hawaii Final Report. (3) 6/77 Region IX Quality Assurance Annual Report.
KEYWORDS: AIR QUALITY;MONITORING;AIR POLLUTION MONITORS;CALIBRATION;METEOROLOGY;NITROGEN OXIDES;SULFUR DIOXIDE;PARTICLES;DUSTS;METALS

<072308>
TITLE: Atlanta Airport Study-Soil and Vegetation Damage From Aircraft Operations
PROJECT NUMBER: J-606-B-13
CIPAL INVESTIGATOR: Brown, K.W.
DDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Wiersma, G.B.
TELEPHONE: C(702)736-2969; F595-2969 ext.394
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$17,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/NO (50%);ORGANICS/Jet Fuel (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective was to determine the course of vegetation damage and alleged soil sterility in the vicinity of Hartsfield, Atlanta's International Airport.
APPROACH: Soil and vegetation samples were collected. Preliminary pathology reports indicated chemical damage of unknown origin. Analyses of soil and vegetation collected through a years time showed no jet fuel residues. Garden plants grown under and away from flight paths showed no abnormalities. Soil test for microtial activity and germination capability showed no abnormalities. Aerosol studies using jet fuels in laboratories did duplicate identified field damage. Jet fuel residues were identified frequently in air samples under flight paths. Nonmethane hydrocarbon levels exceeded federal guideline 95% of time.
RESULTS: Project completed, report on soil and vegetation damage was published.
PROJECT MILESTONES: 2/77 Report on soil and vegetation damage at Hartsfield, Atlanta's International Airport.
KEYWORDS: AIR POLLUTION;EXHAUST GASES;HYDROCARBONS;NITROGEN OXIDES;JET ENGINE FUELS;BIOLOGICAL EFFECTS;SOILS;PLANTS;AIRPORTS;AIRCRAFT;GEORGIA;ENVIRONMENTAL IMPACTS

<072309>
TITLE: 38-State Phytoplankton Reports
PROJECT NUMBER: J-613-B-15
PRINCIPAL INVESTIGATOR: Taylor, W.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Taylor, William
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: VISUAL AESTHETICS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this project is to report the results of analyses of phytoplankton collected during the 1973, 74, and 75 years of the National Eutrophication Survey.
APPROACH: Computer files are accessed and data retrieved is incorporated into standardized report formats.
RESULTS: 38 state phytoplankton reports.
PROJECT MILESTONES: (1) 9/77 First 17 State reports to printshop. (2) 9/77 Next 10 State reports to reviewers. (3) 11/77 Remaining 11 western State reports to reviewers. (4) 5/78 Publication of last of individual state reports.
KEYWORDS: AQUATIC ECOSYSTEMS;BIOCHEMISTRY;PHYTOPLANKTON;BASELINE ECOLOGY;EUTROPHICATION

<072310>
TITLE: San Juan River Basin Study
PROJECT NUMBER: J-613-B-25
PRINCIPAL INVESTIGATOR: Thomas, R.W.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Thomas, Robert W.
TELEPHONE: F595-2969 ext.391
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (80%);FOSSIL FUEL/Coal Conversion liquefaction (20%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);ELECTRICITY GENERATION (34%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific San Juan River Basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
JECT DESCRIPTION: Define baseline conditions in the San Juan River Basin and to assess the importance of the San Juan Arm to Lake Powell, its dependence upon the San Juan River, and the levels and sources of pollutants to the river.
APPROACH: Three field investigations to the San Juan River and the San Juan Arm collected original physical,

chemical and biological data. These were augmented with literature reviews and data storage records from STORET.
RESULTS: A report detailing the results and conclusions of this investigation will be prepared.
PROJECT MILESTONES: 12/77 Publication of Report: San Juan River Basin Water Quality Study
KEYWORDS: WATER;CHEMICAL EFFLUENTS;SAN JUAN POWER PLANT;RIVERS;WATER POLLUTION;BASELINE ECOLOGY

<072311>
TITLE: Technical Support of Water Quality of Interdisciplinary Programs
PROJECT NUMBER: J-613-B-54
PRINCIPAL INVESTIGATOR: Landers, R.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Landers, Robert
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$826,500
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: STORAGE (40%);ELECTRICAL TRANSMISSION (30%);WASTE MANAGEMENT (30%)
POLLUTANTS: HEAT, THERMAL (50%);SPECIFIED OTHER POLLUTANTS/Non point source (50%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Estuarine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the Interdisciplinary Technical Support Program is to provide support to Agency operating programs to enable them to fulfill the objectives of the Agency's mandates. Technical support is defined as the application of knowledge in the current state-of-the-art or knowledge derivable from it to solve or to assist in solving, the immediate problems of the Agency.
APPROACH: The Interdisciplinary Technical Support Program is planned and administered by a specific organaizational entity and is carried out by two of the three ORD laboratories which are dedicated to environmental monitoring and support activities. This program with its dedicated resources, complements the incidental continuing level-of-effort support associated with the other 12 ORD laboratories and activities and assures that the most qualified technical personnel are available to the Agency in a timely manner. Technical support will be provided to the requestors, to the extent that resources permit, so long as it has been specifically identified as supportive of the Agency's objectives, and is not otherwise available. The technical support program will give priority to requested services which require unique ORD personnel or equipment and relative priorities among a given user's requests will be established by that user.
RESULTS: Technical Support services typically fall into the following categories: (1) responding to schedules, unscheduled and emergency requirements for field, analytical, and data analysis support to produce data of known quality through specialized field and analytical studies, organizing this data into summaries and providing interpretive reports; (2) adapting and modifying basic state-of-the-art techniques to gather empirical evidence of environmental levels of specified or suspected pollutants; (3) performing complex chemical and physical analyses; (4) testifying as expert witnesses at administrative and judicial proceedings; and (5) consultants.
KEYWORDS: INSTRUMENTATION;WATER POLLUTION;MONITORING;GEOTHERMAL ENERGY

<072312>
TITLE: NonPoint Source Surface Water Monitoring Technology for Oil Shale Development
PROJECT NUMBER: J-620-A-34
PRINCIPAL INVESTIGATOR: Kinney, W.W.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Research Laboratory
MONITOR: Lambou, Victor W.
TELEPHONE: F595-2969 ext.391
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (33%);STORAGE (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Theoretical (40%);DEVELOPMENT/Pilot plant (60%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Test, validate and describe optimal water quality monitoring procedures and techniques for quantitatively assessing the contribution of nonpoint source pollutants in a stream segment potentially impacted by oil shale development activities.
APPROACH: Field testing of a surface water quality monitoring design incorporating biological, chemical and physical components was conducted on the lower reaches of the White River in eastern Utah in the vicinity of Federal Oil Shale tracts Ua-Ub, automated in-situ contact sensor packages, automated water samplers, conventional water grab sampling techniques, and a variety of biological sampling techniques were assessed for application in streams of semi-arrid regions characterized by highly variable flows and high levels of suspended materials. Adequacy of the design was evaluated in terms of parameters and parameter phases selected for measurement, frequency of measurement, sample site selection, field sampling and measurement techniques, laboratory analytical techniques and data handling procedures.
RESULTS: Report describing field program and evaluating monitoring design based upon approximately 1-year of field testing in an 18-mile reach of stream adjacent to Ua-Ub Federal Oil Shale tracts. Components of the monitoring design are assessed for application in streams of semi-arrid regions impacted by nonpoint source pollutants, particularly those associated with energy developmental activities.

PROJECT MILESTONES: (1) 6/75 Development of implementation plan. (2) 10/75 Initiate field program. (3) 6/76 Prepare interim progress report. (4) 11/76 Conclude field testing program. (5) 12/76 Begin data evaluation and report preparation. (6) 11/77 Issue product report.
KEYWORDS: EFFLUENTS;INSTRUMENTATION;CHEMICAL EFFLUENTS;OIL SHALE MINING;WASTE DISPOSAL;WATER QUALITY;MONITORING;STREAMS;WATER POLLUTION

<072313>
TITLE: Demonstration and Evaluation of Prototype Visibility Monitoring System
PROJECT NUMBER: J-620A-37
ADDRESS: 2112 Third Avenue, Suite 304, Seattle, WA 98121
AFFILIATION: Northwest Environmental Technology Lab., Inc., Seattle, Wash. (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Snelling, Robert N.
TYPE OF FUNDING: Contract No.-68-03-1172
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Demonstration of a laser transmissometer system for obtaining a continuous, quantitative measure of visibility. Interferences caused by turbulence in the optical refractive index of the atmosphere will be evaluated.
APPROACH: (1) Demonstrate prototype transmissometer performance for a 30-day period of continuous operation. (2) Establish and maintain transmissometer at a fixed station for period of 1 year (no funds available for this task).
RESULTS: (1) Final report on prototype performance. (2) Final report on 1-year performance study. One year demonstration project was not conducted because of lack of funds.
PROJECT MILESTONES: Jan 77: Final Report--Prototype Study.
KEYWORDS: ATMOSPHERIC VISIBILITY MEASUREMENT;TRANSMISSOMETER;EARTH ATMOSPHERE;OPTICAL PROPERTIES;AIR POLLUTION MONITORS;PERFORMANCE TESTING;AIR;DEMONSTRATION PROGRAMS;FOSSIL FUELS

<072314>
TITLE: Development of Environmental Keys
PROJECT NUMBER: J-620-A-38
PRINCIPAL INVESTIGATOR: Howard, G.E. Jr.
ADDRESS: P.O. Box 1587, Vint Hill Farms, Warrenton, VA 22186
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Howard, Gordon E. Jr.
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop imagery interpretation keys, and specifically in the following areas of interest: (1) the evidence and detection of leachate migration from landfills; (2) the effects of SO2 in air or vegetation; (3) a photographic key of typical harbor related pollution problems; (4) non-point source detection, identification and analysis in agriculture, silvicultural, and industry.
APPROACH: The development of imagery keys is a continuous and integral part of all programs conducted by the Remote Sensing Division. Since its inception, the Vint Hill Field Station has been charged with the mission of collecting and developing these keys. A comprehensive search of existing keys has been accomplished. During the course of on-going technical assistance programs within EPIC the need has become apparent for subject oriented environmental imagery keys. Toward this end EPIC will develop the keys listed above from experience and imagery derived from the aforementioned tech assistance programs as time and funds permit.
RESULTS: The Harbor key has been delivered and is being prepared for wide distribution printing. An in-house landfills key has been produced and is undergoing review. The Cornell Landfills report is in final review and may be reformatted into an interpretation key. Work on a key describing SO2 damage will continue based upon program requirements. Subject specific keys of non-point sources will continue.
PROJECT MILESTONES: (1) 5/77 Received Harbor Key. (2) 6/77 1st Draft, In-house Landfill Key. (3) 6/77 Received Cornell Landfill-Leachate Report for Final Review. (4) 12/77 Harbor Key Published for Wide Circulation. (5) 10/77 Continue Efforts on Non-point source Keys.
KEYWORDS: ENVIRONMENTAL IMAGERY INTERPRETATION KEYS;AIR;CHEMICAL EFFLUENTS;HYDROCARBONS;NITROGEN OXIDES;SULFUR DIOXIDE;SANITARY LANDFILLS;AGRICULTURE;INDUSTRY;MONITORING;HARBORS;WATER POLLUTION

<072315>
TITLE: Differential Absorption Laser System
PROJECT NUMBER: J-620-A-39
PRINCIPAL INVESTIGATOR: Thompson, R.T. Jr.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Thompson, Richard T., Jr.
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);SPECIFIED OTHER POLLUTANTS/Ozone (34%)
CHARACTER OF STUDY: RESEARCH/Theoretical (25%);FULL SCALE DEMONSTRATION (75%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To design, construct and interpret data from airborne nadir-viewing, laser differential-absorption systems. A CO2 laser system will be developed to measure ozone. A frequency doubled dye laser system (approximately 300 nm) will be developed to monitor sulfur dioxide. The use of differential absorption systems to monitor selected tracer gases will be investigated.
APPROACH: The systems each consist of two lasers, the wavelengths of which have been selected to optimize the difference in reflected signal due to the wavelength dependence of the pollutant or tracer gas. A computer code has been developed to simulate data tapes using a model atmosphere. Simulations are used to develop interpretive software and analyze system parameters. Design considerations preclude the possibility of endangering people with laser radiation.
RESULTS: The ozone monitor system is being redesigned due to laser failure and incompatibility determined in ground tests and preliminary flight tests. The ozone system will be flight tested during 1978 with operational flights to follow. Laboratory studies on the feasibility of using tracer gases have been completed. The SO2 monitor system will be designed in 1978 with procurement and construction to occur in the following 12 months.
PROJECT MILESTONES: (1) 12/77 Tracer gas study report. (2) 12/77 Report on ozone monitor ground tests. (3) 6/79 Second generation ozone system tested and reported. (4) 6/78 Report on other potential measurements using computer simulations. (5) 6/80 Report on SO2 monitor tests.
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;OZONE;SULFUR DIOXIDE;ENVIRONMENTAL TRANSPORT;MONITORING;PERFORMANCE TESTING;COMPUTER CALCULATIONS;LASERS

<072316>
TITLE: Investigate the Potential and Demonstrate the Capability of an Operational System to Image Non-Visible Gases or Interest to EPA
PROJECT NUMBER: J-620-A-41
PRINCIPAL INVESTIGATOR: Dockter, M.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Dockter, Marvin
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/CO;NOXIOUS GAS/NO;NOXIOUS GAS/CO2;NOXIOUS GAS/H2O (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Determine the feasibility of an operational system for imaging nonvisible gases utilizing multispectral scanner techniques.
APPROACH: (a) Build up laboratory model to demonstrate techniques for SO2, CO, NO, CO2 and H2O vapor gases. (b) Conduct laboratory experiments to determine the practicality of utilizing this technique in an operational manner.
RESULTS: (a) Build laboratory Unit. (completed 9/76) (b) Conduct controlled experiments. (completed 12/76) (c) Compile report. (completed 3/77)
PROJECT MILESTONES: (1) 9/76 Build laboratory unit. (2) 12/76 Conduct controlled experiments. (3) 3/77 Compile report.
KEYWORDS: AIR;CARCINOGENS;CHEMICAL EFFLUENTS;HYDROCARBONS;NITROGEN OXIDES;SULFUR DIOXIDE;CARBON MONOXIDE;CARBON DIOXIDE;WATER VAPOR;AIR POLLUTION MONITORS;DESIGN;MONITORING

<072317>
TITLE: Light Aircraft Sensor Pod (Enviro-Pod)
PROJECT NUMBER: J-620-A-42
PRINCIPAL INVESTIGATOR: Crouch, L.
ADDRESS: Air Force Avionics Laboratory, Dayton, OH 45433
AFFILIATION: Air Force Avionics Lab., Wright-Patterson AFB, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
TYPE OF FUNDING: Interagency agreement-IAG D-4-H492
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this program is to demonstrate how essential remote sensing data can be provided by an alternative means that does not involve the high cost of acquisition and maintenance of organic aircraft or the expense of obtaining aerial survey aircraft under contract.
APPROACH: Through an interagency agreement with the U.S. Air Force at Wright Patterson AFB, Dayton, Ohio, the Environmental Protection Agency has tasked the Air Force Avionics Laboratory to design, test, and produce a sensor pod capable of being strapped on a commonly available, light utility aircraft with no modification or change in aircraft registration. The sensor pod developed must be capable of obtaining large scale, high resolution, black and white, color infrared photography.
RESULTS: The ENVIRO-POD was issued a supplemental type certificate (STC) on 19 January 1977 by the Federal Aviation Administration. During Fiscal 77 operational suitability testing was conducted in Regions I, II, III, IV, and Washington D.C. area. It has been recommended that POD production be accelerated. A

final report is to be prepared detailing the recommendations for ENVIRO-POD deployment, based on the demonstrations conducted. Current plans call for the installation and testing of a thermal scanner for the POD and the identification of other possible sensors. A training program will be developed for EPA offices acquiring an ENVIRO-POD.
JECT MILESTONES: (1) 1/77 FAA Certification. (2) 4/77 Operational Suitability Testing Begun. (3) 9/77 Final Report--Recommendations for Deployment. (4) 10/77 Implementation of Thermal Scanner to POD. Begin selection of other sensors. Develop training for USCRS. Other Demonstrations (if called for). (5) 12/77 Test IR Scanner.
KEYWORDS: INFRARED THERMOGRAPHY;THERMAL POLLUTION;HAZARDOUS MATERIALS;WASTE DISPOSAL;AERIAL MONITORING;REMOTE SENSING;POLLUTION;AIRCRAFT

<072318>
TITLE: Development of a Two-Frequency Downlooking Airborne Lidar System
PROJECT NUMBER: J-620-A-44
PRINCIPAL INVESTIGATOR: Eckert, J.A.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Eckert, John A.
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$95,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Design, construct and test a two frequency downward looking airborne lidar system. Lidar systems have demonstrated capability in solving several current pollution monitoring problems: (1) determining mixing layer height over large geographical areas in short periods of time, (2) determining point source plume dimensions, and (3) determining the dimensions of and structure within an urban plume.
APPROACH: The system design utilizes, whenever possible, off-the-shelf components including the laser transmitter. Much of the electronics control and readout subsystem is implemented using two microprocessor systems, thus shifting the construction burden from hardware to software. Much attention is given in the design to operator interaction, including a real time display system for the data.
RESULTS: The optical/mechanical design phase has been completed and the device, minus electronics components, will be delivered by September 1977. Systems design work has been completed on the electronics portion of the device. However, actual implementation in hardware and software will commence after flight testing of the optical system. The completed system will be operational by August 1978.
PROJECT MILESTONES: (1) 12/77 Preliminary ground and flight test. (2) 5/78 Evaluate, modify and refine output systems as necessary. (3) 8/78 Flight test and compare to known distributions. (4) 9/78 Report on system.
KEYWORDS: LIDAR;AIR POLLUTION MONITORS;PERFORMANCE TESTING;REGIONAL ANALYSIS;AERIAL SURVEYING;AIR POLLUTION;PLUMES;METEOROLOGY;POINT POLLUTANT SOURCES;DIFFUSION;URBAN AREAS

<072319>
TITLE: Monitoring Systems Development for Operation Applications--Laserfluorosensor for Chlorophyll
PROJECT NUMBER: J-620A45
PRINCIPAL INVESTIGATOR: Bristow, M.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Bristow, Michael
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Microbiological agents (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop a simple airborne laserfluorosensor capable of measuring and mapping out surface water chlorophyll a concentrations for use as a eutrophic indicator for inland waters. In addition, the device can be used for monitoring fluorescent water tracing dyes.
APPROACH: The airborne laserfluorosensor employs a flashlamp pumped dye laser tuned to the absorption peak of chlorophyll a at 440 nm. The laser-induced fluorescence is then collected by a large aperture telescope and focused via a 685 nm interference filter onto a detector. Correction for variation in water transmission is made by concurrently monitoring the laser-induced water OH stretch Raman band at 5172 A. The signal is displayed on a CRT, digitized and recorded on magnetic tape for later analysis. By making repeated passes over a given target, either in a fixed or rotary wing aircraft, it will be possible to produce a contour map of the chlorophyll fluorescence to water Raman ratio for use as an indicator of surface water chlorophyll a concentration.
RESULTS: The system is currently being evaluated in an EPA Bell Huey helicopter over Lake Mead. At a height of 1000 ft. above the surface and under full daylight conditions, good signal to noise ratios are obtained for surface chlorophyll concentrations of the order of 1 microgram/l. Present plans are to compare and correlate airborne and ground truth data with a view to calibrating the airborne system.

PROJECT MILESTONES: (1) 9/77 Report on field evaluation of chlorophyll monitor. (2) 6/78 Report on laser fluorcsensing tc monitor blue-green algae and tracer dyes. (3) 6/80 Design and construct advanced system. (4) 9/82 Laboratory fluorescence feasibility studies.
KEYWORDS: LASERFLUOROSENSOR;SURFACE WATERS;EUTROPHICATION;LASERS;MEASURING INSTRUMENTS;CHLOROPHYLL;AERIAL MONITORING;REMOTE SENSING

<072320>
TITLE: Optimum Air Quality Monitoring Network Design Methodology
PROJECT NUMBER: J-620A-47
PRINCIPAL INVESTIGATOR: Behar, J.V.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Schuck, Edward A.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$177,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO;NOXIOUS GAS/NO;NOXIOUS GAS/Photochemical oxidants (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To develop a method for selecting the optimum number and disposition of sampling sites for monitoring air quality, encompassing several aspects: meteorology, topography, source distribution, pollutant types, and emissions inventory.
APPROACH: The development of the methodology for optimizing the design of ambient air quality networks requires a field sampling program for collecting air quality data and meteorological data, and the application of these data to an urban airshed simulation model for predicting pollutant concentrations under various meteorological conditions. Optimum sampling locations will be determined by mathematical analysis of several sets of pollution concentration patterns from meteorological simulation for the more commonly occurring weather regimes. The geographical position of the point or points of maximum concentration will be determined and plotted on a map. Monitoring stations will be placed within the overlapping areas for various weather regimes.
RESULTS: Emissions inventory for the Las Vegas Valley, 1975 (1/77); develop a methodology for designing carbon monoxide monitoring networks (3/77); complete field data collection for oxidant modeling in Las Vegas (10/77); apply methodology for the design of a carbon monoxide monitoring network to Las Vegas (12/77); develop a users guide to the SAI urban airshed model (12/77); develop a photochemical oxidant monitoring network optimization guide (12/78).
PROJECT MILESTONES: (1) 1/77 Emissions inventory for the Las Vegas Valley, 1975. (2) 3/77 Development of a methodology for designing carbon monoxide monitoring networks. (3) 10/77 Completion of field data collection for oxidant modeling in Las Vegas. (4) 12/77 Application of a methodology for the design of a carbon monoxide monitoring network to Las Vegas. (5) 12/77 A users guide to the SAI urban airshed model. (6) 12/78 Photochemical oxidant monitoring network optimization guide.
KEYWORDS: CHEMICAL EFFLUENTS;AIR POLLUTION;HYDROCARBONS;NITROGEN OXIDES;CARBON MONOXIDE;PHOTOCHEMICAL OXIDANTS;AIR QUALITY;MONITORING;SAMPLING;METEOROLOGY

<072321>
TITLE: Develop and Apply Biological Monitoring Methods
PROJECT NUMBER: J-620A-49
PRINCIPAL INVESTIGATOR: Crockett, A.B.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Wiersma, G.B.
TELEPHONE: C(702)736-2969 ext.394
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$55,500
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: METALS (50%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Plants, animals, and various indices will be evaluated as to their value as biological monitors and potential for incorporation into operational monitoring networks.
APPROACH: Soil, vegetation, and small mammals will be collected around a coal-fired power plant and in a highly urbanized area. After a potential monitor has been identified, factors affecting the receptor will be studied to determine its response and usefulness. Domestic livestock will also be evaluated. Plant communities will be studied to determine if existing species diversity indices have value as indicators of pollutant impact. Microorganisms will be evaluated to determine usefulness as indicators of pollutant bioavailability in soil systems.
RESULTS: Complete sampling at 4-Corners Power Plant for soil and vegetation has been carried out and analyses for soil conducted for mercury, lead, cadmium, zinc, selenium, and copper. Plant communities have been sampled for indices evaluation and rats collected in Los Angeles for lead.
PROJECT MILESTONES: (1) 5/77 Mercury distribution in soil around a large coal-fired power plant, EPA-600/3-77-063. (2) 9/77 Trace element distribution around a coal-fired power plant. (3) 9/77 Annual

report on biological indices. (4) 9/77 Annual report on usefulness of rats as biological monitors. (5) 9/78 Final report on biological indices. (6) 9/79 Report on trace element concentrations in domestic animals. (7) 10/80 Report on microbiological indicators of pollutant toxicity.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;CHEMICAL EFFLUENTS;AIR POLLUTION;ANIMALS;PLANTS;SOILS;MEASURING INSTRUMENTS;BIOLOGICAL INDICATORS;URBAN AREAS;MERCURY;LEAD;CADMIUM;ZINC;SELENIUM;COPPER

<072322>
TITLE: Aerial Remote Sensor Data Collection Processing and Analysis for Environmental Monitoring
PROJECT NUMBER: J-620A-51
PRINCIPAL INVESTIGATOR: Donaldson, J.R.
ADDRESS: 16811 El Camino Real, Houston, TX 77058
AFFILIATION: Lockheed Missiles and Space Co., Huntsville, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Clawson, Forrest G., Jr.
TYPE OF FUNDING: Contract No.-68-03-2153
77 FUNDING: Environmental Protection Agency FY77:$695,700
TECHNOLOGY: FOSSIL FUEL/General (75%);GEOTHERMAL/General (25%)
ENERGY CYCLE: TRANSPORTATION (25%);STORAGE (25%);ELECTRICAL TRANSMISSION (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The purpose of this contract is to provide continuing on-site support for the two major activities of the Remote Sensing Division. Evaluates new and existing concepts for methods of remote sensing measurement. Designs and constructs electro-optical instruments for the remote detection and measurement of specific physical and chemical pollutants. Evaluate and field test remote sensing instruments for specific chemical and physical pollutants. Develop and evaluate automated data systems and applicable software for analysis of test data and analyze test results in terms of meeting design objectives and criteria. Plan and conduct aerial data collection missions including all phases of the mission, except operation of the aircraft. Maintain and calibrate instrumentation and data systems. Provide remote sensing required in oil and hazardous material spill response situations. Develop and verify mathematical models for the analysis of land use and water quality data. Operate and deploy the airborne MSS instrument for the acquisition of digital spectral reflectance measurements of land and water surfaces. Operate and maintain multi-spectral data analysis system (DAS) which is designed to automate the analysis of digital remote sensing data. Develop and operate programs for multi-spectral data analysis. Operate photo-processing facilities to produce final imagery for interpretation and project
KEYWORDS: REMOTE SENSING;AERIAL MONITORING;AIR POLLUTION;WATER POLLUTION;MONITORING;MINING;HAZARDOUS MATERIALS;OIL SPILLS;DATA PROCESSING;MATHEMATICAL MODELS;LAND USE;WATER QUALITY

<072323>
TITLE: Contract Support Services to EPIC, Vint Hill Farms Station
PROJECT NUMBER: J-620A-52
PRINCIPAL INVESTIGATOR: Stout, K.K.
ADDRESS: P.O. Box 1587, Warrenton, VA 22186
AFFILIATION: Trident Engineering Associates, Inc., Warrenton, Va. (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Webb, Vernon
TELEPHONE: F557-3110
TYPE OF FUNDING: Contract No.-68-03-2539
77 FUNDING: Environmental Protection Agency FY77:$42,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS (25%);PARTICULATES (25%);ORGANICS (25%);HEAT, THERMAL (25%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Identify, locate and delineate point and non-point pollution sources including outfalls, animal feedlots, sanitary landfills, stationary and mobile emission sources, municipal and industrial waste dumps, automobile dumps, strip and deep mines, holding ponds and all other observable threats to environmental quality. Determine the behavior and migration of spilled oil and hazardous materials and provide guidance to clean-up operations. Investigate agriculture and silviculture practices for environmental impact. Produce and/or update land-use data of environmental significance. Determine environmental trends. Conduct search of imagery to monitor for regulations compliance, locate non-filers, and flag impending environmental episodes.
APPROACH: Work in the imagery exploitation research and development will be continued to: (1) develop keys to the interpretation and analysis of overhead imagery for unique environmental monitoring purposes; (2) identify the observable pollution pathways and biotic efforts; (3) determine the historical relationships between environmental pollution and the use of land; (4) identify deficiencies in interpretation and analysis equipment and techniques with particular emphasis on human factors aspects.
RESULTS: Work will be performed in the field when it is necessary to collect ground truth or confirm imagery interpretation.
KEYWORDS: POINT SOURCES;POLLUTION;MONITORING;INVENTORIES;LAND USE;TECHNOLOGY ASSESSMENT;POLLUTION CONTROL;REMOTE SENSING;FORECASTING;STATIONARY POLLUTANT SOURCES;MOBILITY;MEASURING METHODS;MEASURING INSTRUMENTS;ENVIRONMENT;QUALITY CONTROL;OIL SPILLS;CHEMICAL EFFLUENTS;WASTE WATER;MINING;FOSSIL FUELS;WASTE MANAGEMENT

<072324>
TITLE: Provide Quality Control and Quality Control Procedures for Overload Remote Sensing Techniques Employed in Support of Agency Monitoring Programs
PROJECT NUMBER: J-621A-59
PRINCIPAL INVESTIGATOR: Eckert, J.A.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Eckert, John A.
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/Oxidants (70%);PARTICULATES/Dust (30%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Produce guideline documents on selected airborne Remote Sensing Techniques.
APPROACH: Guideline documents, describing the capabilities of the instrumentation and techniques utilized in the remote monitoring of atmospheric particulates, ozone, and water quality, will be prepared. Data from remote monitoring instrumentation (LIDAR, laser differential absorption, and laser fluorosensors) will be compared with data obtained from in situ measurements. This comparison will serve as the basis both for generation of guideline documents and for the introduction of selected remote monitoring methods. In addition to the comparison of data, the guidelines will describe the capabilities of each type of instrument, calibration techniques and frequency of calibration, and the quality control procedures required to insure the precision, accuracy, and defensibility of the data.
RESULTS: Document on Airborne LIDAR is in preparation but awaiting suitable test to obtain comparison in situ data. Earth reflected differential absorption system is being redesigned after preliminary testing. Document will be prepared after suitable instrument test.
PROJECT MILESTONES: (1) 7/78 Guideline Document on earth--reflected ozone monitor. (2) 8/78 Guideline Document on laser fluorosensors for measuring water quality. (3) 8/79 Guideline Document on earth--reflected SO2 monitor.
KEYWORDS: LAND POLLUTION;SULFUR DIOXIDE;WATER QUALITY;REMOTE SENSING;OZONE;PARTICLES;AERIAL MONITORING;QUALITY CONTROL;AIR POLLUTION MONITORS;AIR POLLUTION;MONITORING

<072325>
TITLE: Geothermal Systems/Environmental Assessment of Extraction, Conversion and Waste Disposal
PROJECT NUMBER: J-624B-60
PRINCIPAL INVESTIGATOR: Sanyal, S.K.
ADDRESS: 3165 Adelene St., Berkeley, CA 94703
AFFILIATION: Geonomics, Inc., Berkeley, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gilmore, Donald B.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Contract No.-68-03-2468
77 FUNDING: Environmental Protection Agency FY77:$155,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (30%);PROCESSING, CONVERSION (30%);WASTE MANAGEMENT (40%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multi-media (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: A guideline document for the multi-media monitoring strategy around any geothermal resource development. This output will be used by the Federal, State, and local governments to monitor the changes in surface and underground waters as a result of the development of geothermal resources.
APPROACH: Determine the geology, hydrology, and climatology of the Geysers and Imperial Valley, California, geothermal areas, the Klamath Falls, Oregon, area, the Rio Grande Rift zone area, and identify the aquifers in each area. Define the various geothermal systems, quantify the pollutants from geothermal resources development including phase of produce fluids, subsidence possibilities, seismic effects, fluid disposal methods, thermal losses and their possible effects on the biota and groundwater of each area. Select a study area and design a monitoring system for the area. Implement and operate the monitoring program making such recommendations for improvement in the monitoring plan as deemed advisable. As a result of the experience in designing and operating such a monitoring system, make recommendations for a general monitoring methodology that will be most apt to meet the requirements of any geothermal resource development.
RESULTS: Geologic, hydrologic assessment report (2/77); environmental impact research report (6/77); siting and leasing guide (6/77); geothermal resource uses, conversion processes, wastes report (9/77); monitoring strategy design (9/77); pollution control technology report (9/78); final report (9/81).
PROJECT MILESTONES: (1) 2/77 Geologic, hydrologic assessment report. (2) 6/77 Environmental impact research report. (3) 6/77 Siting and leasing guide. (4) 9/77 Geothermal resource uses, conversion processes, wastes report. (5) 9/77 Monitoring strategy design. (6) 9/78 Pollution control technology report. (7) 9/81 Final report.
KEYWORDS: GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS;ENERGY CONVERSION;WASTE DISPOSAL;GEOLOGY;HYDROLOGY;METEOROLOGY;TERRESTRIAL ECOSYSTEMS;GROUND SUBSIDENCE;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;BASELINE ECOLOGY;ENERGY SOURCE DEVELOPMENT

<072326>
TITLE: Geothermal Environmental Impact Assessment (Fauna)
PROJECT NUMBER: J624B61
PRINCIPAL INVESTIGATOR: Sutton, W.W.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gilmore, D.B.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (30%);COMBUSTION OR END USE (30%);WASTE MANAGEMENT (40%)
POLLUTANTS: METALS/Heavy (30%);SPECIFIED OTHER POLLUTANTS/Nonmetallic inorganics (70%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Biological samples are collected at geothermal sites and analyzed for selected elements. The objectives will be to (1) provide baseline information prior to full scale energy production and (2) to examine the feasibility of using animals as biological monitors for geothermal pollutants. Rodents, rabbits, chickens and beef cattle represent various aspects of the field sampling program. The relative abundance/density of various wildlife species is also being investigated.
APPROACH: Field collected samples are transported back to Las Vegas and will be analyzed for such elements as lead, arsenic, zinc and cadmium. Concurrent laboratory studies are designed to confirm tissue retention characteristics (or complicating homeostatic factors) for geothermal elements following quantitated oral exposures. These laboratory experiments serve as an essential part of the quality assurance effort and the laboratory generated samples will be analyzed by those techniques used for the field collected tissues.
RESULTS: Samples have been collected from Roosevelt Hot Springs, Utah and from Imperial Valley, California. Relative abundance work on small mammal populations at Roosevelt Hot Springs is also in progress. Analytical data on the field collections, and associated laboratory studies, are not available but should be reported next year.
PROJECT MILESTONES: (1) 9/77 ANNUAL REPORT COVERING IMPERIAL VALLEY AND ROOSEVELT HOT SPRINGS. (2) 9/78 ANNUAL REPORT COVERING IMPERIAL VALLEY AND ROOSEVELT HOT SPRINGS. (3) 9/79 ANNUAL REPORT COVERING IMPERIAL VALLEY AND ROOSEVELT HOT SPRINGS. (4) 9/80 DEVELOPMENT OF MONITORING STRATEGY.
KEYWORDS: BASELINE ECOLOGY;GEOTHERMAL ENERGY CONVERSION;UTAH;IMPERIAL VALLEY;CALIFORNIA;ENVIRONMENTAL IMPACTS;CATTLE;RODENTS;RABBITS;CHICKENS;LEAD;ARSENIC;ZINC;CADMIUM;TISSUE DISTRIBUTION;ANIMALS;TOXICITY;TOXIC MATERIALS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL INDICATORS

<072327>
TITLE: Geothermal Environmental Impact Assessment--Plants and Soils
PROJECT NUMBER: J624B62
PRINCIPAL INVESTIGATOR: Brown, K.W.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Gilmore, D.B.
TELEPHONE: F595-2969 ext.241
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$95,700
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (40%);PROCESSING, CONVERSION (60%)
POLLUTANTS: METALS/Heavy (50%);PARTICULATES/Nitrates (50%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Conduct environmental assessment of geothermal energy extraction activities by studying pollutant levels and population characteristics in preoperational and post operational modes.
APPROACH: Soil and plant samples will be colllected prior to geothermal power plant operation to assess baseline levels of pollutants. Samples will also be collected after power plant operation. In addition, characteristics of plant populations will be ascertained, such as species mix and biomass. Two distinct ecotypes will be studied. One is an intensive agricultural area in the Imperial Valley of southern California and the other a range land area near Roosevelt Hot Springs, Utah.
RESULTS: Plant and soil sampling has been conducted at four KGRA's in the Imperial Valley and one KGRA at Roosevelt Hot Springs. AA analyses of samples has begun.
PROJECT MILESTONES: (1) 5/77 BASELINE SAMPLING FOR SOIL AND VEGETATION AT FOUR KGRA'S IN THE IMPERIAL VALLEY, CALIFORNIA, PROCEEDINGS, GEOTHERMAL STATE OF ART. (2) 9/77 ANNUAL REPORT, BASELINE TRACE ELEMENT LEVELS, IMPERIAL VALLEY. (3) 9/77 ANNUAL REPORT, BASELINE STUDIES AT ROOSEVELT HOT SPRINGS. (4) 9/78 POST OPERATIONAL REPORT, IMPERIAL VALLEY. (5) 9/79 POST OPERATIONAL REPORT, ROOSEVELT HOT SPRINGS. (6) 9/81 FINAL REPORT, IMPERIAL VALLEY. (7) 9/81 FINAL REPORT, ROOSEVELT HOT SPRINGS.
KEYWORDS: GEOTHERMAL ENERGY CONVERSION;ENVIRONMENTAL IMPACTS;IMPERIAL VALLEY;UTAH;BASELINE ECOLOGY;PLANTS;SOILS;LAND POLLUTION;CALIFORNIA;BIOMASS;METALS;NITRATES;TERRESTRIAL ECOSYSTEMS

<072328>
TITLE: Monitoring Guides for H2S and Non-Condensible Hazardous Gaseous Emissions/Geothermal Systems
PROJECT NUMBER: J624B63
PRINCIPAL INVESTIGATOR: Adams, W.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory

MONITOR: Gilmore, Donald B.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$76,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop a strategy for air quality monitoring as part of an integrated geothermal monitoring methodology for evaluating the total impact of geothermal development on a given locality.
APPROACH: The design of a monitoring network is accomplished in two phases. Field measurements of ambient air quality will be made and air quality simulations will be made for predicting temporal and spatial distributions of pollutants for various stages of geothermal development. Because meteorological and air quality data for this area are sparse, a two year field program is necessary to document aerometric data. A first year effort would be a pilot study for collecting meteorological data at several sites. Limited air quality data will also be collected during the first year. Data from the first year will be used as a guide to determine the level of effort for an expanded network in the second year. These data will be used as a basis for the air quality simulation phase of the project.
RESULTS: Completion of initial investigation with air monitoring laboratory at 5 sites in the Imperial Valley, California (10/76); completion of second round of air monitoring at 4 sites in the Imperial Valley, California (4/77); initiate collection of continuous meteorological and air quality data at fixed sites near Roosevelt Hot Springs, Utah (10/77); completion of final round of air monitoring at 4 sites in the Imperial Valley (4/78); report on air monitoring strategy around geothermal sites (12/79).
PROJECT MILESTONES: (1) 9/75 FIRST GEOTHERMAL WORKSHOP. (2) 10/76 COMPLETION OF INITIAL INVESTIGATION WITH AIR MONITORING LABORATORY AT 5 SITES IN THE IMPERIAL VALLEY, CALIFORNIA. (3) 2/77 SECOND GEOTHERMAL WORKSHOP. (4) 4/77 COMPLETION OF SECOND ROUND OF AIR MONITORING AT 4 SITES IN THE IMPERIAL VALLEY, CALIFORNIA. (5) 10/77 INITIATE COLLECTION OF CONTINUOUS METEOROLOGICAL AND AIR QUALITY DATA AT FIXED SITES NEAR ROOSEVELT HOT SPRINGS, UTAH. (6) 4/78 COMPLETION OF FINAL ROUND OF AIR MONITORING AT 4 SITES IN THE IMPERIAL VALLEY. (7) 12/79 REPORT ON AIR MONITORING STRATEGY AROUND GEOTHERMAL SITES.
KEYWORDS: AIR QUALITY;AIR POLLUTION MONITORS;IMPERIAL VALLEY;UTAH;SPATIAL DISTRIBUTION;GEOTHERMAL RESOURCES;METEOROLOGY;ENVIRONMENTAL IMPACTS;DATA ACQUISITION;GEOTHERMAL SYSTEMS;HYDROGEN SULFIDES

<072329>
TITLE: Advanced Waste Heat Control-Waste Utilization Program
PROJECT NUMBER: J-624-64
ADDRESS: 4220 S. Maryland Parkway-La Plaza Bldg., Las Vegas, NV 89109
AFFILIATION: Northrop Corp., Las Vegas, Nev. (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lambou, V.W.
TELEPHONE: F595-2969 ext.391
TYPE OF FUNDING: Contract No.-68-03-2591
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this study are to inventory hazardous materials to be found in energy-related cooling system effluents, evaluate the present state-of-the-art of technology for monitoring these materials, and to initiate corrective actions where deficiencies in the technology are identified.
APPROACH: This will be accomplished through extensive literature review, personal contacts with cooling tower operators, monitoring equipment manufactures, and other professional personnel. Data obtained will be presented in two reports, one identifying materials to be found or expected in cooling system effluents and a second evaluating the present state-of-the-art of appropriate monitoring technology.
RESULTS: Based on the results obtained from the above effort, corrective actions will be taken to overcome deficiencies in monitoring technology. These will involve publication of techniques, development and/or modification of equipment, or other efforts.
PROJECT MILESTONES: (1) 9/77 Definition of following corrective actions. (2) 12/77 Publication of report: Hazardous Chemicals in Cooling System Effluents from Energy-Development Related Activities. (3) 12/77 Publication of report: Detection and Monitoring of Hazardous Chemicals in Cooling System Effluents from Energy Development Related Activities.
KEYWORDS: CHEMICAL EFFLUENTS;TOXICITY;COOLING SYSTEMS;LIQUID WASTES;ENVIRONMENTAL EFFECTS;ECOSYSTEMS

<072330>
TITLE: Monitoring the Impact of Western Coal Strip Mining and Oil Shale Extraction on Groundwater Quality
PROJECT NUMBER: J-625-C-65
PRINCIPAL INVESTIGATOR: Tinlin, R.
ADDRESS: Center for Advanced Studies, P.O. Drawer QQ, Santa Barbara, CA 93102
AFFILIATION: General Electric Co., Santa Barbara, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: McMillion, Leslie G.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Contract No.-68-03-2449
77 FUNDING: Environmental Protection Agency FY77:$265,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (25%);PARTICULATES (25%);ORGANICS (25%);VISUAL AESTHETICS (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND

MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The principal objective is to develop and validate in at least two areas a strategy for monitoring groundwater quality alterations that are occurring or could potentially occur as a consequence of the strip mining of coal; mining and processing of oil shale; conversion of these resources; and effects of other related situations (such as population increases and industrial developments). The areas to be monitored will be in the western United States.
APPROACH: The development of the monitoring strategy will follow, in general, the methodology that is described in the recently printed EPA report entitled ''Monitoring Groundwater Quality: Monitoring Methodology.'' A necessary prerequisite to the development of the strategy will be the collection and evaluation of considerable data on subjects such as the following: geology, water chemistry, identifiable pollutants, aquifer hydraulic characteristics, mining methods, land reclamation processes, oil shale processing methods, and practices for disposal of waste substances. The evaluations will include identification of pollutants and the prioritization of pollution sources. Actual field monitoring will be conducted to show the validity and method of application of the monitoring strategy.
RESULTS: Outlines and draft materials for the first phase of the work have been prepared for Monitoring Approaches and Methods; Sources of Pollution and Methods of Waste Disposal; Identification of Potential Pollutants; Grcundwater Usage; and Hydrologic Framework.
PROJECT MILESTONES: (1) 10/77 Collect, organize, and interpret background data. (2) 6/78 Design the monitoring program. (3) 1/79 Implement the monitoring program for coal strip mining. (4) 10/81 Implement the monitoring program for oil shale.
KEYWORDS: EFFLUENTS;COAL INDUSTRY;SURFACE MINING;OIL SHALE INDUSTRY;GROUND WATER;WATER QUALITY;ENVIRONMENTAL IMPACTS;TERRESTRIAL ECOSYSTEMS;CHEMICAL EFFLUENTS;WASTE WATER;MONITORING

<072331>
TITLE: Energy-Related Radiological Pollutant Monitoring Techniques Development
PROJECT NUMBER: J-625C-66
PRINCIPAL INVESTIGATOR: Bretthauer, E.W.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Bretthauer, E.W.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$23,500
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: STORAGE (30%);PROCESSING, CONVERSION (40%);WASTE MANAGEMENT (30%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Conduct research on the development of techniques to monitor potentially hazardous effluents and emissions from nuclear fuel cycle facilities.
APPROACH: Characterize the physical and chemical properties and radiation levels of plutonium and other actinide discharges from a mixed uranium and plutonium oxide fuel fabrication facility. Recommend and collaboratively test methods for monitoring plutonium, uranium and thorium in soil, air and water, including the development of appropriate reference materials for calibration.
RESULTS: The physical and chemical properties and radiation levels of plutonium and uranium discharges have been characterized from stack and environmental samples collected at a mixed uranium-plutonium oxide fuel fabrication facility. The samples were analyzed and individual effluent particles were characterized in terms of activity, size, shape, elemental composition and other parameters by Interagency Agreement with the U.S. Air Force Technical Applications Center. A fusion method and an acid dissolution method for the measurement of plutonium in soil have been evaluated and collaboratively tested. Efforts are underway to prepare appropriate reference material and collaboratively test a method for measuring plutonium in air.
PROJECT MILESTONES: (1) 7/77 Characterization of emissions from a Pu-U oxide fuel fabrication facility. (2) 7/77 Collaboratively tested method for measuring plutonium in soil (fusion technique). (3) 1/78 Collaboratively tested method for measuring plutonium in soil (acid dissolution technique). (4) 10/78 Collaboratively tested method for measuring plutonium in air.
KEYWORDS: PLUTONIUM;THORIUM;URANIUM;RADIATION MONITORING;RADIOACTIVE EFFLUENTS;SOILS;AIR;SURFACE WATERS;RADIOACTIVITY;MIXED OXIDE FUEL FABRICATION PLANTS

<072332>
TITLE: Collaboratively Test Methods for Measuring Uranium in Environmental Samples
PROJECT NUMBER: J-625C-67
PRINCIPAL INVESTIGATOR: Robinson, B.
ADDRESS: P.O. Box 32, Miamisburg, OH 45342
AFFILIATION: Mound Lab., Miamisburg, Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Bretthauer, E.W.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement-IAG D 7-0015
77 FUNDING: Environmental Protection Agency FY77:$51,500
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
EGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
ESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Conduct research on the development of techniques to monitor potentially hazardous effluents and emissions from nuclear fuel cycle facilities.
APPROACH: Develop or evaluate methods for monitoring plutonium in water, uranium in water, soil and air, and americium in soil. Recommend methods which best meet established criteria and conduct and evaluate results

of interlaboratory collaborative tests of these methods. This includes the development of appropriate reference materials for calibration and analysis.
RESULTS: Methods for measuring plutonium in water and uranium in water have been collaboratively tested. Efforts are underway to develop and evaluate methods for americium in soil and uranium in soil and air.
PROJECT MILESTONES: (1) 10/77 Collaboratively tested method for measuring plutonium in water. (2) 1/78 Collaboratively tested method for measuring uranium in water. (3) 6/78 Collaboratively tested method for measuring americium in soil. (4) 10/78 Collaboratively tested method for measuring uranium in air. (5) 10/78 Collaboratively tested method for measuring uranium in soil.
KEYWORDS: AMERICIUM;PLUTONIUM;URANIUM;NUCLEAR FACILITIES;RADIOACTIVE EFFLUENTS;RADIATION MONITORING;RADIOACTIVITY;SOILS;SURFACE WATERS;RADIATION MONITORS;CALIBRATION

<072333>
TITLE: Energy Related Radiological Monitoring Quality Assurance
PROJECT NUMBER: J-625-C-68
PRINCIPAL INVESTIGATOR: Jarvis, A.N.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Jarvis, A.N.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);NUCLEAR/General (30%);GEOTHERMAL/General (30%)
ENERGY CYCLE: EXTRACTION (30%);PROCESSING, CONVERSION (40%);COMBUSTION OR END USE (30%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective is to determine the potential radioactive pollutants for which quality control standards, SRMs, and procedures will be needed as the result of expanded nuclear power, fossil-fuel extraction, and geothermal activities and to supply these standards, SRMs, and procedures to interested laboratories.
APPROACH: A report, "Potential Radioactive Pollutants Resulting from Expanded Energy Programs," was prepared for the EPA through a contractual agreement. Based on the results of this report, standard reference materials and calibrated samples, required for the analysis of samples obtained by monitoring activities in the vicinity of nuclear facilities, fossil-fuel extraction and utilization activities, and geothermal sites, are being developed.
RESULTS: Laboratory intercomparison studies have continued. Standards, including radium-228, have been made available to laboratories upon request. Several guidelines, including use of radiation standards and gamma measurements techniques, have been prepared.
PROJECT MILESTONES: (1) 4/77 Determination of the potential radioactive pollutants for which quality control standards, SRMs, and procedures will be needed as the result of expanded nuclear power, fossil-fuel extraction, and geothermal activities. (2) 5/77 Production of radium-228 standards and continuing traceability studies with NBS. (3) Continuing Laboratory intercomparison studies. (4) 10/76 Publication of guideline describing calibration procedures for gas-flow counters. (5) 11/76 Publication of guideline on the preparation and use of radiation standards.
KEYWORDS: RADIOACTIVITY;QUALITY ASSURANCE;TERRESTRIAL ECOSYSTEMS;RADIOACTIVE EFFLUENTS;STANDARDS;RECOMMENDATIONS;NUCLEAR ENERGY;ENERGY CONSUMPTION;GEOTHERMAL ENERGY;MANUALS;RADIATION DETECTORS;RADIATION MONITORS;RADIATION MONITORING;COAL INDUSTRY

<072334>
TITLE: Development of Background Evaluations for Validations of Groundwater-Quality Monitoring Methodology
PROJECT NUMBER: J-625C-69
PRINCIPAL INVESTIGATOR: Mulligan, J.
ADDRESS: P.O. Box 13246, Capitol Station, Austin, TX 78711
AFFILIATION: Texas Water Quality Board, Austin (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: McMillion, Leslie G.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Contract No.-68-03-2564
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project focuses on the field validation of a research-developed methodology for monitoring changes in groundwater quality presented in the report "Monitoring Groundwater Quality: Monitoring Methodology." By applying the methodology to a region related to energy development, an early appraisal can be made of the impact these activities may have on the environment.
APPROACH: The study area selected for this field validation is 17 counties in the eastern part of Texas which contain enormous and widespread quantities of lignite and some of the nation's largest oil fields. A series of procedural steps designed to lead to a program to monitor groundwater-quality deterioration resulting from man's activities are as follows: Step 1--select area or basin for monitoring; Step 2--identify pollution sources, causes, and methods of waste disposal; Step 3--identify potential pollutants; Step 4--define groundwater usage; Step 5--define hydrogeologic situation; and Step 6--study existing groundwater quality and describe the existing monitoring program. Completion of these steps will provide the background information needed to select more localized demonstration sites to be included in future EPA projects to verify the remainder of the monitoring methodology.
RESULTS: Contract work initiated at the time of this report. Contract reporting schedule is as follows: determine and describe the hydrogeology and groundwater use (12/77); inventory pollution sources and

identify potential pollutants (2/78); collect and analyze existing groundwater-quality data (4/78); report on evaluation of groundwater data interpreted with respect to hydrogeology and pollution source (10/78).
PROJECT MILESTONES: (1) 12/77 Determine and describe the hydrogeology and ground water use. (2) 2/78 Inventory pollution sources and identify potential pollutants. (3) 4/78 Collect and analyze existing ground water quality data. (4) 10/78 Report on evaluation of ground water data interpreted with respect to hydrogeology and pollution source.
KEYWORDS: GROUND WATER;WATER QUALITY;MONITORING;MEASURING METHODS;TECHNOLOGY ASSESSMENT;INVENTORIES;BASELINE ECOLOGY;DATA ACQUISITION;WATER POLLUTION ABATEMENT;PLANNING;TERRESTRIAL ECOSYSTEMS;HYDROLOGY;GEOLOGY;COAL INDUSTRY

<072335>
TITLE: Acquire from NASA and put into use, the Data Analysis System (DAS) for Multispectral Information
PROJECT NUMBER: J-625C-70
PRINCIPAL INVESTIGATOR: Dockter, M.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Dockter, Marvin
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);FOSSIL FUEL/Oil Shale (30%);GEOTHERMAL/General (30%)
ENERGY CYCLE: EXTRACTION (40%);PROCESSING, CONVERSION (60%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple, Agricultural Runoff (100%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Site specific Great Plains
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (a) Training of EMSL-LV Remote Sensing Division personnel by NASA in the use of the automated multispectral analysis system. (b) Acquire from NASA and put into operational use the Data Analysis System. (c) Perform analysis and prepare a final report on completion of the transfer of technology.
APPROACH: The training of EMSL-LV Remote Sensing Division personnel on the actual DAS with operational type requirements will greatly enhance the NASA to EPA technology transfer. The DAS was designed with the capability to reduce a broad range of remote sensor data and will be used to reduce the multispectral scanner and ERTS data for land use mapping and water monitoring purposes. The DAS output may be recorded on nine track digital computer compatible tape for further processing, displayed on a high resolution color television monitor, recorded on 9.5 inch wide color or black and white film, or listed on a high speed line printer. A versatile interactive operator control console is included to provide complete operator-processor communication and control.
RESULTS: (a) Demonstration of technique using existing NASA system. (b) Training of EMSL-LV personnel. October 1976--July 1977. (c) Acquire complete DAS system for EMSL-LV. June 1976--September 1977.
PROJECT MILESTONES: (1) 9/66 Demonstration of technique. (2) 7/77 Training EMSL-LV personnel. (3) 9/77 Acquire complete DAS for EMSL-LV.
KEYWORDS: COAL INDUSTRY;OIL SHALE INDUSTRY;GEOTHERMAL ENERGY;REMOTE SENSING;EDUCATION;TECHNOLOGY TRANSFER;PERSONNEL;DATA PROCESSING;DATA ACQUISITION SYSTEMS;MONITORING;EQUIPMENT;WASTE MANAGEMENT;WATER QUALITY;ENVIRONMENTAL IMPACTS;AIR QUALITY;LAND POLLUTION

<072336>
TITLE: Energy-Related Overhead Monitoring and Techniques Development
PROJECT NUMBER: J-625C-71
PRINCIPAL INVESTIGATOR: Landers, R.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Landers, Robert
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);FOSSIL FUEL/Oil Shale (30%);GEOTHERMAL/General (30%)
ENERGY CYCLE: EXTRACTION (40%);PROCESSING, CONVERSION (60%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Agricultural Runoff (100%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Establish preliminary guidelines for and demonstration of overhead remote monitoring of Western energy related activities.
APPROACH: Cooperative Western energy related overhead monitoring program between NASA and EPA has been established with the purpose to define, demonstrate and develop operational remote sensor techniques to rapidly monitor, in a cost effective, quantitative manner, the success with which an energy-related extraction site has been or is being, rehabilitated to a state suitable for its intended or previous land usage. This includes the determination of environmental baselines for the purpose of establishing rehabilitation criteria as well as environmental effects of mine mouth power plants.
RESULTS: (a) Initiate baseline information studies. (b) Demonstration of multispectral scanner techniques using existing NASA system. (c) Utilizing manual photo interpretation techniques of aerial photographs, perform assessments of environmental impact and rehabilitation efforts. August 1975--August 1976. (d) Utilizing multispectral scanner (MSS) data, perform assessment of environmental imapct and rehabilitation efforts. August 1975--December 1976. (e) Photo Interpretation report preparation. August 1976--September 1976. (f) MSS Data report preparation. December 1976--January 1977. (g) Prepare Western Energy ''Atlas.'' August 1976--December 1976. (h) Evaluation Report. January 1977--June 1977.
PROJECT MILESTONES: (1) 8/76 Baseline Studies. (2) 8/76 Demonstration of Technique. (3) 8/76 Assess

environmental impact. (4) 12/76 Utilize DS-1260 Multispectral Scanner. (5) 1/77 Prepare report. (6) 1/77 Prepare atlas. (7) 6/77 Complete Evaluation report.
KEYWORDS: AGRICULTURE;REMOTE SENSING;MONITORING;WASTE MANAGEMENT;WATER;LAND POLLUTION;BASELINE ECOLOGY;COAL MINES;THERMAL POWER PLANTS;ENVIRONMENTAL IMPACTS;LAND RECLAMATION;COAL INDUSTRY;GEOTHERMAL ENERGY;OIL SHALE INDUSTRY

<072337>
TITLE: Development of Techniques for Remote Monitoring of Organic Pollution in Surface Waters
PROJECT NUMBER: J-625-C-72
PRINCIPAL INVESTIGATOR: Bristow, M.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Bristow, Michael
TELEPHONE: F595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$39,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The ultimate objective of this program is to develop an active airborne monitoring system capable of providing quantitative data on the concentration of total organics in surface waters.
APPROACH: The principle employed is an extension of the laboratory technique of spectrofluorometry. A water sample is irradiated with ultraviolet (uv) light of a specific wavelength and intensity, and the resultant fluorescence emission is then monitored using a monochromator-multichannel detector combination. The fluorescence signal arises from dissolved organic materials both man-made and natural in origin rather than from the water itself, which does not fluoresce. However, the water molecule emits a Raman band which, for very dilute aqueous solutions of organics, has a constant amplitude for a given intensity of excitation radiation. This water Raman emission band is then conveniently employed as a built-in reference source with which to compe the amplitude of the concurrent fluorescence emission. The normalized amplitude of the concurrent fluorescence emission. The normalized amplitude of the signal then provides information concerning the concentration of the dissolved organics.
RESULTS: A number of reports have been published recently which indicate that the uv-induced fluorescence emission is proportional to the concentration of dissolved organic carbon. It is planned to explore this relationship in more detail with the purpose of establishing a firm value for a correlation coefficient. Based on the findings of this correlation study, an airborne laser fluorosensor will be designed, built and tested. This system will have the capability of continuously monitoring and recording the dissolved organic carbon concentration for the surface water below the aircraft.
PROJECT MILESTONES: (1) 9/77 Feasibility report on organic carbon laser fluorosensor. (2) 1/79 Design and construct organic carbon laser fluorosensor. (3) 1/81 Design, construct, test and report on advance system.
KEYWORDS: SURFACE WATERS;REMOTE SENSING;ORGANIC COMPOUNDS;ULTRAVIOLET SPECTRA;AERIAL MONITORING;WATER POLLUTION;CHEMICAL ANALYSIS;TECHNOLOGY ASSESSMENT;MEASURING METHODS;MEASURING INSTRUMENTS

<072338>
TITLE: Energy Related Water Monitoring Data Integration
PROJECT NUMBER: J-625C-73
PRINCIPAL INVESTIGATOR: Thomas, R.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lambou, Victor W.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$84,000
TECHNOLOGY: FOSSIL FUEL/General (60%);NUCLEAR/General (20%);GEOTHERMAL/General (10%);SOLAR/General (10%)
ENERGY CYCLE: EXTRACTION (30%);PROCESSING, CONVERSION (40%);COMBUSTION OR END USE (30%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Establish a water monitoring network throughout the western states to monitor and assess the impact of energy resource development.
APPROACH: Through the use of computer data banks, primarily STORET, water monitoring stations that are currently in operation, back past 1970, and have reported a large number of measured parameters were selected for incorporation into a primary monitoring net. Parameters of interest were identified and a quality assurance program is being established in participating laboratories. Historical data have been reviewed and baseline water quality conditions are being established. A Western Energy Resources Atlas has been published in conjunction with a similar effort on air monitoring.
RESULTS: Data from the primary net stations are being augmented with data from other stations. An assessment of baseline water quality, trends, and impacts on a basin by basin basis is underway. As data gaps, either desired parameters, sampling frequency, or additional stations are identified, actions will be taken with appropriate EPA Regional Offices or other governmental agencies to correct them. The primary net will be updated periodically and extended into areas not presently addressed.
PROJECT MILESTONES: (1) 6/76 Publication of Western Energy Monitoring Atlas. (2) 12/77 Energy Resource Development Impact-San Juan Basin, Utah, Colorado, New Mexico, Arizona. (3) 3/78 Western Energy Resource Development, Baseline Data and Long Term Water Quality Trends. (4) 6/78 Energy Resource Development Impact-Powder River Basin. (5) 7/78 Energy Resource Development Impact-Tongue River Basin. (6) 8/78 Energy Resource Development Impact-Little Missouri River Basin. (7) 9/78 Energy Resource Development Impact-Belle Porche River Basin. (8) 10/78 Energy Resource Development Impact-North Platte River Basin. (9) 1-5/79

Energy Resource Development Impact-Upper Colorado River Basin Indiviual reports. (10) 6/79 Western Energy Resources Development, Baseline Data and Water Quality Trends.
KEYWORDS: DATA INTEGRATION;WATER QUALITY;MONITORING;DATA PROCESSING;GEOTHERMAL ENERGY;NUCLEAR ENERGY;SOLAR ENERGY;FOSSIL FUELS;BASELINE ECOLOGY;ENVIRONMENTAL TRANSPORT;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL IMPACTS;DATA COMPILATION;UTAH;COLORADO;UTAH;NEW MEXICO;ARIZONA;COMPUTER CODES;LAND USE;WASTE MANAGEMENT;WATER RESOURCES

<072339>
TITLE: Four Corners Ambient Air Monitoring Network
PROJECT NUMBER: J-625-C-74
ADDRESS: Box 119, Ft Duchesne, UT 84026
AFFILIATION: UTE Research Lab., Fort Duchesne, Utah (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory, Cincinnati
MONITOR: McNelis, David N.
TELEPHONE: F595-2969 ext.342
TYPE OF FUNDING: Contract No.-68-03-2345
77 FUNDING: Environmental Protection Agency FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES/Dust (25%);ORGANICS (25%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Maintain an air quality monitoring network in the Four Corners area to evaluate the present and future air quality impact of energy-related developments in the Western United States. Integrate the air quality monitoring data collected by this network with data collected elsewhere.
APPROACH: A 28-station Hi-Vol network is operated over the Four Corners Region. A 24-hour sample is collected three times per week. Each sample is analyzed for trace elements (Pb, Cr, Cu, Ni, Fe, and Cd), sulfate nitrate, and total suspended particulate. All data are entered into the EPA SAROAD System.
RESULTS: Annual summary of data. Quarterly progress reports.
PROJECT MILESTONES: (1) 1/76 Network Operational. (2) 6/77 Sulfate nitrate analysis operational. (3) 12/77 Annual Report--data summary. (4) 12/78 Annual Report--data summary. (5) 12/79 Annual Report--data summary. (6) 12/80 Annual Report--data summary.
KEYWORDS: AIR QUALITY;MONITORING;SITE SELECTION;FLUE GAS;DESULFURIZATION;DENITRIFICATION;SULFUR DIOXIDE;NITROGEN OXIDES;REMOVAL;DATA ACQUISITION:DATA ANALYSIS

<072340>
TITLE: Energy-Related Ambient Air Quality Monitoring in the Western Energy Development Area
PROJECT NUMBER: J-625C-75
PRINCIPAL INVESTIGATOR: Snelling, R.N.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Snelling, Robert N.
TELEPHONE: F595-2969 ext. 333
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$230,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);FOSSIL FUEL/Oil and Gas (30%);FOSSIL FUEL/Oil Shale (30%)
ENERGY CYCLE: PROCESSING, CONVERSION (60%);COMBUSTION OR END USE (40%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Provide integrated and validated air quality monitoring data (baseline and trend) for the western area of the U.S. which are or will be impacted by energy-related development activities. The geographic coverage includes the Northern Great Plains, Four Corners Area, Colorado Plateau (Oil Shale), Black Mesa, Arizona and areas of New Mexico.
APPROACH: (1) Maintain inventory of existing and projected pollution sources and monitoring networks. (2) Integrate air quality monitoring data and assess impact of energy-related activities. (3) Conduct aircraft air quality monitoring missions to supplement ground-based network data.
RESULTS: (1) Annual reports of ground-based monitoring data. (2) Annual reports of airborne monitoring data.
PROJECT MILESTONES: (1) 6/77 Energy atlas (inventory). (2) 10/77 Aircraft monitoring operational. (3) 12/77 Annual report summarizing ground-based and airborne sampling data. (4) 12/78 Annual report summarizing ground-based and airborne sampling data. (5) 12/79 Annual report summarizing ground-based and airborne sampling data. (6) 12/80 Annual report summarizing ground-based and airborne sampling data.
KEYWORDS: EARTH ATMOSPHERE;AIR QUALITY;AEROSOL MONITORING;OIL SHALE INDUSTRY;AERIAL MONITORING;INVENTORIES;BASELINE ECOLOGY;MONITORING;SURFACE AIR;DATA;SAMPLING;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL EFFECTS;TECHNOLOGY ASSESSMENT;ARIZONA;COLORADO;NEW MEXICO

<072341>
TITLE: Animal Investigation Program
PROJECT NUMBER: J-627-C-36
PRINCIPAL INVESTIGATOR: Smith, D.M.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Smith, Donald M.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$102,000

TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Periodic sacrifice of beef cattle from the Energy Research and Development Administration Nevada Test Site herd and concurrent collection of wildlife for pathological and radionuclide analyses of tissues are conducted. Investigation of claims of radiation damage to domestic animals and veterinary information services is provided on an ad hoc basis. Seasonal sampling of wildlife at specific locations on the Nevada Test Site and the migration patterns of the mule deer herd are determined by telemetry.
APPROACH: Semiannually, six animals from a 100 head beef herd maintained on the Nevada Test Site are selected for sacrifice and necropsy and samples are collected for radionuclide analysis and histopathological examination. The Nevada Test Site wildlife (both resident and migratory) are periodically collected, necropsied, and sampled. Animals sampled include: mule deer, rabbits, coyotes, chukar, quail, desert bighorn sheep, and other wildlife. The migratory pattern of Nevada Test Site mule deer are studied by attaching telemetry collars to captured animals. Natural springs are rehabilitated and maintained in order to increase the availability of water for wildlife. Mourning doves are banded to determine their migration patterns from the Nevada Test Site. Educational exhibits are displayed at livestock exhibitions and fairs. Alleged radiation damage to livestock is investigated, bioenvironmental sampling programs at other Energy Research and Development Administration operational sites are developed, and ad hoc sampling programs in response to any release of radionuclides from the Nevada Test Site are initiated.
RESULTS: An annual report of progress-to-date is published in September of each year. An ad hoc investigation report would be prepared and published within six months after each special investigation.
PROJECT MILESTONES: (1) 01/74 Animal Investigation Program 1970 Annual Report. (2) 06/75 Animal Investigation Program 1971 Annual Report. (3) 06/76 Animal Investigation Program 1972 Annual Report. (4) 03/77 Animal Investigation Program 1973 Annual Report: Nevada Test Site and Vicinity. (5) 06/77 Animal Investigation Program 1974 Annual Report: Nevada Test Site and Vicinity. (6) Winter 77 Animal Investigation Program 1975 Annual Report: Nevada Test Site and Vicinity.
KEYWORDS: MEAT;NEVADA TEST SITE;ENVIRONMENTAL IMPACTS;DOMESTIC ANIMALS;LIABILITIES;HAZARDS;WILD ANIMALS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL MODELS;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;BIOADSORBENTS;RADIOACTIVE EFFLUENTS;AIR POLLUTION;ACCIDENTS;PATHOLOGICAL CHANGES

<072342>
TITLE: Aircraft Emission Impact Monitoring
PROJECT NUMBER: J-627G-78
PRINCIPAL INVESTIGATOR: Zeller, K.;Snelling, R.N.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Agency, Las Vegas
MONITOR: Zeller, Karl
TELEPHONE: C(702)595-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO;NOXIOUS GAS/NO (65%);PARTICULATES/Dust (35%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: An Interagency Agreement between the EPA, EMSL-LV and the U.S. Air Force Civil Engineering Center established a cooperative study to assess the impact of aircraft emissions on ambient air quality. The U.S. Navy, through the Naval Air Propulsion Test Center, is participating by providing funding and technical support through the Air Force. The data provided from the study will be used to calculate air quality frequency distributions and to validate existing airport models.
APPROACH: Collection and processing of air quality and meteorological data from five stations at Williams AFB for a 1-year period. CO, NOx, reactive hydrocarbons, and particulate data are collected. Monitoring will then be moved to Miramar Navy Air Station, San Diego, California.
RESULTS: (1) Final report summarizing procedures and data from Williams AFB. (2) Validated monitoring data in computer compatible format (Magnetic tape) from Williams AFB. (3) Final report summarizing procedures and data from Miramar. (4) Validated monitoring data in computer compatible format (magnetic tape) from Miramar.
PROJECT MILESTONES: (1) 6/77 Complete monitoring, WAFB. (2) 12/77 Final report, WAFB. (3) 1/78 Monitoring start-up, Miramar. (4) 12/78 Complete monitoring, Miramar. (5) 6/78 Final report, Miramar.
KEYWORDS: AIRCRAFT;EXHAUST GASES;ENVIRONMENTAL IMPACTS;CARBON MONOXIDE;NITROGEN OXIDES;DATA ACQUISITION;MONITORING;MATHEMATICAL MODELS;AIRPORTS;AIR QUALITY;CALIFORNIA;COMPUTER CODES;HYDROCARBONS

<072343>
TITLE: Technical Support for Collection, Processing and Analysis of Environmental Samples and Data
PROJECT NUMBER: J-627-G-80
ADDRESS: 16811 El Camino Real, Houston, TX 77058
AFFILIATION: Lockheed Electronics Co., Inc., Houston, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Cincinnati, Ohio (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Smith, Allan E.
TELEPHONE: F595-2969 ext. 344
TYPE OF FUNDING: Contract No.-68-03-2369
77 FUNDING: Environmental Protection Agency FY77:$553,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (10%);PARTICULATES/Dust (30%);ORGANICS (10%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
OJECT DESCRIPTION: To provide technical support as required for the collection, processing, and analysis of environmental samples and data and for the operations and maintenance of environmental monitoring facilities and platforms. This contract supports a number of program elements.
APPROACH: Contractor responds to program requirements on a task order basis.
RESULTS: Reports and products as defined in individual task orders.
KEYWORDS: ENVIRONMENT;MONITORING;TECHNOLOGY ASSESSMENT;POLLUTION;SAMPLING;DATA ACQUISITION;TECHNOLOGY UTILIZATION;ENVIRONMENTAL ENGINEERING;MEASURING METHODS;AIR POLLUTION;EARTH ATMOSPHERE

<072344>
TITLE: In Vitro Solubility of Plutonium, Americium, and Uranium as Influenced by Chemical Form
PROJECT NUMBER: J-627-A-80
PRINCIPAL INVESTIGATOR: Barth, J.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Potter, G.D.
TELEPHONE: C(702) 736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: METALS/Heavy (30%);RADIATION (40%);SPECIFIED OTHER POLLUTANTS/Toxics (30%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To study and compare the solubility of transuranium radionuclides in an artificial bovine ruminal-gastrointestinal system, in order to predict the biological availability of various forms of these nuclides in vivo.
APPROACH: A viable rumen juice preparation is augmented with a radioactive tracer and incubated for 24 hours under physiological conditions. This preparation is converted to simulate abomasal and intestinal fluids by the addition of enzymes, bile, and adjustments of the pH. The solubility of plutonium-238, -239, and americium-241 from rumen contents of cattle grazing on plutonium contaminated desert vegetation is determined in in vitro bovine gastrointestinal fluids.
RESULTS: Studies have been completed using purified plutonium-238 nitrate, plutonium-238 citrate, plutonium-238 dioxide, and americium-241 nitrate. A study of the in vitro solubility of plutonium-238, -239, and americium-241 nitrate from rumen contents of cattle grazing on plutonium contaminated desert vegetation at the Nevada Test Site is in progress. Future plans include a study to compare the solubility of plutonium-238 incorporated into biological materials by microorganisms with inorganic plutonium and a study to compare the solubility of plutonium-238 and plutonium-239 particulates.
PROJECT MILESTONES: (1) 02/76 Interim Report on Field Ingested Transuranics. (2) 10/76 Report Relating Purified Forms of Transuranics with Field Ingested Transuranics. (3) 06/77 Complete Laboratory Work on Solubility of Am-241. (4) 12/78 Complete Area 13, NTS Field Study. (5) 06/78 Report on Solubility of Am-241. (6) 12/77 Compare Solubility of Pu-238 and Pu-239. (7) 12/77 Effect of Soil Microflora on Solubility of Transuranics. (8) Compare Biological and Nonbiological Plutonium.
KEYWORDS: PLUTONIUM 238;AMERICIUM 241;TRANSURANIUM ELEMENTS;BIOADSORBENTS;NUCLEAR INDUSTRY;PLUTONIUM 239;METABOLISM;CATTLE;BIOLOGICAL MODELS;AIR POLLUTION;LAND POLLUTION;COMPARATIVE EVALUATIONS;RADIONUCLIDE KINETICS;RADIONUCLIDE MIGRATION;TOXICITY;TISSUES;IN VITRO

<072345>
TITLE: Influence of Microbial Activity on the Solubility and Availability of Plutonium
PROJECT NUMBER: J-1627-A-81
PRINCIPAL INVESTIGATOR: Au, F.H.F.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITOR: Stanley, R.E.
TELEPHONE: F595-2969 ext. 265
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$68,400
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (70%);WASTE MANAGEMENT (30%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale (60%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to determine the influence of microbial activity on the solubility and biological availability of plutonium and americium.
APPROACH: Agricultural crops have been planted in ''undisturbed'' plutonium contaminated soil at the Nevada Test Site using portable greenhouses. Plants will also be grown in sterile/nonsterile soils in growth chambers. Solubility of plutonium as effected by sterile/nonsterile soil and various soil extractants will be determined. The influence of microbial activity as exemplified by successive microbial generations on plutonium solubility will be determined.
RESULTS: The portable greenhouse project has been completed and two year's of data collected. The sterile versus nonsterile soil extract study is underway as is the influence of successive microbial generations. Preliminary work has begun on plants growing in sterile/nonsterile conditions.
PROJECT MILESTONES: (1) 06/74 The role of microorganisms in the movement of plutonium-NVO-142. (2) 06/75 The influence of selected variables on the transport of plutonium to the spores of aspergillus niger. NVO-153.

(3) 06/76 Plutonium uptake by a soil microorganism, aspergillus niger. NERC-LV 539-3. (4) 06/76 Possible influence of desert soil microbial changes on plutonium transport. NVO-159. (5) 06/77 Incorporation of transuranics into vegetables and field crops grown at the Nevada Test Site. NAEG plutonium conference. (6) 07/78 Plutonium uptake in plants in sterile/nonsterile soils. (7) 09/79 Influence of selected variables on plutonium uptake in plants.
KEYWORDS: MICROORGANISMS;PLUTONIUM;BIOLOGICAL ACCUMULATION;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;SOILS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL MODELS;PLANTS;GREENHOUSES;NUCLEAR WEAPONS;ENVIRONMENTAL IMPACTS

<072346>
TITLE: Absorption, Distribution, and Excretion of Actinide Elements by Dairy Cattle
PROJECT NUMBER: J-1627-A-82
PRINCIPAL INVESTIGATOR: Potter, G.D.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Potter, G.D.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: NUCLEAR/General (70%);CONSERVATION/General (30%)
ENERGY CYCLE: PROCESSING, CONVERSION (60%);WASTE MANAGEMENT (40%)
POLLUTANTS: METALS/Heavy (40%);RADIATION (60%)
CHARACTER OF STUDY: RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale (60%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The purpose of this research is to provide input data for hazard assessment of areas contaminated by plutonium, uranium, and americium originating from nuclear testing activities, nuclear power plants, nuclear fuel reprocessing/fabrication facilities, and uranium extraction/fabrication activities. Since man consumes large quantities of dairy products and beef, evaluation of radiological hazards associated with actinide releases must include transport to man via the food chain from cattle which could ingest large quantities of these actinides.
APPROACH: Dairy cows and goats are maintained in metabolism stalls and actinide elements are administered by oral or intravenous routes. Blood, milk, urine, and fecal actinide concentrations are determined daily until the animals are sacrificed for determination of tissue nuclide burdens. The actinides administered are in specific chemical/physical forms which include the forms found in the environment.
RESULTS: Studies to compare the biological transport of Pu-238 and Pu-239 will be conducted soon. The report on this study will complement a series of reports on previous Pu-238 studies in dairy animals. Initial studies with Am-241 have been conducted and published; further studies are being conducted and a summary report on Am-241 is planned for FY-81. Uranium studies will begin in FY 78, and a comprehensive summary report is planned for FY 83.
PROJECT MILESTONES: (1) 09/71 Transfer of Intravenously Injected Plutonium to Milk of Goats. (2) 10/74 Absorption, Distribution and Excretion of Plutonium by Dairy Cattle. (3) 06/75 Metabolism of Plutonium by Dairy Cattle. (4) 01/76 Plutonium Uptake from a Contaminated Range. (5) 06/76 Plutonium Transport in Chickens and to Eggs. (6) 06/76 Review: Plutonium in Biological Systems. (7) 06/76 Passage of Particles Through the Gastrointestinal Tract of Dairy Cows. (8) 06/76 Plutonium Transfer of Animals Ingesting In Vivo Labeled Goat's Milk. (9) 11/76 Plutonium Transport Via Food Products of Animal Origin. (10) 02/77 Uptake and Retention of Plutonium from In Vivo and In Vitro Labeled Cow's Milk. (11) 10/78 Comparison of Pu-238 and Pu-239 Metabolism in Cows. (12) 02/78 Americium Metabolism in Dairy Cows. (13) 10/78 Americium Metabclism in Goats. (14) 05/79 Uptake and Retention of Americium from In Vivo and In Vitro Labeled Cow's Milk. (15) 02/80 Summary Report on Americium.
KEYWORDS: CATTLE;METABOLISM;RADIOACTIVITY;BIOLOGICAL ACCUMULATION;ACTINIDES;PLUTONIUM;URANIUM;AMERICIUM;NUCLEAR INDUSTRY;MILK PRODUCTS;FOOD CHAINS;MEAT;RADIOACTIVE EFFLUENTS;BIOLOGICAL RADIATION EFFECTS;RADIONUCLIDE KINETICS;RADIONUCLIDE MIGRATION;IN VITRO;IN VIVO;RADIOACTIVE WASTES;METALS

<072347>
TITLE: Grazing Studies on Actinide Contaminated Ranges of the Nevada Test Site
PROJECT NUMBER: J-1627-A-83
PRINCIPAL INVESTIGATOR: Smith, D.D.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Smith, Donald D.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$90,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (70%);WASTE MANAGEMENT (30%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to provide an assessment of the impact of radionuclide releases on an ecosystem from data collected from tissue and ingesta of animals grazing on a contaminated range.
APPROACH: Grazing ruminants (cattle) will live and graze on an area of known radionuclide contamination for extended periods of time. Periodically animals will be sacrificed and samples collected for analysis for radioactivity. Rumen-fistulated steers serve as biological samplers for the determination of animal preference for vegetation as a function of availability and season for correlation with tissue

radioactivity data.
RESULTS: Analysis of samples from studies carried out on cattle at known plutonium-contaminated range on the Nevada Test Site has been completed and a final report is being written. The study area on the site for the Nevada Applied Ecology Group studies of other radionuclides of interest has been selected and is being prepared to start grazing studies in the study area during FY 78.
PROJECT MILESTONES: (1) 06/74 Grazing Studies on Selected Plutonium-Contaminated Areas in Nevada. (2) 02/75 Actinide Concentrations in Tissues from Cattle Grazing near the RF Plant. (3) 06/75 Grazing Studies on Selected Plutonium-Contaminated Areas in Nevada. (4) 11/75 Grazing Studies on a Plutonium-Contaminated Range of the Nevada Test Site. (5) 03/76 Status Report on Grazing Studies on a Plutonium-Contaminated Range of the Nevada Test Site. (6) Fall 77 Grazing Studies on a Contaminated Range of the Nevada Test Site. (7) Fall 77 Review of Grazing Studies on Plutonium-Contaminated Rangelands. (8) Winter 77 Actinide Concentrations in Tissues from Cattle Grazing a Contaminated Range.
KEYWORDS: NEVADA TEST SITE;RADIOACTIVE EFFLUENTS;CATTLE;FOOD CHAINS;ENVIRONMENTAL EXPOSURE PATHWAY;BIOLOGICAL INDICATORS;RADIOECOLOGY;PLUTONIUM;METABOLISM;PLANTS;TISSUES;TERRESTRIAL ECOSYSTEMS;BIOMASS;ACTINIDES;RADIOACTIVITY;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS

<072348>
TITLE: Biological Transport of Cm and Np in Ruminants
PROJECT NUMBER: J-1627-B-85
PRINCIPAL INVESTIGATOR: Potter, G.D.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Potter, Gilbert D.
TELEPHONE: C(702)736-2969
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (50%);RADIATION (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: These investigations quantitate curium and neptunium transport in commerically significant ruminant species, e.g., dairy goats and cattle which are directly in the human food chain. Since man consumes large quantities of dairy products, any evaluation of radiological hazards associated with an actinide-contaminated countryside should consider transport to milk. On-going studies determine the amount of ingested activity transferred to milk and establish what portion of the activity is retained in various tissues following initial absorption. Additional objectives include (1) quantitating the in vitro solubility of these nuclides in artificial rumen fluids and (2) establishing the biological availability of curium and neptunium once they have been incorporated into an edible animal product.
APPROACH: Dairy goats and cows are maintained at the Nevada Test Site Farm in metabolism stalls to facilitate the collection of blood, milk, urine and feces after the animals have been orally or intravenously dosed with either curium or neptunium. Modified stalls are also used to maintain one week old calves that receive actinide labeled milk obtained from previously dosed lactating adults. Tissue nuclide concentrations are determined for adults and juveniles following subsequent slaughters. Artificial rumen procedures, involving pH and enzymatic alterations, have been perfected for the in vitro nuclide solubility work which is conducted at the Las Vegas Laboratory.
RESULTS: Studies have been conducted with curium and neptunium using dairy goats. Reports have been presented on these topics. One project has also been conducted with curium using dairy cows and another similar study is currently scheduled. Additional studies scheduled this year include neptunium transport in diary cows and the biological availability of curium from in vivo labeled milk. The in vitro solubility of neptunium, using artificial rumen procedures, has been determined and reported. Similar in vitro solubility studies using curium are scheduled for completion this year.
PROJECT MILESTONES: (1) 04/76 Report on Transport of Curium in Dairy Goats. (2) 03/77 Comparison of Curium and Plutonium Transport in Dairy Animals. (3) 03/77 Report on Transport of Neptunium in Dairy Goats. (4) 3/77 Report on In Vitro Solubility of Np Using Artificial Rumen. (5) 06/78 Neptunium Transport in Dairy Cows. (6) 10/77 Curium Transport in Dairy Cows. (7) 06/79 In Vitro Solubility on Cm Using Artificial Rumen. (8) 10/79 Availability of Curium from In Vivo Labeled Milk. (9) 10/80 Availability of Neptunium from In Vivo Labeled Milk.
KEYWORDS: CURIUM;NEPTUNIUM;RADIONUCLIDE KINETICS;GOATS;CATTLE;FOOD CHAINS;METABOLISM;NEVADA TEST SITE;MILK;PLUTONIUM;ENVIRONMENTAL EXPOSURE PATHWAY;BIOLOGICAL MODELS;TERRESTRIAL ECOSYSTEMS;TOXICITY;RADIONUCLIDE MIGRATION;MILK PRODUCTS

<072349>
TITLE: Exposure/Dose Models Applied to Environmental Carcinogens
PROJECT NUMBER: J601F-01
PRINCIPAL INVESTIGATOR: Friedlander, S.
AFFILIATION: California Inst. of Tech., Pasadena (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Schuck, E.A.
77 FUNDING: Environmental Protection Agency FY77:$42,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To report on a survey of the literature on exposure/dose models relating carcinogens in the environment and human exposure to them and to include a workable copy of each model which proves to have a high applicability to environmental carcinogen transport and impact.
APPROACH: Conduct a comprehensive search of the existing literature for development and application of mathematical simulation models describing the sources, environmental pathways, and exposure/dose relationships of environmental carcinogens and review these documents and evaluate the applicability of these models to selected environmental carcinogens or groups of carcinogens. Test the applicability of one or more of the models, identify the gaps in knowledge and re-scan the literature for additional data as

required.
RESULTS: A literature review has been initiated and will be submitted for evaluation by the Project Officer.
PROJECT MILESTONES: 03/78-Literature review on applicable exposure/dose models and critique
KEYWORDS: CARCINOGENS;ENVIRONMENTAL TRANSPORT;BIOLOGICAL EFFECTS;HUMAN POPULATIONS;DOSE-RESPONSE RELATIONSHIPS;MATHEMATICAL MODELS;WATER POLLUTION;AIR POLLUTION;MAN;CARCINOGENESIS;DATA COMPILATION

<072350>
TITLE: Biosynthesis of N-Nitroso Compounds from Trace Level Precursors
PROJECT NUMBER: J601F-05
PRINCIPAL INVESTIGATOR: Epstein, S.S.;Iqbal, Z.M.
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Morgan, G.B.
77 FUNDING: Environmental Protection Agency FY77:$36,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To study the in vivo biosynthesis of N-nitroso compounds from trace level precursors under conditions reflecting environmental exposure.
APPROACH: These studies are based on the quantitative identification of the biosynthesized N-nitroso compounds using the thermal energy analyzer techniques which are sensitive to ppt. levels. Included are time- and dose-dependence of dimethyl nitrosamine following administration of nitrite and dimethylamine and Ziram, respectively, and biosynthesis of di-n-propylnitrosamine, N-nitrosocarbaryl and N-nitrosoatrazine following gavage with nitrite and Treflan, carbaryl and atrazine respectively. Studies also included to investigate biosynthesis following inhalation exposure of mice to NO/sub X/ and gaseous amines; modifying effects of catalysts and inhibitors on kinetics of biosynthesis.
RESULTS: Annual progress reports on kinetics of biosynthesis.
PROJECT MILESTONES: 09/78-Report on analytical method for detection of nitrosamines; 09/79-Report on biosynthesis of dimethyl nitrosamine in the mouse; 12/79-Report on a strategy for carcinogen precursor exposure monitoring.
KEYWORDS: MICE;NITROSO COMPOUNDS;BIOSYNTHESIS;BIOCHEMICAL REACTION KINETICS;METABOLISM;INGESTION;INHALATION;PRECURSOR;AMINES;NITROGEN COMPOUNDS;CARCINOGENS

<072351>
TITLE: Determine Chemical Forms and Transport Phenomena in Soil for Mercury
PROJECT NUMBER: J602C-06
PRINCIPAL INVESTIGATOR: Rogers, R.D.;Wiersma, G.B.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Wiersma, G.B.
77 FUNDING: Environmental Protection Agency FY77:$13,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To determine the factors that influence mercury movement in three soil types.
APPROACH: Three soil types were studied, a sand, loam, and clay. The soils were amended with mercuric nitrate and resultant production of different mercury compounds was monitored. Factors that were considered were soil texture, temperature, pH, organic matter content, time, and microbiological activity. Analyses were conducted by gas chromatography and Isotope Zeeman Atomic Absorption Spectrophotometry.
RESULTS: Mercury was transformed from the inorganic form to an organic form. This transformation was found to be an abiological phenomena. The methylating factor was isolated to organic acid fraction of the soil.
PROJECT MILESTONES: 12/76-Methylation of mercury in agricultural soils; 01/77-Abiological methylation of mercury in soil.
KEYWORDS: MERCURY;ENVIRONMENTAL TRANSPORT;SOILS;CHEMICAL COMPOSITION;ORGANIC MERCURY COMPOUNDS;MERCURY COMPOUNDS;SOIL CHEMISTRY;CHEMICAL REACTIONS

<072352>
TITLE: Phytoplankton Identification and Enumeration
PROJECT NUMBER: J613B-14
PRINCIPAL INVESTIGATOR: Deacon, J.;Lambou, V.W.;Taylor, W.D.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.; Nevada Univ., Reno (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lambou, V.W.
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this project is to continue and complete the quantitative and qualitative analysis of NES phytoplankton samples for the 1973, 1974, and 1975 sampling years. The data is for use in individual NES lake reports and state phytoplankton distribution reports.
APPROACH: Composite samples collected and preserved by the NES field team were shipped to EMSL-Las Vegas where microscopic examination and enumeration at the species level is performed. All results are maintained in a computer file with easy access for report requirements.
RESULTS: Outputs under this task include: phytoplankton summaries for incorporation into about 580 individual lake reports.
PROJECT MILESTONES: 09/77-Completion of analysis of all samples and entry into computer data.
KEYWORDS: AQUATIC ECOSYSTEMS;LAKES;PHYTOPLANKTON;GENETIC VARIABILITY;BIOMASS;POPULATION DYNAMICS;SAMPLING;ANNUAL VARIATIONS

<072353>
TITLE: Oxidant Monitoring Network Design in Tampa/St. Petersburg
PROJECT NUMBER: J606B-12
PRINCIPAL INVESTIGATOR: Behar, J.V.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Schuck, E.A.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To verify an optimum network design methodology in cooperation with the EPA Region IV Office in a field test around Tampa/St. Petersburg, Florida. To optimize the design of the network for airshed monitoring of the reactive pollutants: oxides of nitrogen, ozone, and hydrocarbons.
APPROACH: The development of the methodology for optimizing the design of ambient air quality networks requires a field sampling program for collecting air quality data and meteorological data, and the application of these data to an urban airshed simulation model for predicting pollutant concentrations under various meteorological conditions. Optimum sampling locations will be determined by mathematical analysis of several sets of pollution concentrates patterns from meteorological simulation for the more commonly occurring weather regimes. The geographical position of the point or points of maximum concentration will be determined and plotted on a map.
RESULTS: Report on preliminary hydrocarbon sampling in Tampa/St. Petersburg (11/76); completion of initial field data collection for pollutant distribution and windfield characterization (9/77); anthropogenic emissions inventory for Tampa/St. Petersburg (2/78); completion of intensive field data collection for oxidant modeling (9/78); application of network design methodology for oxidants in Tampa/St. Petersburg (1/79).
PROJECT MILESTONES: 11/76-Report on preliminary hydrocarbon sampling in Tampa/St. Petersburg; 09/77-Completion of initial field data collection for pollutant distribution; 02/76-Anthropogenic emissions inventory for Tampa/St. Petersburg; 09/78-Completion of intensive field data collection for oxidant model; 01/79-Application of network design methodology for oxidants in Tampa/St. Petersburg.
KEYWORDS: FLORIDA;AIR QUALITY;REGIONAL ANALYSIS;URBAN AREAS;MATHEMATICAL MODELS;METEOROLOGY;AIR POLLUTION;NITROGEN OXIDES;OZONE;POLYCYCLIC AROMATIC HYDROCARBONS;MONITORING

<072354>
TITLE: Provide Quality Control and Quality Control Procedures for Overhead Remote Sensing Techniques Used in Agency Monitoring Programs (Abbrev)
PROJECT NUMBER: J621A-59
PRINCIPAL INVESTIGATOR: Eckert, J.A.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Eckert, J.A.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: Produce guideline documents on selected airborne Remote Sensing Techniques.
APPROACH: Guideline documents, describing the capabilities of the instrumentation and techniques utilized in the remote monitoring of atmospheric particulates, ozone, and water quality, will be prepared. Data from remote monitoring instrumentation (LIDAR, laser differential absorption, and laser fluorosensors) will be compared with data obtained from in situ measurements. This comparison will serve as the basis both for generation of guideline documents and for the introduction of selected remote monitoring methods. In addition to the comparison of data, the guidelines will describe the capabilities of each type of instrument, calibration techniques and frequency of calibration, and the quality control procedures required to insure the precision, accuracy, and defensibility of the data.
RESULTS: Document on Airborne LIDAR is in preparation but awaiting suitable test to obtain comparison in situ data. Earth reflected differential absorption system is being redesigned after preliminary testing. Document will be prepared after suitable instrument test.
PROJECT MILESTONES: 07/78-Guideline document on earth--reflected ozone monitor; 08/78-Guideline document on laser fluorosensors for measuring water quality; 08/79-Guideline document on earth--reflected SO2 monitor.
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;REMOTE SENSING;PARTICLES;OZONE;WATER QUALITY;LASERS

<072355>
TITLE: Off-Site Radiological Safety Program for Nuclear Weapons Testing
PROJECT NUMBER: J627D-76
PRINCIPAL INVESTIGATOR: Costa, C.P.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Costa, C.P.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$1,297,000
TECHNOLOGY: NUCLEAR/General (100%)
PROJECT DESCRIPTION: The program is conducted to document environmental radiological levels around areas of nuclear weapons testing in the United States and to provide public protection during the conduct of such tests.
APPROACH: Continuous monitoring of the environment is provided through operation of networks to monitor radiation levels in air, water, and milk and to measure external, whole-body exposures to ionizing radiation. Special projects are conducted to measure radioactivity levels and/or distributions of special radionuclides of interest in other media, such as vegetation and soil. Mobile and aerial monitoring teams are fielded during testing periods to document any inadvertent releases of radioactivity and to take appropriate protective actions.
RESULTS: Quarterly data summaries of results of environmental monitoring and an annual environmental

monitoring report are produced, plus special reports for any projects conducted.
PROJECT MILESTONES: 06/79-Final report on distribution of plutonium in soil around NTS; 05/00-Environmental monitoring report.
KEYWORDS: NEVADA TEST SITE;RADIATION MONITORING;ENVIRONMENT;RADIOACTIVITY;SURFACE AIR;SURFACE WATERS;PLANTS;MILK;FOOD CHAINS;SAMPLING;MAN;EXTERNAL IRRADIATION;WHOLE-BODY IRRADIATION;RADIATION DOSES

<072356>
TITLE: Off-Site Radiological Safety Program for Plowshare
PROJECT NUMBER: J627E-77
PRINCIPAL INVESTIGATOR: Costa, C.F.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Costa, C.F.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: NUCLEAR/General (100%)
PROJECT DESCRIPTION: This program is conducted to document the radioactivity concentrations in ground water around sites of underground nuclear explosive detonations conducted as part of Plowshare (peaceful uses of nuclear explosives), to monitor for any movement of radioactivity from those sources.
APPROACH: Annual samples of ground water are collected from available wells in the vicinity of the Plowshare sites, with special emphasis placed on those that are down the hydraulic gradient from the detonation point.
RESULTS: Data are published in an annual environmental monitoring report.
PROJECT MILESTONES: 05/00-Environmental monitoring report.
KEYWORDS: PLOWSHARE PROJECT;NUCLEAR EXPLOSIONS;CONTAINED EXPLOSIONS;UNDERGROUND EXPLOSIONS;RADIATION MONITORING;GROUND WATER;RADIOACTIVITY;HYDROLOGY;ENVIRONMENT

<072357>
TITLE: Provision of Standards, Reference Materials, and Quality Control Procedures Needed to Enforce Existing EPA Standards
PROJECT NUMBER: J621A-58
PRINCIPAL INVESTIGATOR: Jarvis, A.N.;Easterly, D.G.;Whittaker, E.L.;Beckert, W.F.;Body, A.L.;Grothaus, G.E.;Kinnison, R.R.;Shawver, J.M.;Siu, L.;Thompson, L.E.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Jarvis, A.N.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: The objective is to provide the standards, reference materials, methods, and quality control procedures required to enforce existing EPA standards and regulations.
APPROACH: Intensive testing of methods within the EMSL-LV will be conducted and the resultant data evaluated. The method(s) and instructions for instituting and maintaining adequate quality control program will be developed and published. Existing laboratory performance (interlaboratory comparison) studies will be conducted on a regular basis and new studies implemented as required. Reference materials required for instrument calibration and chemical yield determination will be developed and distributed on a continuing basis. To assure the continued high quality of these materials, periodic intercomparison studies will be conducted with the NBS.
RESULTS: An ongoing laboratory intercomparison studies program involving environmental media and a variety of radionuclides was conducted. Methods testing has continued. Standards and reference materials are being supplied to laboratories involved in environmental radiation measurements upon request.
PROJECT MILESTONES: 00/00-Collaborative testing of tentative reference methods; 00/00-Traceability studies with NBS; 00/00-Maintenance of inventory of calibrated samples; 00/00-Laboratory intercomparison studies; 10/76-Establishment of traceability to national measurement system of Quality Control; 06/77-Publish document on the procurement, preparation, and use of calibration.
KEYWORDS: US EPA;ENVIRONMENT;SAMPLING;QUALITY CONTROL;AIR POLLUTION MONITORS;WATER POLLUTION MONITORS;CALIBRATION;STANDARDIZATION;SURFACE AIR;SURFACE WATERS;RADIOACTIVITY;RADIATION MONITORING;RADIONUCLIDE MIGRATION;CHEMICAL COMPOSITION;MONITORING;CHEMICAL EFFLUENTS;RADIOACTIVE EFFLUENTS;ENVIRONMENTAL TRANSPORT

<072358>
TITLE: Provision of Standards, Reference Materials, and Quality Control Procedures Needed to Enforce Planned EPA Standards
PROJECT NUMBER: J621A-57
PRINCIPAL INVESTIGATOR: Jarvis, A.N.;Easterly, D.G.;Whittaker, E.L.;Beckert, W.F.;Body, A.L.;Grothaus, G.E.;Kinnison, R.R.;Shawver, J.M.;Siu, L.;Thompson, L.E.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Jarvis, A.N.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$160,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: The objective is to provide the standards, reference materials, methods, and quality control procedures needed to enforce standards and regulations currently being planned for adoption by EPA and those nonregulated pollutants warranting concern by EPA.
APPROACH: Intensive testing of methods within the EMSL-LV will be conducted and the resultant data evaluated. The method(s) and instructions for instituting and maintaining adequate quality control programs will be developed and published. Existing laboratory performance (interlaboratory comparison) studies will be conducted on a regular basis and new studies implemented as required. Reference materials required for

instrument calibration and chemical yield determination will be developed and distributed on a continuing basis. To assure the continued high quality of these materials, periodic intercomparison studies will be conducted with the NBS.
SULTS: An ongoing laboratory intercomparison studies program involving environmental media and a variety of radionuclides was conducted. Methods testing has continued. Standards and reference materials are being supplied to laboratories involved in environmental radiation measurements upon request.
PROJECT MILESTONES: 00/00-Collaborative testing of tentative reference methods; 00/00-Traceability studies with NBS; 00/00-Maintenance of inventory of calibrated samples; 00/00-Laboratory intercomparison studies; 02/77-Review of literature on uptake, metabolism, and incorporation; 03/77-Establish and maintain SRM inventory, begin distribution of samples; 07/77-Review of literature on uptake, metabolism and incorporation.
KEYWORDS: US EPA;ENVIRONMENT;SAMPLING;QUALITY CONTROL;AIR POLLUTION MONITORS;WATER POLLUTION MONITORS;CALIBRATION;STANDARDIZATION;SURFACE AIR;SURFACE WATERS;RADIOACTIVITY;RADIATION MONITORING;RADIONUCLIDE MIGRATION;CHEMICAL COMPOSITION;MONITORING;CHEMICAL EFFLUENTS;RADIOACTIVE EFFLUENTS;ENVIRONMENTAL TRANSPORT

<072359>
TITLE: Optimization of Aerial Infrared Survey Techniques
PROJECT NUMBER: J620A-40
PRINCIPAL INVESTIGATOR: Dockter, M.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Dockter, M.
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Continued efforts for improvement to aerial infrared scanner survey techniques simultaneously with data collection.
APPROACH: Modification of existing thermal infrared scanner systems to improve quantities, data and reference data equipments.
RESULTS: (1) Modification of RS-310 scanner to include blackbody temperature references and analysis electronics (completion 3/77); (2) develop program to improve efficiency of isothermal plotting techniques and accuracy capabilities (completion 6/77); and (3) incorporate DS-1260 Multispectral Scanner Operating System (completion 12/77).
PROJECT MILESTONES: (1) 03/77 Modify RS-310 Infrared Scanner. (2) 06/77 Improve Isothermal plotting efficiency. (3) 12/77 Incorporate DS-1260 Multispectral Scanner Operating System.
KEYWORDS: INFRARED THERMOGRAPHY;AERIAL SURVEYING;OPTIMIZATION;MEASURING INSTRUMENTS;GEOLOGICAL SURVEYS

<072360>
TITLE: Application of Aerial Multispectral Techniques for Quantitative Determination of Turbidity
PROJECT NUMBER: J620A-43
PRINCIPAL INVESTIGATOR: Dockter, M.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Dockter, M.
77 FUNDING: Environmental Protection Agency FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Determine the feasibility of using aerial multispectral techniques for remote sensing of sediment in water.
APPROACH: (1) Simultaneously collect ground truth data and multispectral data from an airborne platform at various altitudes and several data sites to allow studies for atmospheric attenuation correction and site-to-site algorithm transferability; and (2) perform analysis and compile a report of results obtained using data collected above and compare to EPA standard laboratory testing methods.
RESULTS: (1) Collect ground truth and multispectral data (completion, 9/77); and (2) perform analysis and compile report (expected completion, 12/77).
PROJECT MILESTONES: (1) 06/76 Surface data collection and analysis (completed). (2) 09/76 Compile report. (3) 09/77 Collect airborne data. (4) 12/77 Compile report. (5) 12/78 Collect data utilizing DS-1260 multispectral scanner.
KEYWORDS: SURFACE WATERS;SEDIMENTS;ENVIRONMENTAL TRANSPORT;DEPOSITION;TURBIDITY;AERIAL MONITORING;REMOTE SENSING;ALGORITHMS

<072361>
TITLE: Deterministic Wind Field Submodel for Use in Phoenix, AZ, and Application of a Sea Breeze Wind Field Model to Tampa and St. Petersburg
PROJECT NUMBER: J620A-46
PRINCIPAL INVESTIGATOR: Liu, M.
AFFILIATION: Systems Applications, Inc., San Rafael, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Schuck, E.A.
77 FUNDING: Environmental Protection Agency FY77:$22,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: (1) To use a dynamic model, developed by Systems Applications, Inc., to simulate the land and sea breeze in the Tampa/St. Petersburg area. The model is based on the finite difference solution of the primitive equations with the hydrostatic assumption; and (2) to use a diagnostic-type of wind model (develcped by Systems Applications, Inc.) based upon the equation for conservation of mass to provide the wind input to airshed model for the Phoenix application.
APPROACH: (1) Re-examine the model formulation and numerical techniques to include up-to-date information; modify the treatment of subgrid-scale processes to include recent results for the characterization of the surface boundary layer; prepare a data base for the Tampa and St. Petersburg application, and exercise the model for no fewer than 3 test days; and to the airshed model; and (2) re-examine the model formulation to investigate the feasibility of an improved treatment for wind values for the empirical coefficients in the model; prepare a data base for the Phoenix area, and exercise the model for no fewer than 10 cases; adapt the wind model so that it is compatible with the input to the airshed model.

RESULTS: The Phoenix windfield model and the Tampa/St. Petersburg seabreeze model have been formulated and coded for computer solution. These are currently being prepared for testing against field data.
PROJECT MILESTONES: (1) 09/77 Phoenix wind field model. (2) 12/77 Tampa/St. Petersburg seabreeze model.
KEYWORDS: METEOROLOGY;SURFACE AIR;BOUNDARY LAYERS;WIND;VELOCITY;TURBULENCE;MATHEMATICAL MODELS;ARIZONA;FLORIDA;EARTH CRUST;SEAS;VARIATIONS;AERODYNAMICS

<072362>
TITLE: Optimum Air Pollution Sampling Network Selection in Urban Areas--Test and Evaluation
PROJECT NUMBER: J620A-48
PRINCIPAL INVESTIGATOR: Vukovich, F.M.
AFFILIATION: Research Triangle Inst., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: McElroy, J.L.
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Develop and field test a method for the design of optimum ambient air monitoring networks.
APPROACH: Evaluate a statistical-dynamical method for optimization in the design of air quality monitoring networks which incorporates station designation using the statistical aspects of the wind field determined with a dynamic meteorological model. An objective variational analysis model based on the wind field, information on atmospheric stability, pollutant observations at the network stations, and the pollutant source inventory is then used to specify the pollutant distribution.
RESULTS: Select optimum meteorological and air pollution sampling network in urban areas (2/77); evaluate optimum siting with respect to air flow (3/78); evaluate optimum siting with respect to air quality (6/79).
PROJECT MILESTONES: (1) 02/77 Optimum meteorological and air pollution sampling network selection. (2) 03/78 Evaluation of optimum siting with respect to air flow. (3) 06/79 Evaluation of optimum siting with respect to air quality.
KEYWORDS: AIR POLLUTION;URBAN AREAS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;SURFACE AIR;AERODYNAMICS;WIND;TURBULENCE;VELOCITY;MATHEMATICAL MODELS;METEOROLOGY;MONITORING

<072363>
TITLE: Design of Integrated Monitoring Systems That Are Pollutant Oriented
PROJECT NUMBER: J620A-50
PRINCIPAL INVESTIGATOR: Wiersma, G.B.;Potter, G.D.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Schuck, E.A.
77 FUNDING: Environmental Protection Agency FY77:$93,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Develop a monitoring system based on identification of critical pathways and assessment of exposure/dose to link the critical receptor with identified sources.
APPROACH: Small animal studies will be carried out to define intestinal absorption rate and relationship of blood lead levels to hair levels. Transformation studies on lead in soil will be carried out to determine possible changes occurring to lead in soil systems that will make it more mobile in biological systems. Similar studies will be carried out on lead and plants. Developmental work is also underway on arsenic and cadmium.
PROJECT MILESTONES: (1) 09/77 Annual report--trace element transformation in soil. (2) 09/77 Annual report--trace element transformation in plants. (3) 11/77 Lead absorption in mammals. (3) 09/78 Annual report on organic pollutant in animals, soils, etc.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;LAND POLLUTION;LEAD;ENVIRONMENTAL TRANSPORT;WILD ANIMALS;FOOD CHAINS;UPTAKE;TISSUE DISTRIBUTION;BLOOD;HAIR;SAMPLING;SOIL CHEMISTRY;METABOLISM

<072364>
TITLE: Laboratory Performance and Intercomparison Studies
PROJECT NUMBER: J621A-55
PRINCIPAL INVESTIGATOR: Jarvis, A.N.;Easterly, D.G.;Whittaker, E.L.;Beckert, W.F.;Body, A.L.;Grothaus, G.E.;Kinnison, R.R.;Shawver, J.M.;Siu, L.;Thompson, L.E.;Ziegler, L.H.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Jarvis, A.N.
77 FUNDING: Environmental Protection Agency FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The objective is to conduct laboratory performance and intercomparison studies, round-robin studies, operational reviews, audits and evaluation of quality control practices in EPA monitoring activities.
APPROACH: A nationwide, interlaboratory comparison, quality assurance program is being conducted to determine the precision, accuracy and comparability of environmental data produced by Federal, State, local and private laboratories. The data quality is being assessed and the analytical performance of participating laboratories is being determined on a nationwide basis through the preparation and distribution of standard samples, the statistical evaluation of resultant data, and the publication of formal reports.
RESULTS: An ongoing laboratory intercomparison studies program was continued. A round-robin study involving the measurement of aqueous solutions of plutonium-239 was conducted. Assessment of the precision and accuracy of radioactive measurements is being made and computerized reports sent to the participants at monthly and/or quarterly intervals.
PROJECT MILESTONES: (1) Ongoing laboratory intercomparison studies program involving environment. (2) An assessment of the precision and accuracy of radioactivity measurements. (3) 10/76 Milk (report). (4) 03/77 Water (report).
KEYWORDS: US EPA;ENVIRONMENT;MONITORING;RADIATION MONITORING;CHEMICAL EFFLUENTS;RADIOACTIVE EFFLUENTS;ENVIRONMENTAL TRANSPORT;SAMPLING;CALIBRATION;STANDARDIZATION;SURFACE AIR;SURFACE WATERS;CHEMICAL COMPOSITION;RADIOACTIVITY;CHEMICAL ANALYSIS

<072365>
TITLE: Assessment of Monitoring Technology for Hazardous Material Spills
PROJECT NUMBER: J620A-35
PRINCIPAL INVESTIGATOR: Thomas, R.W.;Lambou, V.W.
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA). Environmental Monitoring and Support Lab.; Lockheed Electronics Co., Inc., Houston, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Las Vegas, Nev. (USA)
DIVISION: Environmental Monitoring and Support Laboratory
MONITOR: Lambou, V.W.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Assess the present state-of-the-art of monitoring technology for hazardous materials spills.
APPROACH: Define those hazardous chemicals of greatest concern. Evaluate the ability to identify an unknown hazardous material. Evaluate analytical equipment and techniques for monitoring hazardous materials in natural water systems.
RESULTS: (1) A procedures manual for use by respondees to a spill of an unknown hazardous material; and (2) an assessment of monitoring technology for hazardous material spills.
PROJECT MILESTONES: (1) 12/77 Report publication's manual for identification of unknown hazardous materials. (2) 12/77 Report publication's assessment of state-of-the-art of monitoring technology.
KEYWORDS: HAZARDOUS MATERIALS;CHEMICAL EFFLUENTS;ACCIDENTS;LAND POLLUTION;MONITORING;CHEMICAL ANALYSIS;SURFACE WATERS;WATER POLLUTION;DECONTAMINATION;CLEANING;ENVIRONMENTAL TRANSPORT

<072501>
TITLE: Referee Techniques for Multielement Analysis
PROJECT NUMBER: K-713-B-101
PRINCIPAL INVESTIGATOR: Taylor, C.E.
ADDRESS: College Station Road, Athens, GA 30605
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
DIVISION: Athens Environmental Research Laboratory
MONITOR: Taylor, C.E.
TELEPHONE: F205-3525
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$9,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO;NOXIOUS GAS/CO (40%);METALS/Heavy metals (30%);ORGANICS/Nonmetallic inorganics (30%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Instrumental neutron activation analysis and spark source mass spectrometry will be established as referee techniques for the multielemental analysis of environmental samples.
APPROACH: The methods will be intercompared through the analysis of NBS standard reference materials and an extensive series of water and plant tissue samples.
RESULTS: A computerized multielement calibration technique for INAA will be validated and improved sample concentration and preparation methods for SSMS will be developed. Factor analysis mathematical methods will be evaluated for the interpretation of multielement chemical analysis data.
PROJECT MILESTONES: (1) 7/71 Start. (2) 4/77 Research Report.
KEYWORDS: MULTI-ELEMENT ANALYSIS;NITROGEN OXIDES;CARBON MONOXIDE;METALS;ORGANIC COMPOUNDS;ACTIVATION ANALYSIS;STANDARDS;MASS SPECTROSCOPY;SPARK MASS SPECTROMETERS;MEASURING METHODS;PLANTS;WATER;BIOASSAY;CALIBRATION;HYDROCARBONS;MINING;ENVIRONMENTAL IMPACTS

<072502>
TITLE: Identify Organics in Petroleum Refinery Wastewaters
PROJECT NUMBER: K-713-B-135
PRINCIPAL INVESTIGATOR: Garrison, A.W.
ADDRESS: Athens, GA 30605
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITOR: Garrison, Arthur W.
TELEPHONE: F250-3453
77 FUNDING: Environmental Protection Agency FY77:$9,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (33%);SPECIFIED OTHER POLLUTANTS/Wastewater, toxics (67%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Extracts from a typical refinery wastewater will be examined by gas chromatography/mass spectrometry to identify the compounds being discharged.
APPROACH: Sampling points include the API separator effluent, Pasveer Ditch effluent and final lagoon effluent.
RESULTS: Tentative identification of classes of compounds and some specific compounds will be available from EPA Grant R803019-01 and confirmations and quantitative of some of these will be attempted.
PROJECT MILESTONES: (1) 8/77 Grantee's report--Characterization of trace organic constituents in petroleum refinery wastewaters. (2) 12/77 Final report on in-house work on the same topic.
KEYWORDS: PETROLEUM REFINERIES;WASTE WATER;QUANTITATIVE CHEMICAL ANALYSIS;QUALITATIVE CHEMICAL ANALYSIS;TOXICITY;HYDROCARBONS;GAS CHROMATOGRAPHY;MASS SPECTROSCOPY;SAMPLING;REMOVAL;WASTE MANAGEMENT

<072503>
TITLE: Input, Deposition, and Post Depositional Conversion of Arsenic
PROJECT NUMBER: K625A-210
PRINCIPAL INVESTIGATOR: Anderson, M.;Andren, A.;Armstrong, D.
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Wolfe, N.L.
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The input deposition, and post depositional transport and conversion of arsenic is being evaluated in the lower section of the Menchinee River at the entrance to Green Bay. Atmospheric mobilization and inputs of arsenic to the aquatic system are also being assessed. The objectives of the investigation are to: (1) obtain a total mass balance of arsenic by describing the net atmospheric depositional input, sedimentation, resuspension rates, and convective transport of arsenic; and (2) elucidate the major controlling mechanisms for arsenic in this and other aqueous systems in general.
PROJECT MILESTONES: (1) 10/76 Fund grant. (2) 10/77 Annual report. (3) 10/78 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;RIVERS;ENVIRONMENTAL TRANSPORT;ARSENIC;WATER POLLUTION;AIR POLLUTION;SEDIMENTATION;WISCONSIN;FRESH WATER

<072504>
TITLE: Determination of Various Degradation and Transformation Processes for Specific Water Pollutants
PROJECT NUMBER: K625B-209
PRINCIPAL INVESTIGATOR: Smith, J.H.;Mill, T.;Holt, B.;Bononos, N.;Lee, S.C.;Masey, W.R.
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Falco, J.W.
77 FUNDING: Environmental Protection Agency FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);GEOTHERMAL/General (33%)
PROJECT DESCRIPTION: The major objective of this research program is to provide laboratory data on selected chemical pollutants that can be extrapolated to provide an assessment of the fates of these pollutants in freshwater aquatic ecosystems.
APPROACH: Laboratory experiments will be carried out to determine the relative rates of three general fates: biological degradation, chemical/photochemical degradation (primarily hydrolysis or oxidation), and physical transport processes (volatilization or sorption onto sediments). Screening studies will be designed to evaluate the relative rates of these loss processes. Detailed studies to provide better estimates of the rates and to determine the degradation products will be carried out only on the faster processes. A simple systems analysis approach will be used to integrate the laboratory data and to assess the overall fate(s) of the pollutant. Upon completion of the laboratory studies, protocols to characterize the biological, chemical, and physical processes involved in the degradation of toxic substances will be developed.
RESULTS: The result of the screening studies will be a report for each pollutant studied that will contain a summary of the current literature, the experimental data, and an assessment of the environmental fate of the pollutant based on all the available data. A report for each of the protocols developed will be published.
PROJECT MILESTONES: (1) 06/75 Start project. (2) 09/77 Publish interim report on screening techniques. (3) 01/78 Publish report on assessment data on compounds. (4) 10/78 Publish report on developed protocols.
KEYWORDS: AQUATIC ECOSYSTEMS;FRESH WATER;HAZARDOUS MATERIALS;ENVIRONMENTAL TRANSPORT;DECOMPOSITION;CHEMICAL REACTIONS;AQUATIC ORGANISMS;METABOLISM;PHOTOCHEMICAL REACTIONS;OXIDATION;HYDROLYSIS;ENZYMATIC HYDROLYSIS;WATER POLLUTION

<072505>
TITLE: Sorption Properties of Soils and Energy-Related Pollutants
PROJECT NUMBER: K625B-215
PRINCIPAL INVESTIGATOR: Means, J.C.;Nassett, J.;Banwast, W.;Reinbold, K.;Wood, S.
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Brown, D.S.
77 FUNDING: Environmental Protection Agency FY77:$458,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: This two-year study will center on the study of sorption properties of energy-related organic pollutants and various types of soils and sediments. The study will include a detailed review of the literature on soil sorption of organics and the preparation of a critical review on the subject. Laboratory studies will be conducted on ten soil samples of varying types and characteristics with at least eleven organic compounds having a broad range of chemical properties. Sorption isotherms for each compound on each soil-sediment will be determined using radio-labelled chemicals. Statistical analyses of the data will be run using multivariant analysis to determine if chemical properties and soil/sediment properties can be related to yield predictive information about the behavior of other compounds on the soils studied.
PROJECT MILESTONES: (1) 04/78 Literature review report. (2) 07/79 Final report.
KEYWORDS: SOILS;SEDIMENTS;SORPTIVE PROPERTIES;LAND POLLUTION;CHEMICAL EFFLUENTS;ORGANIC COMPOUNDS;LEACHING

<072506>
TITLE: Identify and Measure Chemical Elements and Volatile Organics in Energy Related Wastes
PROJECT NUMBER: K625D-141
PRINCIPAL INVESTIGATOR: Ryan, J.F.
AFFILIATION: Gulf South Research Inst., Baton Rouge, La. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Alford, A.L.
77 FUNDING: Environmental Protection Agency FY77:$101,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: A contractor will identify and measure pollutants in energy-related solid wastes and liquid effluents. Information about data obtained in other current investigations of energy-related

pollution will be summarized to identify information gaps and to select samples that will provide maximum information. To permit efficient use of small dedicated computers, a system designed to rapidly search a data bank of 10,000 mass spectra will be installed to evaluate its potential use in individual EPA laboratories.
JECT MILESTONES: (1) 06/77 First contractor's report on pollutants in energy-related wastes. (2) 04/78 Second contractor's report on pollutants in energy-related wastes.
KEYWORDS: SOLID WASTES;LIQUID WASTES;CHEMICAL EFFLUENTS;ORGANIC COMPOUNDS;SAMPLING;CHEMICAL ANALYSIS;AUTOMATION;DATA COMPILATION;COMPUTER CALCULATIONS;LAND POLLUTION;ENVIRONMENTAL EFFECTS;CHEMICAL COMPOSITION;VOLATILITY

<072507>
TITLE: Microbial Degradation of Polychlorinated Biphenyls (PCB's) in Soils and Water
PROJECT NUMBER: K609A-205
PRINCIPAL INVESTIGATOR: Steen, W.C.;Paris, D.F.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Steen, W.C.
77 FUNDING: Environmental Protection Agency FY77:$167,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Degradation of polychlorinated biphenyls by microorganisms will be investigated in the laboratory.
APPROACH: Rates and products of degradation will be determined for Aroclors 1016 and 1242 and several chlorinated isomers.
RESULTS: Results obtained on solubility, volatility, and partitioning will be used to predict the degradation and behavior of the polychlorinated biphenyls in soil and aquatic systems.
PROJECT MILESTONES: (1) 02/76 Initiation of project. (2) 08/77 Scientific paper on partitioning of polychlorinated biphenyls. (3) 08/77 Scientific paper on role of physico-chemical properties of Aroclors 1016 and 1242. (4) 10/77 Scientific paper on microbial degradation of PCB's in water and soil. (5) 10/77 Completion of project.
KEYWORDS: AROMATICS;ORGANIC CHLORINE COMPOUNDS;CHEMICAL EFFLUENTS;TERRESTRIAL ECOSYSTEMS;MICROORGANISMS;METABOLISM;DECOMPOSITION

<072508>
TITLE: Study of the Mechanism and Rates of Volatilization of Contaminants from Water Bodies
PROJECT NUMBER: K609A-206
PRINCIPAL INVESTIGATOR: MacKay, D.
AFFILIATION: Toronto Univ., Ontario (Canada)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Karickhoff, S.W.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this project is to develop a deeper quantitative understanding of the processes by which some environmental contaminants volatilize from water bodies to the atmosphere. Such a predictive capability will be useful in contributing one component to the overall process of modelling environmental systems.
APPROACH: Work will be undertaken in a wind-water tank to measure volatilization rates and in particular measure liquid phase transfer coefficients and correlate these coefficients with wind speed and other fluid flow characteristics. Henry's Law constants will be measured for selected contaminants, notably hydrocarbons and chlorinated hydrocarbons in aqueous systems, pure, with electrolytes and with adsorbing species such as mineral clays, which are encountered naturally.
RESULTS: This work will be initiated in 1977, thus, no progress report is appropriate at this time.
PROJECT MILESTONES: (1) 09/77 Start. (2) 09/78 Annual report. (3) 09/79 Annual report. (4) 12/80 Annual report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;CHEMICAL EFFLUENTS;CHLORINATED AROMATIC HYDROCARBONS;CHLORINATED ALIPHATIC HYDROCARBONS;VOLATILITY;WIND;VELOCITY;SURFACE WATERS;SURFACE AIR;MIXING;FLUID FLOW

<072509>
TITLE: Microbial Degradation of Chlorinated Hydrocarbon Pesticides in Fresh Water Ecosystem
PROJECT NUMBER: K609A-211
PRINCIPAL INVESTIGATOR: Savage, J.;Ruffin, J.
AFFILIATION: Alabama A and M Univ., Normal (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Paris, D.F.
77 FUNDING: Environmental Protection Agency FY77:$53,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this project is to investigate the interaction of chlorodane, lindane, and toxaphene with microorganisms, using aerobic and anaerobic systems.
APPROACH: The study will consist of isolating pure or mixed microbial cultures from sediments and water in order to test the biodegradability of these chlorinated hydrocarbons in freshwater ponds. Culture conditions for optimum degradation or transformation of the pesticides in the ecosystem will be determined and will include parameters such as pH, temperature, aeration, etc. Rate constants and metabolites will be determined for the pesticides.
RESULTS: Results of these studies can be used to assess the importance of these processes in aquatic ecosystems.
PROJECT MILESTONES: 02/77 Initiation of project. 02/78 Annual report. 02/79 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;FRESH WATER;PESTICIDES;SEDIMENTS;CHLORINATED ALICYCLIC HYDROCARBONS;CHLORINATED ALIPHATIC HYDROCARBONS;CHLORINATED AROMATIC HYDROCARBONS;DECOMPOSITION;MICROORGANISMS;METABOLISM;ENVIRONMENTAL TRANSPORT;WATER POLLUTION

<072510>
TITLE: Evaluative Models for Major Nutrients
PROJECT NUMBER: K609A-302
PRINCIPAL INVESTIGATOR: Lassiter, R.R.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Lassiter, R.R.
77 FUNDING: Environmental Protection Agency
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Using the methodologies developed in evaluative models for toxic substances and experimental methodologies developed in both pesticide and nitrogen work, evaluative models for nutrients will be developed. Experimental work in AEcoS and microcosms will be instrumental in testing hypotheses generated by the model and in providing parameter estimates. Runoff of nutrients will be simulated along with point sources. Later work will examine the relationships between nutrient levels and response of the aquatic system to toxic substances.
PROJECT MILESTONES: 03/78 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;NUTRIENTS;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;MINERAL CYCLING

<072511>
TITLE: Fate of Cadmium in Artificial Streams
PROJECT NUMBER: K609A-304
PRINCIPAL INVESTIGATOR: Giesy, J.P.
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Holm, H.W.
77 FUNDING: Environmental Protection Agency FY77:$96,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The purpose of the project is to determine the stream transport distribution and impact of cadmium in artificial streams. Specific objectives of this funding period are (1) to complete laboratory studies of cadmium uptake by several stream organisms and (2) to prepare system models of the fate and biological effects of cadmium.
PROJECT MILESTONES: 12/77 Report on systems assessment.
KEYWORDS: AQUATIC ECOSYSTEMS;STREAMS;CADMIUM;ENVIRONMENTAL TRANSPORT;WATER POLLUTION;MATHEMATICAL MODELS;TOXICITY;AQUATIC ORGANISMS;METABOLISM

<072512>
TITLE: Impact of Nutrient and Sediments on Surface Waters in the U.S.
PROJECT NUMBER: K609A-309
PRINCIPAL INVESTIGATOR: Golley, F.B.
AFFILIATION: Georgia Univ., Athens (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Brockway, D.L.
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this study is to assess the magnitude and nature of nutrient and sediments entering surface waters of the United States.
APPROACH: The approach is to prepare a research plan to fill gaps in the state of knowledge of the magnitude and nature of nutrients and sediments entering surface waters.
RESULTS: A state of knowledge report will be developed by teams of experienced research workers and applied scientists who will survey the available information and summarize these data in an appropriate form.
PROJECT MILESTONES: 10/78 Report on nature and magnitude of sediment and nutrient loading rate.
KEYWORDS: USA;SURFACE WATERS;NUTRIENTS;SEDIMENTS;ENVIRONMENTAL TRANSPORT;DATA COMPILATION;AQUATIC ECOSYSTEMS

<072513>
TITLE: Modeling Transport and Behavior of Pesticides and Other Toxic Organic Materials in Aquatic Environments
PROJECT NUMBER: K609A-310
PRINCIPAL INVESTIGATOR: Park, R.A.
AFFILIATION: Rensselaer Polytechnic Inst., Troy, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Lassiter, R.R.
77 FUNDING: Environmental Protection Agency FY77:$118,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: A generalized model representing the functional characteristics of toxic organic materials in natural aquatic environments is being formulated, implemented, and tested. It incorporates pertinent parts of the ecosystem model CLEANER and will have potential application for studying environmental impacts of pesticides in diverse aquatic ecosystems.
PROJECT MILESTONES: 08/79 User manual on evaluative model for toxic organics.
KEYWORDS: AQUATIC ECOSYSTEMS;HAZARDOUS MATERIALS;PESTICIDES;ORGANIC COMPOUNDS;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;COMPUTER CALCULATIONS;COMPUTER CODES;C CODES;ENVIRONMENTAL EFFECTS;WATER POLLUTION

<072514>
TITLE: Development of Comprehensive Methods to Determine Natural or Background Levels of Pollutants in Watercourses
PROJECT NUMBER: K609A-311
PRINCIPAL INVESTIGATOR: Lystrom, D.J.
AFFILIATION: Department of the Interior, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Lassiter, R.R.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)

PROJECT DESCRIPTION: Existing data as well as data currently being collected will be used to test methods for back-calculating natural background water qualtiy expected without cultural development. Regression techniques as well as existing mechanistic models will be used.
OJECT MILESTONES: 02/78 Report on statistical assessment of natural loading rates of nutrients.
YWORDS: AQUATIC ECOSYSTEMS;WATER QUALITY;SURFACE WATERS;STATISTICAL MECHANICS;WATER POLLUTION

<072515>
TITLE: New Sampling Theory for the Measurement of Ecosystem Structure and Function
PROJECT NUMBER: K609A-312
PRINCIPAL INVESTIGATOR: Mulholland, R.J.
AFFILIATION: Oklahoma State Univ., Stillwater (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Hill, J.
77 FUNDING: Environmental Protection Agency FY77:$26,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The proposed research will formalize a sampling algorithm, with documentation, for applications to environmental sampling and design of microcosm experiments.
PROJECT MILESTONES: 09/78 Report on model for assessment of ecosystem effects.
KEYWORDS: AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;ENVIRONMENT;SAMPLING;ALGORITHMS;MATHEMATICAL MODELS

<072516>
TITLE: Development of Dynamic Two-layer Model for Stratified Estuaries
PROJECT NUMBER: K609A-406
PRINCIPAL INVESTIGATOR: Chamberlain, S.G.;Tawari, P.V.;Comery, W.
AFFILIATION: Raytheon Co., Lexington, Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Falco, J.W.
77 FUNDING: Environmental Protection Agency FY77:$95,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The primary objective of the project is to develop a two-layer dynamic model of estuarine hydrodynamics and water quality. The model is to be compatible for linkage with appropriate river and loading models to provide a basin planning methodology in coastal areas. A second objective is to test the estuary model on a field data set to define its performance characteristics.
APPROACH: The approach is to complete the development of RAMSES hydrodynamic and water quality model. The hydrodynamic code will be tested as a first phase in this study. Testing will include sensitivity analysis of RAMSES model parameters. The second phase of this study will be directed toward quality model development.
RESULTS: An interim report will be submitted in January 1978 which will summarize the progress of the project. This report will include discussions of hydrodynamic model development. A final report will be submitted at the end of the project that will present the development of the water quality model.
PROJECT MILESTONES: (1) 04/77 Start project. (2) 01/78 Interim report which summarizes hydrodynamics estuary model. (3) 12/78 Final report which summarizes estuary model including water quality model.
KEYWORDS: AQUATIC ECOSYSTEMS;ESTUARIES;WATER QUALITY;HYDRODYNAMICS;COASTAL REGIONS;LAND USE;PLANNING;MATHEMATICAL MODELS

<072517>
TITLE: Comprehensive Assessment of Organics in Drinking Water
PROJECT NUMBER: K614D-140
PRINCIPAL INVESTIGATOR: Bombaugh, K.J.
AFFILIATION: Radian Corp., Austin, Tex. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Pope, J.D.
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The bulk of organic material in drinking water and source water is not amenable to analysis by gas or liquid chromatography for specific organic constituents. This material will be extracted and concentrated by techniques designed not to alter chemical structure and separated into major fractions. These fractions will then be characterized by molecular weight, functional groups, etc. Specific non-volatile compounds will be identified whenever possible.
PROJECT MILESTONES: 04/78 Contractor's first report on non-volatile organics in raw drinking water. 07/80 Final report--non-volatile organics in raw and finished drinking water.
KEYWORDS: DRINKING WATER;WATER QUALITY;ORGANIC COMPOUNDS;QUANTITATIVE CHEMICAL ANALYSIS

<072518>
TITLE: Simulation of Nitrogen Movement and Transformation in the Root Zone
PROJECT NUMBER: K617A-440
PRINCIPAL INVESTIGATOR: Davidson, J.M.;Graetz, D.A.;Rao, P.S.;Selim, H.M.
AFFILIATION: Florida State Univ., Tallahassee (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Smith, C.N.
77 FUNDING: Environmental Protection Agency FY77:$65,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objectives include development and testing of a mathematical model to describe movement and transformation of nitrogen in soils.
APPROACH: Spatial variability of selected soil physical and chemical properties will be evaluated for their influence on the precision with which nitrogen distribution and movement can be predicted and measured in the field. Several sources of existing data will be utilized to test and evaluate the model.
RESULTS: The first phase of this project was completed in March 1977. An EPA report is now being prepared. The project was extended two additional years to develop and evaluate phosphorus transport and

transformation as well as organic nitrogen submodels. In addition, a two-dimensional model for water, nitrogen, and phosphorus movement to tile drains will be the end of the project.
PROJECT MILESTONES: 03/75 Start of grant. 03/77 EPA report. 03/79 Final report.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;SOILS;PLANTS;ROOTS;NITROGEN;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;PHOSPHORUS;WATER

<072519>
TITLE: Non-Point Pollution Studies on Agricultural Land Use Types Prevalent in the Coastal Plain Zone of Maryland
PROJECT NUMBER: K617B-35
PRINCIPAL INVESTIGATOR: Correll, D.L.
AFFILIATION: Smithsonian Institution, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Payne, W.R.
77 FUNDING: Environmental Protection Agency FY77:$181,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This research proposal involves the modification and expansion of a watershed monitoring program now in operation at the Chesapeake Bay Center for Environmental Studies.
PROJECT MILESTONES: 12/78 Data set to model developers plus interpretation of specifics.
KEYWORDS: MARYLAND;REGIONAL ANALYSIS;LAND USE;AGRICULTURE;WATERSHEDS;MONITORING;COASTAL REGIONS

<072520>
TITLE: Nitrogen Cycling in Forested Ecosystems
PROJECT NUMBER: K617B-353
PRINCIPAL INVESTIGATOR: Lassiter, R.R.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Lassiter, R.R.
77 FUNDING: Environmental Protection Agency FY77:$5,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The project will investigate common aspects of nitrogen cycling in differing environmental systems.
APPROACH: A series of models will be developed to study the chemical transformations of nitrogen and the influence of these transformations on the fluxes to and from the biotic components. Dynamics will include the use of time-varying rate coefficients which are functions of environmental variables.
RESULTS: The results of this study may be used to enhance the nitrogen transformation portion of the ARM Model.
PROJECT MILESTONES: 01/78 Final report.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;NITROGEN;ENVIRONMENTAL TRANSPORT;FORESTS;TREES;PLANTS;MATHEMATICAL MODELS;MINERAL CYCLING

<072521>
TITLE: Development of a Physically Based Nutrient and Pesticide Transport Model for Artificially Drained Cropland
PROJECT NUMBER: K617B-354
PRINCIPAL INVESTIGATOR: Commoner, B.
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Hill, J.
77 FUNDING: Environmental Protection Agency FY77:$125,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The research is an interdisciplinary study to develop a mathematical model capable of predicting the entry of soil nutrients and pesticides into surface waters.
PROJECT MILESTONES: 12/78 User manual for runoff from tile drained fields.
KEYWORDS: WATERSHEDS;NUTRIENTS;PESTICIDES;ENVIRONMENTAL TRANSPORT;SURFACE WATERS;WATER POLLUTION;MATHEMATICAL MODELS

<072522>
TITLE: Retention and Transformations of Phosphorus and Selected Pesticides in Soils and Sediments
PROJECT NUMBER: K617B-417
PRINCIPAL INVESTIGATOR: Rao, P.S.;Davidson, J.M.;Out, L.T.;Street, J.J.;Berkhiser, V.E.;Yuan, T.L.;Wheeler, W.B.;Rao, P.V.
AFFILIATION: Florida State Univ., Tallahassee (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Smith, C.N.
77 FUNDING: Environmental Protection Agency FY77:$183,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: The proposed research project consists of three major parts. The first part is to conduct an exhaustive literature search to compile a preliminary data base of retention and transformation characteristics of common pesticides and phosphorus compounds in soils. The second part of the project deals with basic laboratory experiments to measure equilibrium and kinetic adsorption-desorption and bound residue formation characteristics, nonsingularity or irreversibility in adsorption-desorption processes, as well as measurement of transformation rates under controlled soil environmental conditions. The third part of the project involves routine measurements of adsorption-desorption isotherms and transformation rates of a large number of common pesticides using a broad spectrum of soil types from throughout the United States.
APPROACH: The data base generated by the proposed project will then be used in developing general multiple regression equations that relate retention and transformation coefficients to fundamental soil properties. Such relationships are urgently needed to estimate model input parameters for the nonpoint source pollution simulation models (such as EPA's Agricultural Runoff Management Model, ARM) currently used to identify and recommend soil conservation and land use management practices causing minimum environmental contamination. A multi-disciplinary team of researchers (soil physics, soil chemistry, soil microbiology,

pesticide chemistry, and statistics) has been assembled to accomplish the specified project goals.
RESULTS: The final report will be prepared at the end of the project.
PROJECT MILESTONES: (1) 10/77 Start of grant. (2) 10/79 Final report.
WORDS: TERRESTRIAL ECOSYSTEMS;PESTICIDES;PHOSPHORUS COMPOUNDS;ENVIRONMENTAL TRANSPORT;SOILS;SEDIMENTS;CHEMICAL COMPOSITION;MATHEMATICAL MODELS

<072523>
TITLE: Development of a Generalized Planning Model for Evaluation of Alternative Forest Management Practices--Engineering Phase
PROJECT NUMBER: K617C-433
PRINCIPAL INVESTIGATOR: Simons, D.B.;Li, R.M.;Bartlett, E.T.
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mulkey, L.A.
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
PROJECT DESCRIPTION: This is an initial effort to develop a generalized planning model for evaluation of alternative forest management practices as a function of environmental and resource goals. The objectives of this study are: (1) to develop and test a water and sediment routing and yield model for both small and large watersheds and for both short and long term periods; (2) to develop and test a process model which will simulate the erosion and deposition of channel banks for unstable channels in forested upland watersheds. To incorporate this process model into the developed water and sediment routing model, the remaining objectives will be: (3) to develop a procedure for routing forest litter from the land and surface for predicting the loading of stream channels with organic debris; (4) to interface on available nitrogen and phosphorus sediment uptake model with the developed water and sediment routing model; (5) to develop a thermal loading model for predicting the temperature and dissolved oxygen of water loading to the stream; and (6) to link the cause-effect process model and the multiple-objective programming model for the selection of forest management alternatives.
APPROACH: In order to meet the above mentioned objectives, the proposed study will develop numerical models considering the physical significance of the governing processes.
RESULTS: A final report will be published on the tested model system.
PROJECT MILESTONES: 03/77 Start project. 10/78 First report of general planning model. 04/80 Completion/publication of tested modeling system.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;MANAGEMENT;LAND USE;WATERSHEDS;HYDROLOGY;SURFACE WATERS;SEDIMENTS;FOREST LITTER;STREAMS;NITROGEN;PHOSPHORUS;ENVIRONMENTAL TRANSPORT;BIOLOGICAL WASTES;OXYGEN;TEMPERATURE MEASUREMENT;MATHEMATICAL MODELS;WATER QUALITY

<072524>
TITLE: Development of a Generalized Planning Model for Forest Management--Management Phase
PROJECT NUMBER: K617C-434
PRINCIPAL INVESTIGATOR: Carder, R.
AFFILIATION: Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mulkey, L.A.
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
PROJECT DESCRIPTION: The forest management components of the overall generalized planning model system under development for evaluation of the environmental impact of forest management will be completed in this project.
APPROACH: The modules for predicting the relationship among forest management variables (e.g., tree species, water yield goals, road construction) and the watershed environmental response will be developed.
RESULTS: These components, combined with engineering models for runoff and pollutant yields, can be used in forest management planning and execution. A final report will be published on the model complete with testing and user manual.
PROJECT MILESTONES: 02/77 Start project. 10/78 Publication of initial model and testing results. 04/80 Completion of model, complete with testing and user manual.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;MANAGEMENT;ENVIRONMENTAL EFFECTS;TREES;GENETIC VARIABILITY;BIOMASS;WATERSHEDS;SURFACE WATERS;WATER QUALITY;MATHEMATICAL MODELS;HYDROLOGY

<072525>
TITLE: Extraction and Separation Techniques
PROJECT NUMBER: K713B-103
PRINCIPAL INVESTIGATOR: Webb, R.G.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Webb, R.G.
77 FUNDING: Environmental Protection Agency FY77:$63,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Glass capillary columns will be evaluated for separation of complex organic extracts. Extraction and separation techniques for organic bases, including benzidine, will be developed. Liquid-liquid extraction, resin adsorption, GC and GS-MS will be involved. Various aspects of solvent extraction of water samples will be examined including choice of solvent, tendency to form emulsions, methods of drying, evaporation techniques and effectiveness of solvent exchange for mass spectral analysis. Extraction of trace organics from sediments will be investigated.
PROJECT MILESTONES: (1) 06/75 Report on isolating organic water pollutants. (2) 07/77 Report on XAD resins and carbon accumulator column. (3) 10/77 Report on solvent extraction techniques. (4) 11/77 Report on application of capillary columns to organics in water. (5) 10/79 Report on extraction from sediments.
KEYWORDS: AQUATIC ECOSYSTEMS;SEDIMENTS;CHEMICAL COMPOSITION;ORGANIC COMPOUNDS;SEPARATION PROCESSES;WATER POLLUTION;QUANTITATIVE CHEMICAL ANALYSIS;TRACE AMOUNTS;BENZIDINE

<072526>
TITLE: Separation of Polar Compounds by LC
PROJECT NUMBER: K713B-104
PRINCIPAL INVESTIGATOR: Pope, J.D.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Pope, J.D.
77 FUNDING: Environmental Protection Agency FY77:$24,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Techniques, using high pressure liquid chromatography (HPLC) will be developed for the separation and analysis of polar organic compounds extracted from water. These types of compounds are quite prevalent in water and are not easily analyzed by gas liquid chromatography.
PROJECT MILESTONES: (1) 09/78 Report on application of LC to analysis of organics in effluents. (2) 04/79 Major report on analysis of organics in water by LC.
KEYWORDS: AQUATIC ECOSYSTEMS;SURFACE WATERS;WATER POLLUTION;ORGANIC COMPOUNDS;SEPARATION PROCESSES;QUANTITATIVE CHEMICAL ANALYSIS;LIQUID COLUMN CHROMATOGRAPHY;TRACE AMOUNTS

<072527>
TITLE: Analysis of Polar Compounds by Liquid Chromatography
PROJECT NUMBER: K713B-106
PRINCIPAL INVESTIGATOR: Thruston, A.D.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Thruston, A.D.
77 FUNDING: Environmental Protection Agency FY77:$184,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: high speed liquid chromatography offers speed, sensitivity, and accuracy. A state-of-the-art liquid chromatograph has been evaluated and purchased. Several classes of polar compounds will be chosen for study. Liquid chromatography columns and instrumental variables will be evaluated. The best collection techniques for liquid chromatography eluted peaks will be evaluated for further identification by other techniques. A mass spectrometer and data system will be acquired and dedicated to analysis of fractions from the liquid chromatograph.
PROJECT MILESTONES: (1) 07/75 Start. (2) 07/76 Complete evaluation and purchase of SOTA instrument. (3) 06/78 Report on LC analysis of polar compounds.
KEYWORDS: AQUATIC ECOSYSTEMS;SURFACE WATERS;WATER POLLUTION;ORGANIC COMPOUNDS;TRACE AMOUNTS;SEPARATION PROCESSES;QUANTITATIVE CHEMICAL ANALYSIS;LIQUID COLUMN CHROMATOGRAPHY

<072528>
TITLE: Establish GC/FTIR Techniques for ab initio Identification of Organic Pollutants
PROJECT NUMBER: K713B-110
PRINCIPAL INVESTIGATOR: Azarraga, L.V.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Azarraga, L.V.
77 FUNDING: Environmental Protection Agency FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: A report on the current status of application of the AERL GC/FTIR system to organic pollutant identification will be prepared. Effort to optimize this prototype system's performance will continue. Features to be improved include the light pipe dimensions, the interface between the light pipe and the interferometer, and the software for computerized data collection and manipulation. A state-of-the-art chromatograph will be incorporated into the FTIR system and evaluated.
PROJECT MILESTONES: (1) 07/75 Start. (2) 05/77 Research report. (3) 01/80 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;SURFACE WATERS;WATER POLLUTION;ORGANIC COMPOUNDS;TRACE AMOUNTS;SEPARATION PROCESSES;QUANTITATIVE CHEMICAL ANALYSIS;CHROMATOGRAPHY

<072529>
TITLE: Capillary Columns in GC/MS Analysis
PROJECT NUMBER: K713B-112
PRINCIPAL INVESTIGATOR: Carter, M.H.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Carter, M.H.
77 FUNDING: Environmental Protection Agency FY77:$19,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Techniques are being developed to utilize capillary columns in GC/MS systems. Equipment modifications will be made and evaluated to determine their effects on the versatility and sensitivity of the system. The GC/MS systems to be used in this work will be low resolution CI and EI systems and a high resolution EI system. This task will proceed in conjunction with Task 103. Capillary column performance in GC/MS systems will be correlated with GC capillary column analyses of various types of samples.
PROJECT MILESTONES: (1) 07/75 Start. (2) 05/77 Research report on capillary columns. (3) 07/80 Research report on chemical ionization.
KEYWORDS: AQUATIC ECOSYSTEMS;SURFACE WATERS;WATER POLLUTION;ORGANIC COMPOUNDS;TRACE AMOUNTS;QUANTITATIVE CHEMICAL ANALYSIS;SEPARATION PROCESSES

<072530>
TITLE: Plasma Emission Spectrometry Technique Development
PROJECT NUMBER: K713B-116
PRINCIPAL INVESTIGATOR: Fassel, V.A.;Winge, R.
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Taylor, C.E.
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This project will continue the development of plasma-source emission spectrometry as a rapid, sensitive technique for multielement analysis. Attention will be given to lowering detection limits and eliminating interferences. Nebulization techniques for introducing aqueous samples will be refined and a scanning monochromator will be evaluated.
PROJECT MILESTONES: (1) 03/74 Start. (2) 05/77 Evaluation report. (3) 05/78 Final report.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;WATER POLLUTION;LAND POLLUTION;ELEMENTS;QUANTITATIVE CHEMICAL ANALYSIS;SAMPLING;SURFACE WATERS;SOILS;CHEMICAL COMPOSITION;SPECTROSCOPY

<072531>
TITLE: X-Ray Fluorescence Instrumentation
PROJECT NUMBER: K713B-117
PRINCIPAL INVESTIGATOR: Birks, L.S.;Gilfrich, J.V.
AFFILIATION: Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Anderson, C.H.
77 FUNDING: Environmental Protection Agency FY77:$52,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This new project will critically evaluate commercially available x-ray fluorescence instrumentation for the multielement analysis of water. Detection limits and matrix effects will be evaluated and the relative merits of energy-dispersive vs. wavelength dispersive instruments will be determined. Chemical methods of concentrating trace elements in water will be investigated.
PROJECT MILESTONES: (1) 01/76 Start. (2) 03/78 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;SURFACE WATERS;SAMPLING;ELEMENTS;QUANTITATIVE CHEMICAL ANALYSIS;TRACE AMOUNTS;X-RAY FLUORESCENCE ANALYSIS;CHEMICAL COMPOSITION

<072532>
TITLE: Plasma MS Evaluation
PROJECT NUMBER: K713B-118
PRINCIPAL INVESTIGATOR: Fassel, V.A.;Svec, H.
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Energy Research Laboratory
MONITOR: Taylor, C.E.
77 FUNDING: Environmental Protection Agency FY77:$79,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This project will evaluate the feasibility of coupling the plasma source of Tasks 115 and 116 to a mass spectrometer. The plasma is expected to provide a steady and abundant supply of atomic ions, increasing the precision and sensitivity of detection by the mass spectrometer and permitting direct analysis of aqueous solutions. After construction and thorough testing, the instrumentation will be delivered to EPA.
PROJECT MILESTONES: (1) 01/76 Start. (2) 02/77 Annual report. (3) 03/78 Annual report. (4) 03/79 Annual report. (5) 03/80 Annual report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;SURFACE WATERS;CHEMICAL COMPOSITION;SAMPLING;QUANTITATIVE CHEMICAL ANALYSIS;TRACE AMOUNTS;ELEMENTS;MASS SPECTROMETERS;PERFORMANCE TESTING

<072533>
TITLE: Development of Search Procedures
PROJECT NUMBER: K713B-123
PRINCIPAL INVESTIGATOR: Shackelford, W.M.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Shackelford, W.M.
77 FUNDING: Environmental Protection Agency FY77:$66,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: A library of mass spectra will be constructed that contains only spectra of those organic compounds that have been found in water. This high probability matching file will contain approximately 2000 mass spectra. An evaluation of the Probability Based Matching (PBM) system will be undertaken to decide upon its effectiveness as a mass spectra data handling tool. Assistance to the users of the present spectra matching programs will be provided in the form of defining operator procedures and trouble-shooting problems.
PROJECT MILESTONES: (1) 07/75 Start. (2) 05/76 Complete development of tuning method for quadrupole mass spectrometry. (3) 03/77 Deliver magnetic tape containing mass spectra of most common pollutants. (4) 09/78 Report on PBM evaluation.
KEYWORDS: WATER POLLUTION;LAND POLLUTION;ORGANIC COMPOUNDS;CHEMICAL ANALYSIS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;SAMPLING;MASS SPECTROSCOPY;MASS NUMBER;DATA COMPILATION;ELEMENTS;MAGNETIC STORAGE DEVICES;MAGNETIC TAPES

<072534>
TITLE: Chemical Speciation
PROJECT NUMBER: K713B-126
PRINCIPAL INVESTIGATOR: Hoover, T.B.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Hoover, T.B.
77 FUNDING: Environmental Protection Agency FY77:$19,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of the project is to develop and evaluate analytical methods for the identification and determination of inorganic species in water.
APPROACH: A literature survey will assess the significance of inorganic chemical species with respect to health and ecological effects and transport of elements in the environment. Current analytical methodology will be surveyed. Voltammetric methods will be evaluated experimentally with respect to sensitivity, selectivity, and minimum pretreatment of the sample. Means of extending the detection limits of ion-selective electrodes will be sought. Ion exchange techniques will be examined for the preconcentration or separation of ionic species. Spectrometric methods will be explored.
RESULTS: Outputs will be a series of research reports evaluating specific analytical methodologies.
PROJECT MILESTONES: (1) 04/75 Determination of molecular hydrogen sulfide research report. (2) 10/76 Evaluation of prototype instrument for phosphorus research. (3) 10/77 Inorganic species in water research report. (4) 05/78 Inorganic species in water research report. (5) 05/79 Inorganic species in water research report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;INORGANIC COMPOUNDS;VOLUMETRIC ANALYSIS;SAMPLE PREPARATION;CHEMICAL ANALYSIS

<072535>
TITLE: Asbestos Sampling Techniques
PROJECT NUMBER: K713B-129
PRINCIPAL INVESTIGATOR: Chatfield, E.J.
AFFILIATION: Ontario Research Foundation, Sheridan Park (Canada)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Anderson, C.H.
77 FUNDING: Environmental Protection Agency FY77:$3,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This contract will establish the proper storage techniques for water samples containing asbestos that result in minimum change of particle concentration. It will also compare sample preparation techniques to determine if newer methods of preparation are more accurate than those presently used. Extended contract evaluates alternative new transfer techniques.
PROJECT MILESTONES: (1) 03/76 Start. (2) 06/77 Final report. (3) 07/78 Award new contract. (4) 07/80 Annual report. (5) 06/81 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;ASBESTOS;CHEMICAL ANALYSIS;SAMPLE PREPARATION;SURFACE WATERS

<072536>
TITLE: Instrumental Quantification of Organic Compounds
PROJECT NUMBER: K713B-130
PRINCIPAL INVESTIGATOR: Alford, A.L.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Alford, A.L.
77 FUNDING: Environmental Protection Agency FY77:$3,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Literature surveys on Environmental Applications of Mass Spectrometry were completed for the years 1969--1975. This will be updated through 1976. A method will be developed for quantitating organic compounds eluted during GC-MS runs. Using a series of known standards and the Finnigan GC-MS, the best quantitative technique will be determined. The total ion current and computer programs will be used. After the technique is established with standards, various pollution samples will be tested. The method will be repeated on the Varian GC-MS. A method will be developed for quantitating organic compounds eluted during a GC-FTIR run.
PROJECT MILESTONES: (1) 07/75 Start. (2) 06/76 Literature review completed (1969--1975). (3) 09/77 Literature review completed (1976).
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;ORGANIC COMPOUNDS;CHEMICAL ANALYSIS;MASS SPECTROSCOPY;SURFACE WATERS;SAMPLE PREPARATION;COMPUTER CALCULATIONS;DATA ANALYSIS

<072537>
TITLE: Development of Agricultural Practice Assessment Methodology
PROJECT NUMBER: K617B-426
PRINCIPAL INVESTIGATOR: Mulkey, L.A.;Smith, C.N.;Dean, J.D.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mulkey, L.A.
77 FUNDING: Environmental Protection Agency FY77:$33,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: A wide array of tools, including the EPA Agricultural Runoff Management Model (ARM) will be evaluated for their applicability in evaluation of the water pollution control effectiveness of agricultural practices. Specific, simplified analyses based on modifications of more complex approaches will be investigated. The most appropriate analysis methodology, the complexity of approach, data requirements, and necessary assumptions will be carefully documented and reported periodically.
PROJECT MILESTONES: (1) 09/76 Start project. (2) 12/77 Publication of simplified approach to evaluation of

erosion control. (3) 06/78 Publication of case study applications of ARM model. (4) 12/78 Publication of evaluation of impact of supplemental irrigation.
KEYWORDS: AGRICULTURE;LAND USE;MANAGEMENT;WATER POLLUTION CONTROL;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;WATERSHEDS;SEDIMENTS;NITROGEN;PHOSPHORUS;ENVIRONMENTAL TRANSPORT;CROPS;HYDROLOGY;FLUID FLOW;STREAMS;TOPOGRAPHY;COMPUTER CALCULATIONS;COMPUTER CODES;A CODES;MATHEMATICAL MODELS

<072538>
TITLE: Effectiveness of Vegetation Buffer Strips for Controlling Sediment and Other Water Pollutants from Disturbed Watersheds
PROJECT NUMBER: K617B-427
PRINCIPAL INVESTIGATOR: Simons, D.B.;Li, R.M.
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mulkey, L.A.
77 FUNDING: Environmental Protection Agency FY77:$183,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The primary objective of this study is to develop a methodology for evaluating the effectiveness of vegetation buffer strips for controlling sediment and other major water pollutants such as nitrogen and phosphorus.
APPROACH: This methodology will be developed considering the physical significance of the governing processes which dominate the hydrologic, hydraulic, and vegetative aspects of the buffer zone. The design of the buffer strip will determine size of zone, shape of zone, and type of vegetation in the buffer strip. This determination would be independent of the land use in other parts of the watershed. The hydrologic analysis will consider type, duration, intensity and recurrence interval of storms, infiltration rate, water, sediment runoff, and the distribution of other major pollutants in the watershed. The hydraulic analysis will consider the rate of surface runoff, resistance to flow, sediment trapping efficiency, sediment and other major pollutants resistance time, channelization from the upstream and progressive head cut from the downstream end of the strip. The hydrologic and hydraulic response of the buffer strip is dependent on the geometry of the watershed. A range of conditions from flat land, intermediate land, and steep land will be investigated. The vegetation analysis will consider the type, height, density stiffness, and natural and flow-induced vibration frequency of the vegetative cover.
RESULTS: An engineering analysis of the sediment control efficacy will be made initially and documented in an interim report. Finally, design criteria including the developed methodology will be published.
PROJECT MILESTONES: (1) 09/77 Start project. (2) 09/78 Report on effectiveness of buffer strips for sediment control. (3) 09/80 Design criteria for stream-side management zones.
KEYWORDS: AGRICULTURE;LAND USE;MANAGEMENT;WATER POLLUTION CONTROL;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;WATERSHEDS;CROPS;GRASS;HYDROLOGY;STORMS;FLUID FLOW;SEDIMENTS;ENVIRONMENTAL TRANSPORT;TOPOGRAPHY;WATER POLLUTION

<072539>
TITLE: Develop Computer Program to Record Frequency Distribution of Organics
PROJECT NUMBER: K713B-142
PRINCIPAL INVESTIGATOR: Milne, G.W.
AFFILIATION: Department of Health, Education, and Welfare, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: McGuire, J.M.
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This interagency is for the purpose of developing computer programs to produce statistics on specific compounds identified using the computer-searchable file of 40,000 mass spectra assembled in an interagency agreement between EPA and NIH. Means will also be devised whereby a running compilation can be made of the geographical location in which specific chemicals are found.
PROJECT MILESTONES: (1) 09/76 Award IAG. (2) 01/78 Complete programs to record frequency distribution.
KEYWORDS: WATER POLLUTION;LAND POLLUTION;ORGANIC COMPOUNDS;CHEMICAL ANALYSIS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;SAMPLING;MASS SPECTROSCOPY;MASS NUMBER;DATA COMPILATION;ELEMENTS;GEOGRAPHY;COMPUTER CALCULATIONS

<072540>
TITLE: Lab Model Ecosystem for Evaluating Toxic Substances, Fate and Effects
PROJECT NUMBER: K715B-375
PRINCIPAL INVESTIGATOR: Brockway, D.L.
AFFILIATION: Environmental Protection Agency, Athens, Ga. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Brockway, D.L.
77 FUNDING: Environmental Protection Agency FY77:$59,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective is to develop and evaluate microcosms as research tools and as "screening tools" for use in assessing potential environmental transport and distribution of trace pollutants.
APPROACH: Continuous-flow and static aquatic microcosms with variations in biotic and abiotic structure will be set up to evaluate the influence of these factors on microcosm stability and reproducibility. They will be studied and then spiked with a toxicant to determine if microcosms can be used to predict the transport and distribution of pollutants in relation to variables listed above.
RESULTS: This in-house work will include developing the capability to do aquatic microcosm studies, paralleling the IAG studies to verify the reproducibility of their microcosms and determining the differences between microcosms started with laboratory or natural organisms.
PROJECT MILESTONES: (1) 10/77 Interim report on stability of flowing aquatic microcosms. (2) 01/79 Report on fate of toxic substance in flowing aquatic microcosms.
KEYWORDS: AQUATIC ECOSYSTEMS;SURFACE WATERS;WATER POLLUTION;BIOLOGICAL MODELS;HAZARDOUS MATERIALS;ENVIRONMENTAL TRANSPORT;CHEMICAL EFFLUENTS;TRACE AMOUNTS;ENVIRONMENTAL EFFECTS

<072541>
TITLE: Evaluation of Microcosm Techniques for Assessment of Chemical Transport and Effects in Aquatic and Terrestrial Ecosystems
PROJECT NUMBER: K715B-376
PRINCIPAL INVESTIGATOR: Harris, W.F.
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Athens, Ga. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Brockway, D.L.
77 FUNDING: Environmental Protection Agency FY77:$250,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Microcosms with variations in size, biotic and abiotic structure will be set up to evaluate the impact of these variations on the stability and reproducibility of aquatic and terrestrial microcosms. They will be studied and then spiked with a toxicant to determine if microcosms can be used to predict transport and distribution of pollutants.
PROJECT MILESTONES: 04/78 Provisional protocol for microcosm screening of toxic materials.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;LAND POLLUTION;WATER POLLUTION;HAZARDOUS MATERIALS;ENVIRONMENTAL TRANSPORT

<072601>
TITLE: Powdered Carbon-Activated Sludge-Filtration Processes for Petroleum Refinery Wastewater
PROJECT NUMBER: L-610-C-18
PRINCIPAL INVESTIGATOR: Knecht, A.T.
ADDRESS: Harvey Technical Center, 400 E. Sibley Blvd., Harvey, IL 60426
AFFILIATION: Atlantic Richfield Co., Harvey, Ill. (USA)
MONITORING AGENCY: SEE CODE- 9500683 Environmental Protection Agency, Ada, Okla. (USA). Robert S. Kerr Environmental Research Lab.
MONITOR: Pfeffer, Fred M.
TYPE OF FUNDING: Grant No.-R-804731-01
77 FUNDING: Environmental Protection Agency FY77:$211,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Site specific Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine if direct addition of powdered activated carbon (PAC) to activated sludge units and changes in operating procedure will significantly improve effluent quality and approach Best Available Technology. The role of adsorbents in enhancing biological activity will be investigated, along with their ultimate impact on sludge disposal by land application.
APPROACH: An investigation of activated sludge treatment of refinery process wastewaters will be conducted in laboratory bench-scale system. Side-by-side studies will be made to: (1) determine role of adsorbents in enhancing biological treatment; (2) determine the impact of loading variations on system performance. Additional studies will be conducted to: (1) identify hydrocarbon types which resist removal by biological and physical treatment programs evaluated; (2) investigate the ultimate fate of sludges generated by treatment programs in land application techniques; (3) formulate a work plan for and conduct a full-scale plant evaluation of combined adsorbent-activated sludge treatment based on pilot studies; and (4) develop rough economic assessment of treatment programs investigated.
PROJECT MILESTONES: (1) 7/77 Preliminary testing. (2) 7/78 Bench testing. (3) 10/78 Full-scale design. (4) 10/79 Full-scale testing. (5) 12/79 Final report.
KEYWORDS: ACTIVATED SLUDGE PROCESS;ACTIVATED CARBON;PETROLEUM REFINERIES;WASTE PROCESSING;WASTE WATER;WASTE MANAGEMENT;ADSORPTION;EFFICIENCY;SOILS;IRRIGATION;HYDROCARBONS;REMOVAL;BIOLOGICAL EFFECTS;SLUDGES;WASTE DISPOSAL;DEMONSTRATION PROGRAMS;ECONOMICS;CHEMICAL EFFLUENTS;ENVIRONMENTAL IMPACTS;WATER POLLUTION CONTROL

<072602>
TITLE: Effectiveness and Cost of Activated Carbon Absorption of Toxic Compounds from Petroleum Refinery Wastewaters
PROJECT NUMBER: L-610-C-20
PRINCIPAL INVESTIGATOR: Burks, S.L.
ADDRESS: Reservoir Research Center, Stillwater, OK 74074
AFFILIATION: Oklahoma State Univ., Stillwater (USA)
MONITORING AGENCY: SEE CODE- 9500683 Environmental Protection Agency, Ada, Okla. (USA). Robert S. Kerr Environmental Research Lab.
MONITOR: Matthews
TELEPHONE: P743-2233
TYPE OF FUNDING: Grant No.-R-805307-01
77 FUNDING: Environmental Protection Agency FY77:$2,710
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: A study will be conducted to determine the adsorption capacity of activated carbon for specific toxic organic compounds identified in petroleum refinery wastewaters.
APPROACH: Adsorption isotherms and column breakthrough data on the specific toxic compounds will be utilized to predict the effectiveness of carbon adsorption treatment and the projected cost of a full scale treatment plant.
RESULTS: In addition, Pathead minnow and benthic macroinvertebrate continuous-flow bioassays of carbon treated petroleum refinery wastewaters will be performed to determine the capability of carbon treatment to produce a zero-toxic-pollutant discharge.

PROJECT MILESTONES: (1) 8/77 Start project. (2) 7/78 Complete project--final report.
KEYWORDS: PETROLEUM REFINERIES;WASTE WATER;COST;ACTIVATED CARBON;SORPTIVE PROPERTIES;ADSORPTION;WATER POLLUTION;PURIFICATION;SEPARATION PROCESSES;WASTE PROCESSING;ORGANIC COMPOUNDS;HYDROCARBONS;REMOVAL;BIOLOGICAL INDICATORS;WATER QUALITY;BIOASSAY;WASTE MANAGEMENT;ACTIVATED SLUDGE PROCESS;EFFICIENCY

<072603>
TITLE: State of the Art of Wastewater Aquaculture
PROJECT NUMBER: L-611C-44
PRINCIPAL INVESTIGATOR: Duffer, W.R.;Moyer, J.E.
ADDRESS: P.O. Box 1198, Ada, OK 74820
AFFILIATION: SEE CODE- 9500683 Environmental Protection Agency, Ada, Okla. (USA). Robert S. Kerr Environmental Research Lab.
MONITORING AGENCY: SEE CODE- 9500683 Environmental Protection Agency, Ada, Okla. (USA). Robert S. Kerr Environmental Research Lab.
DIVISION: Environmental Research Lab.
MONITOR: Duffer, William R.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: An assessment of wastewater aquaculture in the United States will be made for marine and freshwater.
RESULTS: Conclusions will be drawn as to research requirements for development of treatment and utilization systems. Research recommendations will be presented. Output will be used to determine future research programs in aquaculture for EPA and by groups as reference and information.
PROJECT MILESTONES: (1) 01/77 Review Literature and Prepare Report Outline. (2) 06/77 Final Project Report on Municipal Wastewater Aquaculture; State-of-the-Art.
KEYWORDS: WASTE WATER;AQUACULTURE;TECHNOLOGY ASSESSMENT;FRESH WATER;SEAWATER;MUNICIPAL WASTES;RECYCLING;HYDROCARBONS;FISHES;METABOLISM;BIOLOGICAL EFFECTS;WASTE MANAGEMENT

<072604>
TITLE: Soil Filtration of Sewage Effluent of a Rural Area
PROJECT NUMBER: L-611-C-51
PRINCIPAL INVESTIGATOR: Sabey, B.R.;Evans, N.A.
ADDRESS: Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: SEE CODE- 9500683 Environmental Protection Agency, Ada, Okla. (USA). Robert S. Kerr Environmental Research Lab.
MONITOR: Leach, Lowell E.
TYPE OF FUNDING: Grant No.-R-805401
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS/Nitrates (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To monitor soil filtration as sewage effluent in a rural area.
APPROACH: The work plan is presented in two parts: (1) a continuation of an experimental study begun in 1976; and (2) an investigation of the feasibility of lengthening the operating season by under-snow fall and winter application. The first experiment is a plot design to compare: (1) drained vs. non-drained site treatment; (2) zero vs. three inches of application per week; and (3) lagoon effluent vs. irrigation ditch water. Pollutant movement in the soil profile into drainage pipe or into groundwater will be monitored. Biomass yield from the plots will be measured.
RESULTS: Winter irrigation possibilities will be investigated in field plots prepared with ridges and furrows of variable depth and spacing on which an ice cover will be formed as support to the snow overburden. As in the first experiments, movement of pollutants through the profile will be monitored.
PROJECT MILESTONES: 8/77 Project initiation.
KEYWORDS: SOILS;FILTRATION;SEWAGE;ENVIRONMENTAL EFFECTS;RURAL AREAS;NITRATES;WASTE DISPOSAL;IRRIGATION;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;CROPS;LAND POLLUTION;SOIL CHEMISTRY;WASTE WATER;SEASONAL VARIATIONS;RECYCLING

<072605>
TITLE: Dissemination of Information Concerning Animal Production Effects on Environmental Quality
PROJECT NUMBER: L-617D-28
PRINCIPAL INVESTIGATOR: Rowe, M.L.
ADDRESS: Ada, OK 74820
AFFILIATION: East Central State Coll., Ada, Okla. (USA)
MONITORING AGENCY: Robert S. Kerr Environmental Research Lab., Ada, Okla. (USA)
MONITOR: Kreis, R. Douglas
TYPE OF FUNDING: Grant No.-R805151-01
77 FUNDING: Environmental Protection Agency FY77:$47,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS

PROJECT DESCRIPTION: This proposal outlines a project aimed at facilitating the dissemination of information pertaining to animal production's impact on environmental quality.
APPROACH: This will be accomplished by searching the literature, abstracting pertinent publications, publishing water-related abstracts in Water Resources Information Abstracts, and submitting a cumulative bibliography of abstracts to the Environmental Protection Agency for publication at the end of each budget period. The publications to be abstracted will be examined for the following topics: (1) The environmental impact of animal production activities on water, ground water, air, soil systems, health, and aesthetics. (2) Feedlot, confinement pen, rangeland, and pasture land management, including animal waste management; the use of chemical fertilizers, manures, green manures, and sewage sludge in conjunction with animal production facilities; the use of pesticides in conjunction with animal production areas or animal production-related areas; and pollution effects of crop residues, soil losses and sediments production from animal production areas to animal production-related areas. (3) Legal, economic and social constraints. (4) Research and development. The project staff will maintain a file copy of all articles which appear in the bibliography. Upon request to the project staff, users will be supplied a copy of individual articles at cost.
PROJECT MILESTONES: (1) 3/77 Initiate project. (2) 2/78 Annual bibliography. (3) 2/79 Annual bibliography. (4) 2/80 Annual bibliography. (5) 2/81 Annual bibliography. (6) 2/82 Final bibliography.
KEYWORDS: DOMESTIC ANIMALS;INDUSTRY;AGRICULTURAL WASTES;ENVIRONMENTAL IMPACTS;ANIMAL BREEDING;DATA COMPILATION;WATER POLLUTION;AIR POLLUTION;SOIL CHEMISTRY;HEALTH HAZARDS;SOCIO-ECONOMIC FACTORS;MANAGEMENT;WASTE MANAGEMENT;FERTILIZERS;MANURES;PESTICIDES;LAND USE;LEGAL ASPECTS;BIBLIOGRAPHIES;INFORMATION RETRIEVAL;NITROGEN COMPOUNDS;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL TRANSPORT

<072606>
TITLE: Animal Production Waste Survey
PROJECT NUMBER: L617D-36
PRINCIPAL INVESTIGATOR: Clark, D.A.
ADDRESS: P.O. Box 1198, Ada, OK 74820
AFFILIATION: Robert S. Kerr Environmental Research Lab., Ada, Okla. (USA)
MONITORING AGENCY: Robert S. Kerr Environmental Research Lab., Ada, Okla. (USA)
DIVISION: Robert S. Kerr Environmental Research Laboratory
MONITOR: Clark, Don A.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To determine differences in animal waste from different regions of the United States. Salt concentration in the waste is of special interest. Results from the survey will be used to determine optimum waste loading rates for land disposal to optimize concentrations of feed additives for the different regions of the United States.
APPROACH: Eight animal production operations were selected from six different regions of the United States. Samples of drinking water, lagoon water, soil, feed, manure, and stockpiled manure from each location are collected and analyzed quarterly. Parameters of analysis are chlorides, total nitrogen, total phosphorous, nitrate, nitrite, carbon oxygen demand, percent moisture, percent residue, and ten selected metals.
RESULTS: Results from four quarters have been tabulated.
PROJECT MILESTONES: (1) 1/76 Project Initiation. (2) 9/78 Final Report.
KEYWORDS: DOMESTIC ANIMALS;WASTE MANAGEMENT;AGRICULTURAL WASTES;CHLORINE;INGESTION;NITROGEN COMPOUNDS;PHOSPHORUS;SALTS;WASTE DISPOSAL;WATER POLLUTION;CHLORIDES;METALS

<072607>
TITLE: Mineralogy of Overburden as related to Groundwater Degradation in the Strip Mining of Coal
PROJECT NUMBER: L-625-B-54
PRINCIPAL INVESTIGATOR: Kloepper, D.C.;Pryberger, J.S.
ADDRESS: P.O. Box 112, Golden, CO 80401
AFFILIATION: Colorado School of Mines, Golden (USA)
MONITORING AGENCY: SEE CODE- 9500683 Environmental Protection Agency, Ada, Okla. (USA). Robert S. Kerr Environmental Research Lab.
DIVISION: Environmental Research Laboratory, ADA, Oklahoma
MONITOR: Newport, Bob
TYPE OF FUNDING: Grant No.-R-804162-01
77 FUNDING: Environmental Protection Agency FY77:$275,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: VISUAL AESTHETICS (50%);SPECIFIED OTHER POLLUTANTS/Ground water degradation (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective is to develop a method of predicting potential ground water degradation in strip coal mining on the basis of the mineralogy of the overburden.
APPROACH: The approach is to determine the mineralogy of cores in undisturbed overburden adjacent to spoil piles which have undergone extensive chemical and biological weathering. Extensive ground water quality data will be gathered from wells drilled through and down-dip from spoil piles. Using this data base, a method of predicting ground water quality in post coal strip mining operations will be developed.
RESULTS: This project was funded on December 22, 1975. Due to adverse climatical conditions in N.W. Colorado, initial drilling, coring and completion operations were delayed until March 22, 1976. Coring operations have been particularly successful except in spoil piles where high percentage core recovery in this unconsolidated material has been difficult to attain. Portable well pumping and sampling equipment utilizing expandable packers for zone isolation has been successfully demonstrated. Lysimeters and associated fluid recovery systems have been installed in selected wells. Well sampling was begun in June 1976. Analytical data generated from the initial samples will consist of over 45 parameters from approximately 25 samples. Mineralogy of core samples are being determined utilizing X-ray diffraction and X-ray fluorescence. The first interim report on this project is on schedule and will be forthcoming in

October 1976. A grant amendment, R-804162-01-01, is directed toward expanding the Scope of Work outlined in existing Grant 804162-01. This amendment will permit several additional mining sites to be studied, thus broadening the data base to include varying mineralogical and climatological conditions and strengthening the accuracy and applicability of the predictive nature of findings formulated in the original grant.
PROJECT MILESTONES: 1/78 Overburden mineralogy--ground water quality correlation.
KEYWORDS: OVERBURDEN;SOIL CHEMISTRY;SURFACE MINING;SPOIL BANKS;WATER POLLUTION;COAL MINING;WATER QUALITY;GROUND WATER;ENVIRONMENTAL EFFECTS;FORECASTING;DATA ACQUISITION;SAMPLING

<072608>
TITLE: Infiltration Land Treatment of Stabilization Pond Effluent
PROJECT NUMBER: L611C-47
PRINCIPAL INVESTIGATOR: Dornbush, J.N.
AFFILIATION: South Dakota State Univ., Brookings (USA)
MONITORING AGENCY: Environmental Protection Agency, Ada, Okla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Enfield, C.G.
77 FUNDING: Environmental Protection Agency FY77:$7,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Specific project objectives are: (1) Demonstrate the use of infiltration-percolation land disposal as a means of up-grading existing secondary treatment to meet new effluent standards. (2) Determine acceptable loading rates for both a scarified and undisturbed soil for climatic conditions similar to those at Brockings, South Dakota. Identify winter operating constraints imposed by the climatic conditions of the site.
APPROACH: Three pilot infiltration-percolation basins of about 1/6 acre each have been constructed with underdrains at a depth of 2-1/2 feet in silty loam soil. The normal ground water depth is about 4 feet. Stabilization pond effluent is applied at weekly intervals in quantities equivalent to a depth of 18 or 24 inches. Samples collected from the influent and effluent drain of each basin are analyzed for BOD5, suspended solids; ammonia, nitrate and kjeldahl nitrogen; ortho and total phosphorus, specific conductance and fecal coliforms. Infiltration rates are determined using automatic float recorders in each basin. Groundwater levels and quality are also monitored for the area.
RESULTS: Data has been collected since June 1975 and a technical progress report has been prepared describing the construction and operation of the unit into the summer of 1976.
PROJECT MILESTONES: 03/77-Evaluate 75 cm soil for wastewater treatment; 03/78-Evaluate 150 cm soil for wastewater treatment.
KEYWORDS: AQUATIC ECOSYSTEMS;PONDS;CONSTRUCTION;DRAWDOWN;SOILS;GROUND WATER;SURFACE WATERS;CHEMICAL COMPOSITION;BIOCHEMICAL OXYGEN DEMAND;AMMONIA;NITRATES;NITROGEN;PHOSPHORUS;SAMPLING;COLIFORMS;MONITORING;SEASONAL VARIATIONS;SEWAGE;GROUND RELEASE;WASTE DISPOSAL;LIQUID WASTES;SOUTH DAKOTA;CLIMATES;POLLUTION REGULATIONS;ENVIRONMENTAL TRANSPORT

<072609>
TITLE: Determination of Kinetics of Phosphorus Mineralization in Soils Under Oxidizing Conditions
PROJECT NUMBER: L611C-48
PRINCIPAL INVESTIGATOR: Ellis, R.;Subbarao, Y.V.
AFFILIATION: Kansas State Univ., Manhattan (USA)
MONITORING AGENCY: Environmental Protection Agency, Ada, Okla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Enfield, C.G.
77 FUNDING: Environmental Protection Agency FY77:$29,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objectives of this research are to determine the kinetics of phosphorus mineralization in soils under oxidizing conditions and to relate these findings to the movement of phosphorus in soils.
APPROACH: The regenerative capacity of soils to fix phosphorus will be studied by determining the influence of rates of application of phosphorus and intervals between application on phosphorus compounds formed and rates of transformation of compounds in soils. The objectives will be accomplished by the following techniques: (1) Determination of phosphate potentials at time intervals for soils to which different rates of phosphorus have been added. Phosphate potentials will be used to identify the phosphorus compounds formed and changes with time. (2) Phosphorus will be added to the soils at different time intervals to determine the best time interval to keep the amount of soluble phosphorus in the soil solution at a minimum to minimize the movement of phosphorus in soils. (3) Sources and solubilities of aluminum, iron, and calcium in the soils will be determined in order to obtain data for these cations which are involved in precipitating phosphorus in soils.
KEYWORDS: SOILS;PHOSPHORUS;OXIDATION;MINERAL CYCLING;PHOSPHORUS COMPOUNDS;TIME DEPENDENCE;SOLUBILITY;ENVIRONMENTAL TRANSPORT;PRECIPITATION;DEPOSITION

<072701>
TITLE: Effects of SO2 and NO/sub x/ on the Soil Ecosystem
PROJECT NUMBER: M602A-1
PRINCIPAL INVESTIGATOR: Alexander, M.
ADDRESS: Department of Agronomy, Ithaca, NY 14853
AFFILIATION: Cornell Univ., Ithaca, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory, Corvallis
MONITOR: Lighthart, Bruce
TELEPHONE: F420-4832;C(503)757-4832
TYPE OF FUNDING: Grant No.-R803691-03
77 FUNDING: Environmental Protection Agency FY77:$46,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x//;NOXIOUS GAS/NO/sub x/ (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The influence of continuous exposure to 5 ppM NO2 on nitrite metabolism and nitrifying

populations will be evaluated using soils with a wide range of pH values.
APPROACH: Experiments will be conducted to assess the effects of continuous exposure of soils to an atmosphere containing low levels of both SO2 and NO2 to determine if there is a synergism. Several agricultural soils will be subjected to a long-term exposure to 1 ppM SO2 and possibly low levels of NO2 to determine whether solubilization of cations takes place. The influence of SO2, NO2, and their solubility products on ammonium-oxidizing and nitrite-oxidizing autotrophic bacteria will be evaluated. For this purpose, respirometric techniques will be employed.
RESULTS: Additional studies will be performed to evaluate in more detail the impact of both SO2 and NO/sub x/ on the nitrogen-fixing activity of blue-green algae indigenous to many soils. Several nitrogen-fixing bacteria will be investigated to establish whether these pollutants suppress nitrogen fixation by heterotrophic populations. Furthermore, the mechanism by which bisulfite and nitrite inhibit blue-green algae will be explored.
PROJECT MILESTONES: 6/78 Final Report.
KEYWORDS: SULFUR DIOXIDE;NITROGEN DIOXIDE;ENVIRONMENTAL IMPACTS;ENVIRONMENTAL TRANSPORT;SOILS;SOIL CHEMISTRY;METABOLISM;CHRONIC INTAKE;AGRICULTURE;BACTERIA;METABOLISM;ALGAE;NITROGEN FIXATION

<072702>
TITLE: Nutrients and Acidity in Wet and Dry Precipitation
PROJECT NUMBER: M-602-A-35
PRINCIPAL INVESTIGATOR: Brezonik, P.L.
ADDRESS: Gainesville, FL 32611
AFFILIATION: Florida Univ., Gainesville (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Maloney, Thomas
TYPE OF FUNDING: Grant No.-R805560-01
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Multiple (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project addresses four aspects of the role of the atmosphere as a source of nutrients, acidity, other substances to water and land ecosystems: (1) quantification of loadings of N, P, acidity and other substances in wet and dry fallout in peninsular north Florida; (2) evaluation of the mechanisms of input-comparison of dry and wet fallout and measurement of gaseous (NH3 and NO2/absorption; (3) documentation of the ecological effects of acid rain on the structure and functioning aquatic ecosystems and of the effects of atmospheric nutrients on lake productivity; and (4) evaluation quantification and modeling of the factors affecting atmospheric fluxes of nutrients and acidity.
APPROACH: (1) A small network of sampling stations is being established for objectives and (2). Detailed studies of rainfall composition in comparison with ambient air quality (particularly for atmospheric nitrogen forms) will provide the basis for models of nitrogen transformation and transport through the atmosphere and deposition via rainout, fallout and gaseous absorption. Lakes in north central Florida will be sampled and studied to determine the extent of acidification caused by acid rainfall (mean pH of rainfall in Gainesville, Florida from June, 1976, to June, 1977, is 4.45).
RESULTS: Studies will be done to determine effects of acidification on the lake biota and on productivity, organic decomposition and mineral cycling.
PROJECT MILESTONES: 08/79 Final Report.
KEYWORDS: NUTRIENTS;PH VALUE;ATMOSPHERIC PRECIPITATIONS;PRECIPITATION SCAVENGING;NITROGEN;AIR POLLUTION;AMMONIA;DEPOSITION;QUANTITATIVE CHEMICAL ANALYSIS;ACID RAIN;AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;ENVIRONMENTAL IMPACTS;ENVIRONMENTAL TRANSPORT;FLORIDA;WATER QUALITY;LAKES;MINERAL CYCLING;BIODEGRADATION;DECOMPOSITION

<072703>
TITLE: Seasonal Cycles in Body Composition, Organ System Function, and Energetics of Grassland Birds Near Colstrip, Montana
PROJECT NUMBER: M-625-A-36
PRINCIPAL INVESTIGATOR: Morton, M.L.
ADDRESS: Department of Biology, Los Angeles, CA 90041
AFFILIATION: Occidental Coll., Los Angeles, Calif. (USA). Dept. of Biology
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory, Corvallis
MONITOR: Preston, Eric M.
TELEPHONE: C(503) 757-4636
TYPE OF FUNDING: Grant No.-R805581-01
77 FUNDING: Environmental Protection Agency FY77:$47,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Photochemical oxidants (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: In 1974 the Environmental Protection Agency (EPA) began a long-term study of air pollution effects on the grassland ecosystem near coal-fired power plants at Colstrip, Montana. This study is broad in scope but one particular aspect, of concern here, has been on the potential of birds as bioindicators of pollution.
APPROACH: In the three year period, 1974-76, many avian specimens were collected in the Colstrip area by EPA personnel and large quantities of data were gathered on seasonal cycles in body composition, organ system function, and bioenergetics. Since the power plants did not become functional until 1975 and 1976, these data have the potential of providing a solid base of information that can be used to quantify pollution effects which may accrue in the future. At this time, however, many of the collected bird specimens have not undergone laboratory processing nor has existing data been pulled together in useful form.
RESULTS: It is the purpose of the study proposed herein to complete the necessary laboratory procedures on stored specimens, make additional collections, if necessary, to fill informational gaps, compile and

evaluate all pertinent data, and construct a final report of sufficient scope and detail that will constitute an effective documentation of biological function in grassland birds of the Colstrip area.
PROJECT MILESTONES: 9/78 Final Report.
WORDS: BIOCHEMISTRY;ENZYMES;PLANTS;BIRDS;SEASONAL VARIATIONS;MONTANA;TERRESTRIAL ECOSYSTEMS;COAL GASIFICATION;PHOTOCHEMICAL OXIDANTS;PHYSIOLOGY;BIOLOGICAL EFFECTS;GASEOUS WASTES

<072704>
TITLE: Impact of Ambient Oxidant Pollutants on the Mixed Conifer Forest Ecosystem
PROJECT NUMBER: M-602-A-45
PRINCIPAL INVESTIGATOR: Taylor, C.O.
ADDRESS: Riverside, CA 92502
AFFILIATION: California Univ., Riverside (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITOR: Wilhour, Raymond G.
TELEPHONE: C(503)757-4634;FTS-420-4634
TYPE OF FUNDING: Contract No.-68-03-2442
77 FUNDING: Environmental Protection Agency FY77:$46,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Photochemical oxidants (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the effect of long term exposure to oxidant air pollutants on a western coniferous forest ecosystem and to develop predictive models for the system.
APPROACH: Nineteen major plots were established along a 35 mile long transect with an oxidant pollutant gradient. Several other smaller satellite plots have also been established for special studies and one large plot is used to study tree mortality. A monitoring network is established to record climate and pollutant conditions. Other subprojects designed to evaluate pollutant effects include: tree growth, rating of visible pollutant injury on major tree species; population dynamics study with bark beetle; measure rate of accumulation and decomposition of litter; measure precipitation, soil moisture, and soil temperature; measure reproduction (cone and seed production) of major pine species known to be affected by the pollutants; evaluate the response of pathogenic organisms to air pollutants; determine rate of new seedling establishment and identify organisms responsible for damping-off; evaluate mortality of tree species and describe successional patterns.
RESULTS: Data collected will be stored in an established data management system and will be used in the development and testing of predictive models.
PROJECT MILESTONES: 8/77 Final report.
KEYWORDS: AIR;PHOTOCHEMICAL OXIDANTS;BIOLOGICAL EFFECTS;PINES;CHRONIC INTAKE;BIOLOGICAL MODELS;ENVIRONMENTAL IMPACTS;MORTALITY;PLANT GROWTH;POPULATION DYNAMICS;DISEASES;BIOMASS;REPRODUCTION;DATA ACQUISITION SYSTEMS;SOILS;TERRESTRIAL ECOSYSTEMS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;PLANTS

<072705>
TITLE: Impact of Oxidants Air Pollutants on a Western Coniferous Forest Ecosystem
PROJECT NUMBER: M-602-A-46
PRINCIPAL INVESTIGATOR: Taylor, C.O.
ADDRESS: Riverside, CA 92502
AFFILIATION: California Univ., Riverside (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITOR: Wilhour, Raymond G.
TELEPHONE: C(503)757-4634;FTS-420-4634
TYPE OF FUNDING: Contract No.-68-03-0273
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Photochemical oxidants (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine the effect of long term exposure to oxidant air pollutants on a western coniferous forest ecosystem and to develop predictive models for the system.
APPROACH: Nineteen major plots were established along a 35 mile long transect with an oxidant pollutant gradient. Several other smaller satellite plots have also been established for special studies and one large plot is used to study tree mortality. A monitoring network is established to record climate and pollutant conditions. Other subprojects designed to evaluate pollutant effects include: tree growth, rating of visible pollutant injury on major tree species; population dynamics study with bark beetle; measure rate of accumulation and decomposition of litter; measure precipitation, soil moisture, and soil temperature; measure reproduction (cone and seed production) of major pine species known to be affected by the pollutants; determine rate of new seedling establishment and identify organisms responsible for damping-off; evaluate mortality of tree species and describe successional patterns.
RESULTS: Data collected will be stored in an established data management system and will be used in the development and testing of predictive models.
PROJECT MILESTONES: 8/76 Final report.
KEYWORDS: PHOTOCHEMICAL OXIDANTS;PINES;FORESTS;BIOLOGICAL MODELS;BIOLOGICAL EFFECTS;OXIDATION;PHOTOSYNTHESIS;PLANTS

<072706>
TITLE: Impact of Oxidant Air Pollution on a Western Coniferous Ecosystem
PROJECT NUMBER: M-602-A-52
PRINCIPAL INVESTIGATOR: Conrad, G.
ADDRESS: 110 N. Wabash, Glendora, CA 91740
AFFILIATION: Forest Service, Berkeley, Calif. (USA). Pacific Southwest Forest and Range Experiment Station
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Wilhowr, Raymond G.
TELEPHONE: F420-4634;C(503)757-4634
TYPE OF FUNDING: Interagency agreement-IAG-D7-0561
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Photochemical oxidants (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Air pollutant concentrations and durations, meteorological variables and other environmental factors must be measured near vegetation study plots in the San Bernardino Mountains in order to determine their single and interactive controlling influences in the case of morbidity and mortality of forest vegetation along a gradient of decreasing oxidant dosage.
APPROACH: The influences of interacting variables must be interpreted at the organism and community levels, with particular emphasis on successional trends in the mixed conifer forest of the San Bernardino Mountains long stressed by chronic oxidant damage.
PROJECT MILESTONES: (1) 5/79 Final Report.
KEYWORDS: PHOTOCHEMICAL OXIDANTS;BIOLOGICAL EFFECTS;TERRESTRIAL ECOSYSTEMS;EARTH ATMOSPHERE;AIR POLLUTION;PHOTOSYNTHESIS;FORESTS;PLANTS

<072707>
TITLE: Develop Analytical Methodologies Useful for Environmental and Energy Research Problems
PROJECT NUMBER: M-602-A-58
PRINCIPAL INVESTIGATOR: Fassel, V.A.
ADDRESS: 9800 S. Cass Avenue, Argonne, IL 60439
AFFILIATION: Ames Lab., Iowa (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITOR: Feldman, Milton H.
TELEPHONE: F420-4370
TYPE OF FUNDING: Interagency agreement-IAG-D7-F975
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The ERDA shall furnish the services of a mutually acceptable scientist, on site at CERL, to perform services which include, but are not necessarily limited to, the following:
APPROACH: (A) Participate in existing programs at CERL in development of analytical methodologies useful for environmental and energy development research problems. Utilize advanced technologies such as plasma emission spectroscopy, ESCA and AES, mass spectroscopy (computerized) and others, all anticipated as essential tools in the chemistry problems inherent in environmental and energy resource problems. (B) Participate in developmental work in chemical dissolutions and separations; environmental sample chemical analysis where special handling problems occur, e.g., saline waters, waters with particulate content, and sample type preservation probelms.
PROJECT MILESTONES: 2/78 Final report.
KEYWORDS: METALS;PARTICLES;AEROSOLS;HYDROCARBONS;CHEMICAL ANALYSIS;MEASURING METHODS;TECHNOLOGY ASSESSMENT;AEROSOL MONITORING;SAMPLING;SAMPLE PREPARATION;WATER POLLUTION;PRESERVATION;AIR POLLUTION;MASS SPECTROSCOPY;SEPARATION PROCESSES;CHEMICAL EFFLUENTS

<072708>
TITLE: The Nature of Plant Resistance to Air Pollution Effects
PROJECT NUMBER: M-602-A-85
PRINCIPAL INVESTIGATOR: Tingey, D.T.
ADDRESS: 200 S.W. 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory, Corvallis
MONITOR: Tingey, David T.
TELEPHONE: F420-4621;C(503)757-4621
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$39,200
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Research is being conducted to identify and quantify the nature of plant resistance to ozone and sulfur dioxide. Plant resistance is apparently the result of the interplay of three factors: (1) pollutant penetration into the leaf; (2) metabolic processes repairing air pollution injury; and (3) metabolic processes causing lesion formation. Studies are being conducted on pollutant penetration into the leaf to determine if plant resistance is related to a reduced pollutant dose at the cellular level. The influence of stomatal resistance, and mesophyll resistance, the formation and amount of intercellular spaces, and internal cutin is being studied. Metabolic repair processes are also being studied by determining the pool levels of metabolites, energy charge levels, the mile fraction of NAD (p)H, protein

and lipid turnover rate and the activities of bio-synthetic enzymes. The processes of lesion formation, involving the activities of oxidative enzymes and enzymes involved in the formation of secondary metabolites such as phenols, flavones, coumarins and tannins are being determined. Also, metabolite pool levels that are increased or new metabolites that are formed as a result of pollution stress are being studied.
PROJECT MILESTONES: (1) 6/77 Complete analysis of 1976 field study. (2) 6/78 Complete analysis of 1977 field study. (3) 7/79 Report on dose-response curves for the effect of ozone on nitrogen fixation and forage quality. (4) 7/82 Final Report.
KEYWORDS: AIR POLLUTION;BIOLOGICAL EFFECTS;PLANTS;PHYSIOLOGY;SULFUR DIOXIDE;OZONE;BIOLOGICAL REPAIR;DOSE-RESPONSE RELATIONSHIPS;METABOLISM;ENZYMES;EARTH ATMOSPHERE

<072709>
TITLE: Response of Scotch Pine to Acid Mist Droplets Effect in Producing Short Needle and/or Stunted Growth
PROJECT NUMBER: M-602-A-78
PRINCIPAL INVESTIGATOR: Hindawi, I.J.
ADDRESS: 200 SW 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory-Corvallis
MONITOR: Hindawi, Ibrahim J.
TELEPHONE: F420-4669;C(503)757-4669
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$42,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Sulfuric acid (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To find out the critical stage of scotch pine needle development prior to and during the break of the dormancy with relation to pH2 sulfuric acid droplets in producing short needle and/or stunted growth.
APPROACH: One hundred and forty-four (144) two-year old scotch pine planted in ten-inch diameter plastic pots filled with Jiffy mix. Plants will be inoculated with acid droplets pH2 at 10-day intervals, after 10, 20, 30 and 40 days of treatment. This experiment will be started February 2, 1976 through May 21, 1976. (1) 1st group (36) plants will be exposed 2/02 to 3/29. (2) 2nd group (36) plants will be exposed 2/16 to 4/23. (3) 3rd group (36) plants will be exposed 3/01 to 5/07. (4) 4th group (36) plants will be exposed 3/15 to 5/21.
RESULTS: Results will be evaluated with factorial analysis of variance.
PROJECT MILESTONES: 06/77 Final Report.
KEYWORDS: PINES;SULFURIC ACID;ACID RAIN;ATMOSPHERIC PRECIPITATIONS;DOSE-RESPONSE RELATIONSHIPS;LEAVES;PLANT GROWTH;ENVIRONMENTAL IMPACTS;BIOLOGICAL EFFECTS;FORESTS

<072710>
TITLE: Response of Scotch Pine to Sulfuric Acid Mist at Various
PROJECT NUMBER: M-602-A-79
PRINCIPAL INVESTIGATOR: Hindawi, I.J.
ADDRESS: 200 SW 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory, Corvallis
MONITOR: Hindawi, Ibrahim J.
TELEPHONE: F420-4669;C(503)757-4669
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfuric acid (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To find out: (1) the critical acid mist pH in producing the short needle syndrome and tip injury; and (2) to determine the effect of sulfuric acid aerosol on soil pH during the term exposure studies and to evaluate whether pH soil changes influence plant growth during needle development and to determine if pH soil changes affect the calcium balance in soil, thereby leaching nutrients from leaves and influencing growth during the advanced stages of plant development.
APPROACH: Two-year old scotch pine were planted in ten-inch diameter plastic pots filled with Jiffy mix. The experimental design is involved in six pH treatments (1.5, 2.5, 3.5, 4.5, 5.5 and 6.5) x 3 plant varieties x 8 plants each = 144 plants. This experiment will be started several weeks prior to the break of the dormancy. Plant exposure date will be from March 1976 to April 30, 1976 (one hour a day and five times a week). Results will be evaluated with factorial analysis of variance.
PROJECT MILESTONES: 06/77 Final Report.
KEYWORDS: PINES;SULFURIC ACID;ACID RAIN;AIR POLLUTION;ENVIRONMENTAL IMPACTS;LEAVES;PLANT GROWTH;SULFUR DIOXIDE;ENVIRONMENTAL TRANSPORT;FORESTS;EARTH ATMOSPHERE

<072711>
TITLE: Controlled Field Studies to Strengthen Secondary Air Quality Standards for Sulfur Dioxide
PROJECT NUMBER: M-602-A-80
PRINCIPAL INVESTIGATOR: Wilhour, R.G.
ADDRESS: 200 SW 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory, Corvallis
MONITOR: Neely, Grady E.

TELEPHONE: F420-4638;C(503)757-4638
77 FUNDING: Environmental Protection Agency FY77:$11,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2;NOXIOUS GAS/Photochemical oxidants (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this research project is to develop a realistic appraisal of the relationship between plant growth or yield and ambient SO2 exposure.
APPROACH: The research approach is to develop mathematical models for stochastically varying pollutant concentrations, then expose plants over a growing season to a simulated stochastic variation in pollutant concentration, and finally relate the parameters of the stochastic pollutant model to plant growth. A stochastic model was developed which simulates ambient SO2 regimes emitted from area sources. The original model had two parameters: (1) medial SO2 concentrations and (2) standard geometric deviation of the SO2 concentration. A specially designed field exposure system was used to expose 8 plant species (lettuce, onion, radish, snap bean, table beet, alfalfa, Ponderosa Pine, and Douglas Fir) to a stochastically varying SO2 concentration at median concentrations of 2, 6, 15, 20, and 30. The standard geometric deviation parameter was maintained constant at a value estimated for sampled metropolitan sources. Two levels of ozone (0, and 5 pphm) were also introduced as an interacting additional stressor. The data for the abcve research have been analyzed and are being incorporated into a manuscript under preparation. The objective of the second season (1975) of the continuing experiment was to determine the relationship of variable ozone concentrations and variable standard geometric SO2 deviations. Uncontrolled cultural variables caused great variability between treatments.
PROJECT MILESTONES: 11/76 Final Report.
KEYWORDS: SULFUR DIOXIDE;AIR QUALITY;STANDARDS;PHOTOCHEMICAL OXIDANTS;PLANT GROWTH;ENVIRONMENTAL IMPACTS;BIOLOGICAL MODELS;CROPS;PLANTS;LETTUCE;ONIONS;BEANS;RADISHES;BEETS;ALFALFA;PINES;OZONE;TREES

<072712>
TITLE: Exposure of Ponderosa Pine and Douglas Fir to SO2 During Dormancy
PROJECT NUMBER: M-602-A-82
PRINCIPAL INVESTIGATOR: Wilhour, R.G.
ADDRESS: 200 SW 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory, Corvallis
MONITOR: Wilhour, Raymond G.
TELEPHONE: F420-4634;C(503)757-4634
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$5,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Photochemical oxidants (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The purpose of this research is to determine the sensitivity of Ponderosa Pine and Douglas Fir to variable SO2 exposures administered during the winter season (dormant period).
APPROACH: The two coniferous species were exposed to 0, 2, 6, 10, 15 or 20 pphm SO2 constantly during the (1974-75) winter months. They were transplanted the following spring in a randomized block design at O.S.U.'s Schmidt Research Farm. The seedlings were maintained under field conditions for the remainder of the growing season. The following winter the seedlings were removed in their entirety from the growing area. The roots were washed and the seedlings were separated into roots, new lateral growth, new terminal growth, and old growth. All parts were oven dried at a uniform 70C temperature and bagged in heavy polyethylene bags to prevent absorption of atmospheric moisture.
RESULTS: The following growth parameters will be estimated: (1) Oven dry weight (ODW) new stem plus new needles, (2) ODW new stem, (3) ODW lateral stems and needles, (4) ODW lateral stems, (5) ODW old stem, (6) ODW terminal buds, (7) length new main stem, and (8) length old main stem, (9) ODW roots.
PROJECT MILESTONES: 03/77 Final Report.
KEYWORDS: PINES;PHOTOCHEMICAL OXIDANTS;SULFUR DIOXIDE;ENVIRONMENTAL IMPACTS;PLANT GROWTH;SEASONAL VARIATIONS

<072713>
TITLE: Effects of Acid Rain on Model Forest Ecosystems
PROJECT NUMBER: M-602-A-84
PRINCIPAL INVESTIGATOR: Weber, D.E.
ADDRESS: 200 SW 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory, Corvallis
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Acid rain (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine the effects of acid rain at different degrees of acidity on processes associated with two experimental ecosystems.
APPROACH: Ecosystem plots consisting of water-sealed enclosures (2.3 m2) have been established in the field to evaluate the effects of acid rain. The plots contain forest soil and two tree species--sugar maple or red alder. A litter layer of the respective trees has been added to the soil surface. In this three year study simulated rain treatments at levels of acidity typical of average values for the United States and at a level representing a possible increase in acidity are applied to the ecosystem plots. Measurements of water flow, decomposition, and plant growth are included to examine the effects of acid rain on nutrient

cycling and plant-soil processes.
RESULTS: This research will provide the framework for the development of simulation and predictive models.
PROJECT MILESTONES: (1) 08/78 Develop mathematical model for total forest ecosystem and for specific components of forest ecosystem. (2) 03/80 Final Report.
WORDS: ACID RAIN;TERRESTRIAL ECOSYSTEMS;FORESTS;BIOLOGICAL MODELS;ENVIRONMENTAL IMPACTS;SULFURIC ACID;SOILS;WATER;PLANTS

<072714>
TITLE: Production of Ethylene and Other Hydrocarbons by Plants
PROJECT NUMBER: M-602-A-86
PRINCIPAL INVESTIGATOR: Tingey, D.T.
ADDRESS: 200 SW 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory-Corvallis
MONITOR: Tingey, David T.
TELEPHONE: F420-4621;C(503)757-4621
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$16,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Research is being conducted to identify and measure the rate of production of ethylene and other hydrocarbons by plants. The objective of the study is to determine the influence of environmental and atmospheric stresses of the production of stress ethylene or other organic volatiles can be used as a means of measuring plant response to stresses.
PROJECT MILESTONES: (1) 08/77 Report on determination if stress ethylene can be used to measure stress from pollutants other than ozone. (2) 07/80 Final Reports.
KEYWORDS: PLANTS;ETHYLENE;HYDROCARBONS;PHOTOSYNTHESIS;BIOSYNTHESIS;BIOLOGICAL STRESS;BIOLOGICAL INDICATORS;AIR POLLUTION

<072715>
TITLE: Toxic Effects of Selected Inorganic Pollutants on Western Aquatic Species
PROJECT NUMBER: M-608-A-71
PRINCIPAL INVESTIGATOR: Miller, W.E.
ADDRESS: 200 S.W. 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory, Corvallis
MONITOR: Miller, W.E.
TELEPHONE: F420-4775
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$42,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Field and laboratory research will be conducted to determine relationships between pollutant concentration and ecological effects.
APPROACH: Single-toxicant and complex wastes will be utilized in the laboratory research using a variety of aquatic organisms. Field studies will be conducted to corroborate laboratory data, using as indices, ecological effects levels, tissue toxicant levels, and toxicant concentrations and forms. Emphasis will be on aquatic forms of established importance and sensitivity (e.g., aquatic insects, zooplankton, salmonid and other important fishes); ecosystem effects will be inherent in the field studies and would be included in post-feasibility studies in laboratory streams or similar laboratory ecosystems. Another phase of the research will be conducted to define, quantify and predict the toxic effects of inorganic pollutants originating from non-point sources and non-renewable energy resource wastes upon the growth of representative algae and invertebrates. Effects of synergistic and antagonistic phenomena as well as bioaccumulation of inorganic pollutants within aquatic ecosystems will be investigated.
PROJECT MILESTONES: 09/81 Final Report.
KEYWORDS: AQUATIC ORGANISMS;AQUATIC ECOSYSTEMS;WATER POLLUTION;TOXICITY;BIOLOGICAL MODELS;SYNERGISM;BIOLOGICAL ACCUMULATION;FISHES;ENERGY SOURCE DEVELOPMENT;WASTE MANAGEMENT;BIOLOGICAL EFFECTS;INORGANIC COMPOUNDS

<072716>
TITLE: Toxic Effects of Selected Organic Pollutants on Western U.S. Aquatic Species
PROJECT NUMBER: M-608A-73
PRINCIPAL INVESTIGATOR: Miller, W.E.
ADDRESS: 200 S.W. 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Miller, William E.
TELEPHONE: C(503)757-4775
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$42,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS (33%);METALS (33%);PARTICULATES (34%)
CHARACTER OF STUDY: RESEARCH (50%);DEVELOPMENT (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT

PROJECT DESCRIPTION: Research will be conducted to design, develop and apply bioscreening techniques to define the effects of organic compounds, origination from non-point and non-renewable energy waste sources, upon the growth of selected algae and invertebrates.
APPROACH: These studies will include the evaluation of the toxicity of herbicides, pesticides and other synthetic organic compounds upon the life cycle of algae and invertebrates under both laboratory and field conditions. Evaluation of rapid bioscreening toxicity techniques such as use of bioluminescent organisms will also be undertaken.
PROJECT MILESTONES: 09/81 Final Report.
KEYWORDS: AQUATIC ECOSYSTEMS;TOXICITY;BIOLOGICAL EFFECTS;ENVIRONMENTAL TRANSPORT;BIOASSAY;ORGANIC COMPOUNDS;ALGAE;INVERTEBRATES;HERBICIDES;PESTICIDES;ENVIRONMENTAL IMPACTS;COMBUSTION PRODUCTS

<072717>
TITLE: Alaskan Oil Seeps: Their Chemical and Biological Effects on the Environment
PROJECT NUMBER: M-625A-3
PRINCIPAL INVESTIGATOR: Shaw, D.G.
ADDRESS: Institute of Marine Science, Fairbanks, AK 99701
AFFILIATION: Alaska Univ., Fairbanks (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Lotspeich, Frederick B.
TELEPHONE: C(907)479-7728
TYPE OF FUNDING: Grant No.-R-803922-03
77 FUNDING: Environmental Protection Agency FY77:$123,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oil seepage (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Objective is to relate a defined chronic input of petroleum in an intertidal environment to biological changes at the organism and community levels.
APPROACH: The project will investigate oil seeps along the Gulf of Alaska that provide long-term, low-level input of petroleum into the marine intertidal environment.
PROJECT MILESTONES: 5/78 Final Report.
KEYWORDS: ALASKA;OIL SPILLS;CHEMICAL REACTIONS;PETROLEUM;WATER POLLUTION;BIOLOGICAL EFFECTS;AQUATIC ORGANISMS;POPULATION DYNAMICS;CHRONIC INTAKE;AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;ARCTIC REGIONS;TOXICITY;FISHES;PHYSIOLOGY;ENVIRONMENTAL IMPACTS

<072718>
TITLE: Assessment of the Effects of Bottom Disturbance on the Environment of a Clear Subarctic Stream
PROJECT NUMBER: M625A-4
PRINCIPAL INVESTIGATOR: Morrow, J.E.
ADDRESS: Division of Life Sciences, Fairbanks, AK 99701
AFFILIATION: Alaska Univ., Fairbanks (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Schallock, Eldor W.
TELEPHONE: C(907)479-7728
TYPE OF FUNDING: Grant No.-R-803945-03
77 FUNDING: Environmental Protection Agency FY77:$33,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The effects of a buried pipeline crossing in the Chatanika River are being monitored.
APPROACH: Parameters considered are: (1) Type and rate of flow; (2) Oxygen and carbon dioxide content of water; (3) Water Temperature; (4) Size type and distribution of stream bottom particles; (5) Intra-gravel water flow and chemistry; (6) Quantity and diversity of animal and plant organisms; (7) Organic drift; (8) Primary productivity. Items (1) through (5) are handled by personnel of the Arctic Environmental Research Laboratory, EPA.
RESULTS: Results thus far indicate some siltation downstream from the crossing; loss of a small spawning ground for longnose sucker downstream from the crossing; some increase in organic drift; temporary increase in primary productivity below as compared with above the crossing. It is planned to monitor these factors for another year to determine whether the observed effects are permanent or temporary.
PROJECT MILESTONES: 7/78 Final Report.
KEYWORDS: PIPELINES;ENVIRONMENTAL IMPACTS;SEDIMENTS;OXYGEN;CARBON DIOXIDE;WATER QUALITY;PARTICLES;PARTICLE SIZE;FLOW RATE;AQUATIC ORGANISMS;POPULATION DYNAMICS;ARCTIC REGIONS;HYDROCARBONS;FISHES;REPRODUCTION;WATER;SEDIMENTATION;MONITORING;PETROLEUM;NATURAL GAS

<072719>
TITLE: Effects of Non-Gaseous Airborne Pollutants from Coal-Fired Power Plants
PROJECT NUMBER: M625A-5
PRINCIPAL INVESTIGATOR: Landa, E.R.
ADDRESS: Department of Soil Science, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA). Dept. of Soil Science
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Preston, Eric
TYPE OF FUNDING: Grant No.-R-803948-02
77 FUNDING: Environmental Protection Agency FY77:$83,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Heavy (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND

EFFECTS
PROJECT DESCRIPTION: Investigate selected effects of stack emissions associated with coal-burning on plant growth and metabolism.
KEYWORDS: NONGASEOUS;CHEMICAL EFFLUENTS;PARTICLES;AEROSOLS;FLY ASH;FOSSIL-FUEL POWER PLANTS;COAL;STACK DISPOSAL;ENVIRONMENTAL IMPACTS;PLANTS;METABOLISM;HYDROCARBONS;PLANT GROWTH;SOLID WASTES

<072720>
TITLE: Effects of Chronic SO2 Fumigation on Primary Producers and Invertebrate Consumers in a Mixed Prairie Ecosystem
PROJECT NUMBER: M625A-19
PRINCIPAL INVESTIGATOR: Dodd, J.L.;Lavenroth, W.K.
ADDRESS: Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
TYPE OF FUNDING: Grant No.-R-805320-01
77 FUNDING: Environmental Protection Agency FY77:$163,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to assess the effects of chronic sulfur dioxide fumigation on primary producers and invertebrate consumers in a mixed prairie ecosystem.
APPROACH: Field experiments are designed to (1)characterize physiological responses of western wheatgrass to four SO2 exposure levels, (2) relate physiological responses to whole plant growth and population dynamics of western wheatgrass on each treatment area; (3) investigate the relationships between physiological status of western wheatgrass and infrared reflections.
RESULTS: Laboratory experiments support and amplify the field experiments. These experiments will be conducted in controlled environment plant growth chambers. These experiments are designed to: (1) characterize the physiological response of western wheatgrass to SO2 fumigation within a minor range of environmental conditions, and (2) determine the relationship between internal sulfur status of western wheatgrass and physiological responses. Variables to be measured include gross photosynthesis, net photosynthesis, photospiration, dark respiration, plant and leaf water potential, stomata diffusion resistance and leaf temperatures.
PROJECT MILESTONES: 6/80 Final Report.
KEYWORDS: SULFUR DIOXIDE;ENVIRONMENTAL IMPACTS;FUMIGANTS;BIOLOGICAL EFFECTS;CHRONIC INTAKE;TERRESTRIAL ECOSYSTEMS;PLANT GROWTH;POPULATION DYNAMICS;GRASS;WHEAT;PHYSIOLOGY;FOOD CHAINS;PHOTOSYNTHESIS;RESPIRATION;WATER;INVERTEBRATES

<072721>
TITLE: Use of Lichens as Predictors and Indicators of Air Pollution from a Coal-Fired Power Plant
PROJECT NUMBER: M625A-20
PRINCIPAL INVESTIGATOR: Eversman, S.
ADDRESS: Biology Department, Bozeman, MT 59715
AFFILIATION: Montana State Univ., Bozeman (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Preston, Eric
TELEPHONE: C(503) 757-9636
TYPE OF FUNDING: Grant No.-R-805367-01
77 FUNDING: Environmental Protection Agency FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SOx (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Two lichen species native to southeast Montana showed reduced respiration rates and algal cell plasmolysis and bleaching when exposed to 0.02, 0.04, and 0.07 ppm SO2 (geometric means) on a field fumigation site. The major objective of the current project is to collect these same two lichen species to be observed as biological monitors of SO2 emissions from two coal-fired power plants in Colstrip, Montana.
APPROACH: Lichen community information is also being collected in order to detect any changes in epiphytic and soil lichen communities as coal burning proceeds in this area.
RESULTS: All the lichen information will be integrated with plant community data gathered by other researchers in the area in order to determine effects of SO2 emissions (and other coal-burning pollutants) on Ponderosa pine-grassland ecosystems.
PROJECT MILESTONES: 7/80 Final Report.
KEYWORDS: AIR POLLUTION;BIOLOGICAL INDICATORS;FOSSIL-FUEL POWER PLANTS;BIOLOGICAL EFFECTS;FLUE GAS;MONITORING;FORECASTING;ENVIRONMENTAL IMPACTS;LICHENS;PHYSIOLOGY;TERRESTRIAL ECOSYSTEMS;EARTH ATMOSPHERE;HYDROCARBONS;SULFUR DIOXIDE;ECOLOGICAL CONCENTRATION

<072722>
TITLE: Investigation of the Effects of Coal-Fired Power Plant Emission on Tissue Structure of Selected Bird Species: Birds as Indicators
PROJECT NUMBER: M625A-21
PRINCIPAL INVESTIGATOR: Kern, M.D.
ADDRESS: Biology Department, Wooster, OH 44691
AFFILIATION: Wooster Coll., Ohio (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Preston, Eric
TELEPHONE: C(503) 757-4636;F420-4636
TYPE OF FUNDING: Grant No.-R-805370-01

77 FUNDING: Environmental Protection Agency FY77:$27,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Photochemical oxidants (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this project is to identify species of grassland birds and/or their organ-systems which are particularly sensitive to the emissions of coal-fired power plants and can be used to monitor and indicate air quality; and predict the impact of chronic, low-level, non-lethal stack emissions on the surrounding ecosystem.
APPROACH: The study site is a grassland ecosystem in Colstrip, Montana, in which two coal-fired power plants operate. Representative grassland birds selected for study at the site are the Western Meadowlark (Sturnella neglecta), Mourning Dove (Zenaidura macroura), Lark Bunting (Calamospiza melanocorys), Vesper Sparrow (Pooecetes gramineus), and Lark Sparrow (Chondestes grammacus). In each case, the histology of the following tissues is examined before (1975-1976) and after (1976-1979) the power plants have gone on-line: (1) tissues which are stress indicators: the adrenal and thyroid glands; (2) tissues which belong to the immune system: the bursa of Fabricius, thymus, and spleen; (3) detoxifying tissues: the liver, kidney, and lung and (4) reproductive tissues: the testis, ovary, and oviduct.
RESULTS: This histological information will be integrated with (1) measures of carcass and tissue composition and other gross measurements made on the same birds, and (2) information on the air quality, weather, and other organisms in the same impacted ecosystem, in order to identify relationships which are useful for (1) predicting the biological effects of given rates of pollution challenge, and (2) siting coal-fired power plants in the Great Plains region.
PROJECT MILESTONES: 7/80 Final Report.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL IMPACTS;AIR POLLUTION;BIOLOGICAL INDICATORS;BIRDS;PHYSIOLOGY;PLANTS;BIOCHEMISTRY;BIOPSY;SENSITIVITY;AIR QUALITY;CHRONIC INTAKE;STACK DISPOSAL;MONTANA;BIOLOGICAL STRESS;ADRENAL GLANDS;THYROID;THYMUS;SPLEEN;LIVER;KIDNEYS;LUNGS;TESTES;OVARIES;BIOLOGICAL EFFECTS;SITE SELECTION

<072723>
TITLE: Monitoring Plant Community Changes Due to Fossil Fuel Power Plants in Southeastern Montana
PROJECT NUMBER: M625A-23
PRINCIPAL INVESTIGATOR: Taylor, J.E.
ADDRESS: Department of Animal and Range Sciences, Bozeman, MT 59715
AFFILIATION: Montana State Univ., Bozeman (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Preston, Eric
TELEPHONE: C(503) 757-4636
TYPE OF FUNDING: Grant No.-R-805391-01
77 FUNDING: Environmental Protection Agency FY77:$53,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/80/sub x/ (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (a) To continue to monitor air pollution effects upon native grassland vegetation in areas affected by fossil fuel power plants and on areas artificially stressed with air pollutants; (b) To supply baseline inventory information, including aerial photography and its interpretation, to a variety of scientists, land users and managers in southeastern Montana; (c) To provide rigorous data for simulation models which can be used to predict bioenvironmental changes due to fossil fuel power generation in other areas.
APPROACH: Aerial and ground photography, species diversity (number and cover), and phenology will be related to pollution stresses and ''normal'' variation in community structure.
RESULTS: Two years' additional field observations will be incorporated into the coal-fired power plant protocol and a vegetational monitoring system.
PROJECT MILESTONES: 7/80 Final Report.
KEYWORDS: PLANTS;PHYSIOLOGY;SULFUR DIOXIDE;BIOLOGICAL INDICATORS;HYDROCARBONS;AIR POLLUTION;SIMULATION;BIOLOGICAL EFFECTS;AERIAL MONITORING;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL IMPACTS;MONTANA;BASELINE ECOLOGY;LAND USE;MONITORING

<072724>
TITLE: Oil Spills: Effect on Arctic Lake Systems
PROJECT NUMBER: M625-31
PRINCIPAL INVESTIGATOR: Barsdate, R.
ADDRESS: Institute of Marine Science, Fairbanks, AK 99701
AFFILIATION: Alaska Univ., Fairbanks (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Gordon, Ronald C.
TELEPHONE: C(707) 479-7232
TYPE OF FUNDING: Grant No.-R-804152-03
77 FUNDING: Environmental Protection Agency FY77:$156,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: ORGANICS/Protes bacteria (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Other hydrographic areas Alaskan lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to assess the effects of crude oil on high latitude aquatic environments with emphasis on the effects of oil on high latitude arctic lakes.
APPROACH: The principal activity will be the application of a moderate scale experimental crude oil spill to

an arctic lake in order to observe the impact and recovery of various trophic levels from bacteria through fish.
PROJECT MILESTONES: 7/78 Final Report.
ORDS: OIL SPILLS;WATER POLLUTION;ARCTIC REGIONS;LAKES;PETROLEUM;ENVIRONMENTAL TRANSPORT;AQUATIC COSYSTEMS;FISHES;BACTERIA;PHYSIOLOGY;SIMULATION;RECOVERY;BIODEGRADATION;BIOLOGICAL EFFECTS

<072725>
TITLE: Effects of Petroleum Hydrocarbons on Fatty Acid Metabolism in Marine Fishes: A Possible Sublethal Effect on the Physiolcgy of Temperature Acclimation
PROJECT NUMBER: M625A-38
PRINCIPAL INVESTIGATOR: Caldwell, R.S.
ADDRESS: Department of Fisheries and Wildlife, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Brice, Robert M.
TELEPHONE: C(503)757-4709;F420-4709
TYPE OF FUNDING: Grant No.-R-805625-01
77 FUNDING: Environmental Protection Agency FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Continental;COASTS/Other coasts All waters;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The proposed research will test the hypothesis that petroleum hydrocarbon compounds capable of inducing microsomal mixed function oxidases in fish tissues interfere with normal patterns of fatty acid metabolism, specifically microsomal fatty acid desaturation, and that such effects result in modified fatty acid patterns in membrane phospholipids of fish and suboptimal physiological responses to temperature.
APPROACH: Two approaches will be taken. In one, fish will be exposed to petroleum hydrocarbons for one to two weeks at an intermediate temperature. Following this, treated and control fish will be compared with respect to microsomal cytochrome P450 and b5 levels, mixed function oxidase and fatty acid desaturase activities, fatty acid composition of membrane phospholipids, and several physiological responses to temperature known to be dependent in part on specific biophysical characteristics of membranes. In a second approach, fish will be acclimated to extreme temperatures, both in the presence and absence of petroleum hydrocarbons, and compared with respect to ability to carry out known biochemical and physiological adaptations to temperaure (e.g., temperature mediated adjustment of membrane fatty acid composition and the biochemical and physiological adaptations resulting from such fatty acid changes).
PROJECT MILESTONES: 8/79 Final Report.
KEYWORDS: PETROLEUM;OIL SPILLS;METABOLISM;PHYSIOLOGY;BIOLOGICAL ADAPTATION;FISHES;BIOLOGICAL EFFECTS;HYDROCARBONS;TEMPERATURE EFFECTS;TOXICITY

<072726>
TITLE: Aerosol Characterization Research--Colstrip, Montana
PROJECT NUMBER: M625A-54
PRINCIPAL INVESTIGATOR: Derr, V.E.
ADDRESS: National Oceanographic and Atmospheric Administration Wave Propagation Laboratory, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Glass, Norman R.
TELEPHONE: F420-4671
TYPE OF FUNDING: Interagency agreement-IAG-D7-0740
77 FUNDING: Environmental Protection Agency FY77:$57,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Photochemical oxidants (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Project involves the measurement of the concentration of particulates categorized by size, shape and chemical constitution.
APPROACH: Two radiation measurements will be made: (1) rate at which solar energy reaches the earth as a function of wave length, and (2) the net heat loss of the earth will be measured by infrared radiometry by measuring upward and downward radiation and by employing aircraft and ground based instruments.
RESULTS: Document results.
PROJECT MILESTONES: 9/77 Final Report.
KEYWORDS: MONTANA;AEROSOLS;AIR QUALITY;BASELINE ECOLOGY;PARTICLES;PARTICLE SIZE;CHEMICAL COMPOSITION;SOLAR FLUX;NET ENERGY;INFRARED SPECTRA;VISIBLE RADIATION;METEOROLOGY;CLIMATES;EARTH ATMOSPHERE

<072727>
TITLE: Oil Movement on Soil Active Layer
PROJECT NUMBER: M625A-55
PRINCIPAL INVESTIGATOR: McFadden, T.T.
ADDRESS: Cold Regions Research and Engineering Laboratory, U.S. Army, Hanover, NH 03755
AFFILIATION: Cold Regions Research and Engineering Lab., Hanover, N.H. (USA)
NITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: McFadden, Ruth
TELEPHONE: C(907)479-7636
TYPE OF FUNDING: Interagency agreement-IAG-D7-0794
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)

POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Toxics (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to evaluate the rate and extent of oil movement in and over the soil active layer, and to determine transport pathways, fate of pollutants, and degradation by-products, following a simulated oil spill of hot crude oil on a permafrost underlain slope.
PROJECT MILESTONES: 5/78 Final Report.
KEYWORDS: PETROLEUM;VISCOSITY;SOIL CHEMISTRY;ENVIRONMENTAL EXPOSURE PATHWAY;OIL SPILLS;BIOLOGICAL MODELS;ENVIRONMENTAL TRANSPORT;BIODEGRADATION;SIMULATION;PERMAFROST;ARCTIC REGIONS;SOIL MECHANICS;TEMPERATURE EFFECTS;FLOW RATE;TOXICITY

<072728>
TITLE: Characterizing the Air Quality in the Colstrip, Montana Area
PROJECT NUMBER: M625A-57
PRINCIPAL INVESTIGATOR: Ambrose, T.W.
ADDRESS: Energy Research and Development Agency, Richland Operations Office, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Glass, Norman R.
TELEPHONE: F420-4671
TYPE OF FUNDING: Interagency agreement-IAG-D7-0840
77 FUNDING: Environmental Protection Agency FY77:$119,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: ERDA will operate and maintain a research survey station for the Environmental Protection Agency at Colstrip, Montana, providing approximately 1 man year of effort. ERDA will maintain a scientist at Colstrip who will operate research equipment, as required by EPA, for the measurement of a wide spectrum of airborne pollutants.
APPROACH: It is understood that these pollutants include the measurements of most of the conventional air pollutants which are monitored by the EPA and will require daily calibrations of much of the scientific equipment used for these measurements. It will also require the transfer of data from the various analyzers to an on-board computer for subsequent analysis and transmittal.
PROJECT MILESTONES: 11/78 Final Report.
KEYWORDS: MONTANA;AIR QUALITY;COAL INDUSTRY;AIR POLLUTION MONITORS;AIR POLLUTION;BASELINE ECOLOGY;MONITORING;AUTOMATION;COMPUTERS;DATA ANALYSIS;SITE SELECTION;ENVIRONMENTAL IMPACTS

<072729>
TITLE: Montana Coal-Fired Power Plant Bioenvironmental Study
PROJECT NUMBER: M-625-A-88
PRINCIPAL INVESTIGATOR: Preston, E.
ADDRESS: 200 SW 35th Street, Corvallis, OR 97330
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Preston, Eric
TELEPHONE: C(503) 757-4637;F420-4636
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The two objectives of this program are: (1) to develop procedures which can be used to forecast and assess the impacts of stressants from energy producing activities on affected ecosystems; and (2) to identify and describe the impacts for a given set of ecosystems.
APPROACH: The approach is to combine field measurements with on site field experimentation and laboratory process studies. Remote sensing, modeling activities, and other associated supportive efforts will be utilized to maximize the activity. The Corvallis Environmental Research Laboratory has mounted a field effort in Montana. Besides the normal field facilities (mobile air quality laboratories, biological analysis systems, etc.) an effort has been made to coordinate the project with other scientific centers (Grassland IBP, ERDA, EPA and NOAA) to include the necessary scientific and engineering expertise to guarantee a unified program.
RESULTS: It is intended that the research information gathered from this project be utilized in such a fashion that a set of biological parameters are found that will allow planning managers to project cost/benefit relationships prior to locating an energy producing facility.
PROJECT MILESTONES: (1) Annual Reports. (2) 6/80 Final Report.
KEYWORDS: EFFLUENTS;EMISSIONS;ENERGY PRODUCTION;COAL PREPARATION PLANTS;SOLVENT-REFINED COAL;ENVIRONMENTAL IMPACTS;WASHINGTON;POLLUTION CONTROL EQUIPMENT;BASELINE ECOLOGY;BIOLOGICAL EFFECTS;AIR;ECOSYSTEMS

<072730>
TITLE: Impact of Oxidant Air Pollutants on a Western Coniferous Forest-Ecosystem
PROJECT NUMBER: M602A-25
PRINCIPAL INVESTIGATOR: Taylor, O.C.;Miller, P.R.;Ackley, P.B.
AFFILIATION: California Univ., Berkeley (USA); Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Wilhour, R.G.
77 FUNDING: Environmental Protection Agency FY77:$262,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The proposed work is the continuation of a study, previously funded by EPA contracts, to

determine the effect of long term exposure to oxidant air pollutants on a western coniferous forest ecosystem and to develop predictive models for the system.
APPROACH: Nineteen major plots were established along a 35-mile long transect with an oxidant pollutant gradient. Several other smaller satellite plots have also been established for special studies and one large plot is used to study tree mortality. A monitoring network is established to record climate and pollutant conditions. Other subprojects designed to evaluate pollutant effects include: tree growth, rating of visible pollutant injury on major tree species; population dynamics study with bark beetle; measure rate of accumulation and decomposition of litter; measure precipitation, soil moisture, and soil temperature; measure reproduction (cone and seed production) of major pine species known to be affected by the pollutants; evaluate the response of pathogenic organisms to air pollutants; determine rate of new seedling establishment and identify organisms responsible for damping-off; evaluate mortality of tree species and describe successional patterns.
RESULTS: Data collected will be stored in an established data management system and will be used in the development and testing of predictive models.
PROJECT MILESTONES: 05/80-Final report.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;CONIFERS;TREES;GROWTH;POPULATION DYNAMICS;INSECTS;BIOLOGICAL EFFECTS;AIR POLLUTION;FOREST LITTER;DECOMPOSITION;PHOTOCHEMICAL OXIDANTS

<072731>
TITLE: Subsystems of Forest Ecosystems
PROJECT NUMBER: M602A-51
PRINCIPAL INVESTIGATOR: Trappe, J.M.
AFFILIATION: Oregon State Higher Education System, Salem (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Wilhour, P.G.
77 FUNDING: Environmental Protection Agency FY77:$33,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The purpose of the agreement is to facilitate a coordinated, multidisciplinary interaction of scientists from two research organizations to research specific subsystems of a forest ecosystem. They are as identified: (a) response of ponderosa pine x dwarf mistletoe interaction to ozone; (b) effect of ozone on Douglas fir and red alder and their phyllosphere microflora; (c) effect of ozone on decomposition rate and nitrogen transformations on forest litter, and (d) development of a model depicting the growth response of Douglas fir to environmental stressors.
PROJECT MILESTONES: 12/77-Final report.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;TREES;AIR POLLUTION;BIOLOGICAL EFFECTS;OZONE;GENETIC VARIABILITY;NITROGEN;MINERAL CYCLING;ENVIRONMENTAL TRANSPORT;FOREST LITTER;DECOMPOSITION;CONIFERS;GROWTH;BIOLOGICAL MODELS;POPULATION DYNAMICS

<072732>
TITLE: Modeling in Terrestrial Ecosystem
PROJECT NUMBER: M602A-67
PRINCIPAL INVESTIGATOR: Botts, R.P.;Lee, J.;Lewis, D.H.;Shirazi, M.A.;Hart, W.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Botts, R.P.
TYPE OF FUNDING: Agency in-house effort-(in-house)
77 FUNDING: Environmental Protection Agency FY77:$154,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To develop scientific base for air pollution strategies and to establish secondary air quality standards in compliance with the Clean Air Act, EPA conducts research on effects of air pollutants on individual flora and fauna as well as on the intact ecosystem. When combined with these studies, modeling the response of the terrestrial ecosystem to air pollutant stress is conducted to enable quantitation assessment of these stresses as well as to predict their long range chronic effects for better management of resources. Specific work includes effect of acid rain on forest ecosystem, and impact on a forest watershed of urea fertilization management.
PROJECT MILESTONES: 09/80-Final report.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;AIR POLLUTION;PLANTS;ANIMALS;BIOLOGICAL STRESS;BIOLOGICAL EFFECTS;ACID RAIN;FORESTS;MANAGEMENT;UREA;FERTILIZERS;POLLUTION REGULATIONS;WATERSHEDS;ENVIRONMENTAL TRANSPORT

<072733>
TITLE: Air Response of Plants to Air Pollutants
PROJECT NUMBER: M602A-7
PRINCIPAL INVESTIGATOR: Weinstein, L.H.
AFFILIATION: Boyce Thompson Inst. for Plant Research, Inc., Yonkers, N.Y. (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Raniere, L.C.
TYPE OF FUNDING: Grant No.-R804513-02
77 FUNDING: Environmental Protection Agency FY77:$76,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: (1) To determine whether concurrent exposure to mixtures of hydrogen fluoride and ozone or hydrogen fluoride and nitrogen dioxide produces interactive effects (antagonism or synergism) on the growth, yield or accumulation of fluoride by vegetation; (2) to provide quantitative estimates of the effects of ambient oxidants on the growth, development and yield of economically-important plants; (3) to provide quantitative estimates of the effects of ambient rainfall and simulated acidic rain on the growth, development and yield of crop plants.
APPROACH: Field exposure chambers, greenhouses and controlled environment chambers specially designed for these studies will be used to expose vegetation to controlled concentrations of pollutants. Dose-response relationships will be determined to provide a basis for the development of predictive models.
RESULTS: We have found that (1) yields of beans and tomatoes are reduced by ambient oxidants occurring in Yonkers, New York; (2) sulfur dioxide may lower or have no effect on the accumulation of fluoride in plants exposed simultaneously to hydrogen fluoride and sulfur dioxide depending on the plant species and pollutant concentrations; and (3) repeated exposure to simulated acidic rain causes necrotic lesions on susceptible herbaceous plant species when pH values are less than 3.4 and on needles of Eastern white pine trees when pH values are less than 2.6.

PROJECT MILESTONES: 05/78-Final report.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;PLANTS;GROWTH;BIOMASS;AIR POLLUTION;BIOLOGICAL EFFECTS;OZONE;HYDROFLUORIC ACID;ACID RAIN;NITROGEN DIOXIDE;FLUORIDES;UPTAKE;SYNERGISM;CROPS;DOSE-RESPONSE RELATIONSHIPS;TOXICITY;PHOTOCHEMICAL OXIDANTS;CONIFERS;GENETIC VARIABILITY;ECONOMICS;AGRICULTURE;BEANS;TOMATOES;SULFUR DIOXIDE

<072734>
TITLE: Economic Assessment of Crop Losses Caused by Air Pollution
PROJECT NUMBER: M602A-75
PRINCIPAL INVESTIGATOR: Jaksch, J.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Jaksch, J.A.
TYPE OF FUNDING: Agency in-house effort-(in-house)
77 FUNDING: Environmental Protection Agency FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: (1) Develop methods to quantify economically those factors affecting agricultural crop yields. (2) Evaluate market interactions affecting crop yields within geographic regions. (3) Evaluate the economic losses not directly measurable by yield reductions. (4) Combine 1-3 (above) to provide an economic evaluation of crop losses caused by air pollution.
APPROACH: (1) Prepare a state-of-the-art report on methods used to measure and economically quantify changes in crop yield. (2) Develop data bases for specific geographical regions which will provide information on crop yields, market factors, air pollution impacts, etc. (3) Using these data bases, test and refine available methods for evaluating the economic impact of yield reductions. (4) With the refined methodology, predict the economic impact of agricultural air pollution damage for selected geographic regions.
PROJECT MILESTONES: 12/76-S-O-A Report on factors affecting crop yield; 12/78-Report on economically important crops affected by air pollution; 12/79-Report on quantifying the economic costs by region; 12/80-Report aggregating regional results.
KEYWORDS: AIR POLLUTION;BIOLOGICAL EFFECTS;PLANTS;CROPS;AGRICULTURE;ECONOMICS;GENETIC VARIABILITY;GEOGRAPHY;CLIMATES;REGIONAL ANALYSIS;BIOMASS

<072735>
TITLE: Effects of CD on Nitrogen Fixation by Alnus Rubra
PROJECT NUMBER: M602A-77
PRINCIPAL INVESTIGATOR: Wickliff, C.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Wickliff, C.
TYPE OF FUNDING: Agency in-house effort-(in-house)
77 FUNDING: Environmental Protection Agency FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The project scope encompasses the following objective: (1) to determine the effects of Cd on N2 fixation by red alder; (2) to determine the effect on growth; (3) in situ nitrogenase activities; (4) to illustrate anatomical changes in roots and nodules associated with Cd uptake; (5) to determine in vitro effects of Cd on nitrogenase extracted from soybeans root nodules; and (6) to measure concentrations of Cd in the tissues of red alder.
APPROACH: Red alder was grown from seed then treated with concentrations of Cd in the nutrient solution ranges from 0.005 to 25 mg/l over a period of eleven weeks. Following this, the plants were harvested and measurements were made of growth, Cd uptake, nitrogenase activity and nitrogen fixation.
RESULTS: Currently electron micrographs of roots and nodules are being made for anatomical study and nitrogenase preparations are being assayed for Cd effects.
PROJECT MILESTONES: 10/76-Develop dose-response curve on effect of CdN-fixation; 12/76-Develop concentration vs. enzyme activity curve for nitrogen systems; 06/77-Report on effect of CL on the ultrastructure of alder roots and nodules; 05/79-Progress report on development of dose-response curves; 05/81-Final report and manuscript.
KEYWORDS: CADMIUM;BIOLOGICAL EFFECTS;TREES;PLANTS;LEGUMINOSAE;NITROGEN FIXATION;SOILS;ROOTS;UPTAKE;GROWTH;SOYBEANS;ROOT ABSORPTION

<072736>
TITLE: Chronic Ozone Effects on Ponderosa Pine, Dwarf Mistletoe Association
PROJECT NUMBER: M602A-81
PRINCIPAL INVESTIGATOR: Wilhour, R.G.;Neely, G.E.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Wilhour, R.G.
TYPE OF FUNDING: Agency in-house effort-(in-house)
77 FUNDING: Environmental Protection Agency FY77:$30,800
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The primary objective of this research project is to describe the response of the ponderosa pine (Pinus ponderosa L.) and dwarf mistletoe (Arceuthobium campylopodium) to chronic ozone exposures. The growth and developmental aspects of each associate as well as the success and/or progress of specific stages of disease development (e.g., infection) comprise the responses to be characterized.
APPROACH: A replicated factorial design was utilized to treat mistletoe inoculated and noninoculated ponderosa pine to 2 ozone levels (0 and 10 pphm), 6 hr per day, 7 days per week. The experiments were conducted outdoors in specially designed exposure chambers during the months May-October 1973. The initial attempt was severely impacted by very low survival of the inoculum. The germinating dwarf mistletoe seed was apparently killed by high temperatures shortly after inoculation. Therefore, the research shall be repeated during the 1974 growing season. However, inoculation will be accomplished during the early spring while the temperature maxima are lower. Ponderosa pine seedlings were successfully inoculated with dwarf mistletoe during February 1974. Both inoculated and uninoculated seedlings were exposed to either 0 or 20 pphm ozone during the 1974 and 1975 growing seasons. The mistletoe plants became visible during the 1975 growing season and growth measurements were recorded the following winter. The experiment shall be conducted an additional growing season (1976) to allow time for the mistletoe plant to reproduce. The

growth of both the host and the mistletoe and the reproductive status of the mistletoe will be evaluated during the Winter of 1976.
RESULTS: A manuscript shall be prepared shortly thereafter.
PROJECT MILESTONES: 08/77-Final report.
WORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;PINES;PARASITES;AIR POLLUTION;OZONE;BIOLOGICAL EFFECTS;GROWTH;DOSE-RESPONSE RELATIONSHIPS;TOXICITY;REPRODUCTION

<072737>
TITLE: Response of Ponderosa Pine to Chronic Ozone Exposures
PROJECT NUMBER: M602A-83
PRINCIPAL INVESTIGATOR: Wilhour, R.G.;Neely, G.E.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Wilhour, R.G.
TYPE OF FUNDING: Agency in-house effort-(in-house)
77 FUNDING: Environmental Protection Agency FY77:$8,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this research was to intensively evaluate the seasonal growth and metabolic response of ozone-stressed ponderosa pine (Pinus ponderosa L.). Several integral objectives included a determination of: (a) seasonal, chronic ozone susceptibility, (b) dynamics of recovery, and (c) response to intermittent ozone exposures (1, 2, 3, 4, 5, 6, or 7 days per week exposure).
APPROACH: The experiments were conducted outdoors in specially designed 8 x 8 x 7 ft. teflon covered exposure chambers. The chronic ozone treatment consisted of 10 pphm ozone, 6 hrs daily, and 7 days per week. The ozone treated plants were exposed to charcoal filtered air the remaining 18 hr per day. The check plants were treated with charcoal-filtered air 24 hr per day. A series of bi-weekly harvests and periodic transfer of plants between treatment and control chambers were executed to give the appropriate data necessary to meet the stated objectives.
RESULTS: All the data have been analyzed and a manuscript is in preparation.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;PINES;AIR POLLUTION;OZONE;BIOLOGICAL EFFECTS;GROWTH;DOSE-RESPONSE RELATIONSHIPS;TOXICITY;METABOLISM

<072738>
TITLE: Effects of Pollutants on a Soil Ecosystem
PROJECT NUMBER: M602A-89
PRINCIPAL INVESTIGATOR: Bond, H.A.;Shimabuko, R.;Lighthart, B.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Lightheart, B.
TYPE OF FUNDING: Agency in-house effort-(in-house)
77 FUNDING: Environmental Protection Agency FY77:$84,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: In order to obviate certain variations in natural soil systems, a soil/litter simulating microcosm and life support system has been designed, tested, and used to evaluate the effects of cadmium, selenium, used singly and in combination, and copper and zinc used singly and in combination. The cadmium/selenium series showed possible stimulation at low selenium levels, inhibition at moderately high cadmium levels, and marked inhibition in combination, whereas the copper/zinc at moderately high levels showed no detectable effects after 6 weeks incubation. The measured effects were in terms of integrated community response of respiration; i.e., CO2 and heat generation and O2 consumption. Organism detection, enumeration, sizing and from these measurements with certain assumptions, biomass calculation, are being perfected using optical scanning procedures.
APPROACH: The instrumentation for this research includes a Leitz epi-fluorescent illumination interference contrast microscope coupled with an Imance Quantimat-720 image analyzer and Hewlett Packard 9830A computer and x-y plotter. Specimen input to this system is from the microcosms just described.
RESULTS: The ultimate output of the analytical/microcosm system is a computer simulation which will be used to provide educated guesses of pollutant effects on soil decomposer systems.
PROJECT MILESTONES: 12/77-Response structure predicting simulation model; 00/00-Reports on determination of regional soil systems decomposition; 12/80-Final project report(s).
KEYWORDS: TERRESTRIAL ECOSYSTEMS;SOILS;CADMIUM;SELENIUM;SYNERGISM;BIOLOGICAL EFFECTS;COPPER;ZINC;FOREST LITTER;DECOMPOSITION;MINERAL CYCLING;MICROORGANISMS;RESPIRATION;CARBON DIOXIDE;OXYGEN;TEMPERATURE MEASUREMENT;MATHEMATICAL MODELS;COMPUTER CALCULATIONS

<072739>
TITLE: Response of Birds to Environmental Stress
PROJECT NUMBER: M625A-24
PRINCIPAL INVESTIGATOR: Farner, D.S.;Wingfield, J.C.;Donham, R.S.
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Preston, E.
TYPE OF FUNDING: Grant No.-R805409-01
77 FUNDING: Environmental Protection Agency FY77:$29,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Micro-radio competitive-protein-binding and micro-radioimmunoassays for cortisone in avian plasma have already been developed and adapted for field investigations in this laboratory. Since this method requires less than 100 microliters of plasma, individual birds can be sampled, marked and released for subsequent capture and sampling. The method has been ''field-tested'' extensively on white-crowned Sparrows. Zonotrichia leucoporys gambelii and Z.I. pugetensis.
APPROACH: It is proposed to develop this system further as a means of ''earth detection'' of environmental stress in populations of birds. Using these methods, first on white-crowned Sparrows, the following are proposed: (1) Procurement of base-line data on daily cycles in plasma corticosterone; (2) Procurement of additional data on effects of handling and holding in cages; (3) Examination of effects of induced stress in field (disturbance of flocks, harassment of territorial birds, artificial disturbance of habitat...); (4) Determination of metabolic clearance and half-life of corticosterone in birds; and (5) Observation of effects of ''artificial stress'' (implantation of corticosterone in silastic tubes in territorial birds). Comparable microassays have been developed for testosterone and estradiol. The avian radioimmunoassay of

Pollett, Seanes, and Cunningham for luteinizing hormone (LH) has been modified for passerine birds. Accurate estimates of LH, sex hormone and corticosterone can be made from 200 microliters of plasma from birds that can be bagged and released for subsequent capture and sampling. Laparotomy can be performed on these birds for assessment of gonadal state. For LH and sex hormones data comparable to corticosterone (1-S and 5) will be obtained, insofar as possible, by repeated sampling of individual birds.
RESULTS: Samples will be analyzed from a carnivore, the Western Meadowlark, Sturnella neglecta, at the EPA Montana Coal-fired Power Plant Project, Colstrip, to evaluate the significance of histological and gravimetric observations on adrenal glands.
KEYWORDS: BIRDS;BIOLOGICAL STRESS;MEASURING METHODS;ENVIRONMENT

<072740>
TITLE: Support Services at Fort Howes Ranger Station
PROJECT NUMBER: M625A-53
PRINCIPAL INVESTIGATOR: Richmond, R.M.
AFFILIATION: Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Preston, E.M.
77 FUNDING: Environmental Protection Agency FY77:$5,500
PROJECT DESCRIPTION: The agreement calls for maintenance of living and laboratory trailers located at Ft. Howes, maintenance of water and sewage systems, temporary storage of equipment and services of a safety officer to ensure compliance with all applicable standards.
KEYWORDS: FORESTS;TERRESTRIAL ECOSYSTEMS;WILD ANIMALS;PLANTS;SAFETY;FINANCING;PERSONNEL

<072741>
TITLE: Definition of Alaskan Wetlands by Floristic Criteria
PROJECT NUMBER: M608C-13
PRINCIPAL INVESTIGATOR: Murray, D.F.;Batten, A.
AFFILIATION: Alaska Univ., College (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kibby, H.V.
TYPE OF FUNDING: Grant No.-R804965-01
77 FUNDING: Environmental Protection Agency FY77:$2,800
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The primary objective of this project is to develop a comprehensive picture of vegetation and flora along selected transects from the tidal zone through the coastal wetlands to the uplands in the Gulf of Alaska.
APPROACH: From this very large region we will select a number of different sites that will reflect regional diversity and provide a test of the hypothesis that floristic data will aid the preparation of more precise definition of coastal wetland. Ground photography, plant sampling along transects, and the preparation of plant sampling along transects, and the preparation of plant collections will provide the data base. Individual taxa and combinations of taxa exclusive to wetlands will be sought with special attention to the definition of the limits of the wetland-upland transition zone.
PROJECT MILESTONES: 3/78-Final report.
KEYWORDS: ALASKA;TERRESTRIAL ECOSYSTEMS;COASTAL REGIONS;PLANTS;GENETIC VARIABILITY;REGIONAL ANALYSIS;SAMPLING;GEOGRAPHY;ECOLOGY

<072742>
TITLE: Procedures for Quantitative Ecological Assessments in the Intertidal Benthic Environment
PROJECT NUMBER: M608C-94
PRINCIPAL INVESTIGATOR: Gonor, J.J.
AFFILIATION: Oregon State Higher Education System, Salem (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swartz, R.C.
TYPE OF FUNDING: Grant No.-R805018-01
77 FUNDING: Environmental Protection Agency FY77:$22,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Objectives are written procedures for assessments in the marine intertidal benthic environments which are applicable to evaluation of existing or potential pollution effects.
PROJECT MILESTONES: 09/77-Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;BENTHOS;COASTAL WATERS;ENVIRONMENT;WATER POLLUTION;BIOLOGICAL EFFECTS;POPULATION DYNAMICS

<072743>
TITLE: Effects of Chromium and Nutrient Pollutants on Natural Phytoplankton
PROJECT NUMBER: M608C-17
PRINCIPAL INVESTIGATOR: Small, L.P.
AFFILIATION: Oregon State Higher Education System, Salem (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Specht, D.T.
TYPE OF FUNDING: Grant No.-R805282-01
77 FUNDING: Environmental Protection Agency FY77:$174,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of the proposal are to study the responses of endemic estuarine and nearshore phytoplankton population to a variety of pollutant additions (excess major and micro-nutrients and chromium) using a special algal assay technique previously developed by the principal investigators.
APPROACH: Specifically, the following problems will be addressed: (1) determining factors which govern growth rates, final bicmass yields and species composition of phytoplankton population endemic to Yaquina Bay, Oregon, and environs; (2) responses of these endemic populations to chromium and excess nutrient; (3) effects on phytoplankton populations from reduced zooplankton grazing due to chromium toxicity; (4) bioaccumulation of chromium by phytoplankton and zooplankton; (5) the extent of seasonal and yearly

biological, chemical, and physical fluctuation in Yaquina Bay as a base for comparison of the above results.
KEYWORDS: AQUATIC ECOSYSTEMS;COASTAL WATERS;ESTUARIES;PHYTOPLANKTON;GROWTH;BIOMASS;WATER POLLUTION;NUTRIENTS;CHROMIUM;ENVIRONMENTAL TRANSPORT;ALGAE;GENETIC VARIABILITY;OREGON;ZOOPLANKTON;FOOD;TOXICITY;BIOLOGICAL EFFECTS

<072744>
TITLE: Determination of Statistical Methods to Identify Tropho-Dynamics Involvement in Recovery
PROJECT NUMBER: M608C-18
PRINCIPAL INVESTIGATOR: Livingston, R.J.
AFFILIATION: Florida State Univ., Tallahassee (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swartz, R.C.
TYPE OF FUNDING: Grant No.-R805288-01
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: (1) To evaluate the use of tropho-dynamic analysis of food web relationships in determining the recovery of a coastal ecosystem following pollution abatement. (2) To develop methods of quantitative sampling and statistical analysis of field collections with an emphasis on successional changes in trophic relationships.
PROJECT MILESTONES: 07/79-Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;FOOD CHAINS;WATER POLLUTION;WATER POLLUTION ABATEMENT;BIOLOGICAL EFFECTS;BIOLOGICAL RECOVERY;POPULATION DYNAMICS;STATISTICAL MECHANICS

<072745>
TITLE: Relationship Between Black Mangrove Forest and Estuarine Waters
PROJECT NUMBER: M608C-27
PRINCIPAL INVESTIGATOR: Lugo, A.
AFFILIATION: Florida State Univ., Tallahassee (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kibby, H.V.
TYPE OF FUNDING: Grant No.-R805424-01
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Exports and imports of dissolved and particulate organic matter will be measured from elected black mangrove forests in the west coast of Florida. Results should show net exports of organic matter from black mangroves to estuarine waters. They should also show that black mangrove stands that are apparently isolated from the sea do have periodic exchanges with the sea and that these exchanges are important to the maintenance of regional productivity.
PROJECT MILESTONES: 07/78-Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;FLORIDA;FORESTS;TERRESTRIAL ECOSYSTEMS;COASTAL REGIONS;SHORES;MANGROVES;ESTUARIES;NUTRIENTS;SEAWATER;BIOMASS;FOREST LITTER;DECOMPOSITION

<072746>
TITLE: Production in Coastal Salt Marshes of Southern California
PROJECT NUMBER: M608C-29
PRINCIPAL INVESTIGATOR: Eilers, H.P.
AFFILIATION: California State Univ., Fullerton (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kibby, H.V.
TYPE OF FUNDING: Grant No.-R805438-01
77 FUNDING: Environmental Protection Agency FY77:$400,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this project is to determine the annual net aerial production in southern California coastal salt marshes to determine productive response to environmental factors, and to estimate marsh contribution to secondary production in the coastal system.
APPROACH: Six study marshes will be selected to represent the variety and latitudinal extent of the southern California coast. Three will be chosen from those with continuous ocean contact, two from those with seasonal contact, and one from diked marsh. Sampling to determine production in each study marsh will be by the harvest method with samples collected at monthly intervals for one year. Environmental measurements will include tidal elevation, inundation frequency and duration, soil salinity, soil nitrogen, soil aeration (redox), and soil temperature. Marsh export of organic detritus will be estimated by analyzing creek water samples from ebb and flood flow for suspended organic particulates.
PROJECT MILESTONES: 08/79-Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;COASTAL REGIONS;CALIFORNIA;MARSHES;SEAWATER;FRESH WATER;SEASONAL VARIATIONS;PLANTS;BIOMASS;TIDE;ENVIRONMENTAL EFFECTS;SALINITY;CHEMICAL COMPOSITION;NUTRIENTS;PLANTS;BIOMASS;WATER QUALITY

<072747>
TITLE: Assessment of the Application of Multivariate Analysis in Ecological Investigations of Water Pollution
PROJECT NUMBER: M608C-30
PRINCIPAL INVESTIGATOR: Boesch, D.F.
AFFILIATION: Virginia Inst. of Marine Science, Gloucester Point (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swartz, R.C.
77 FUNDING: Environmental Protection Agency FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)

PROJECT DESCRIPTION: The objective is the further evaluation of the numerical techniques of clarification (cluster analysis) for use in ecological investigations of water pollution, expanding the expected products of ongoing research.
PROJECT MILESTONES: 11/77-Annual report; 11/79-Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;BIOLOGICAL EFFECTS;MATHEMATICAL MODELS;STATISTICAL MECHANICS

<072748>
TITLE: Southeast Florida Ocean Outfall Study
PROJECT NUMBER: M608C-32
PRINCIPAL INVESTIGATOR: Snedaker, S.C.;Schaiberger, G.E.
AFFILIATION: Miami Univ., Fla. (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Baumgartner, D.J.
TYPE OF FUNDING: Grant No.-R804749-01
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
PROJECT DESCRIPTION: Ocean-outfall disposal of domestic wastes raises pertinent questions concerning prior treatment and preferred outfall location due to a paucity of factual information and data. To resolve these questions, the research in this project is subsumed under three objectives which are to: (1) characterize the plume mixing zone as it relates to the kinds and subsequent distribution of particulates, (2) design and test methods for the sampling and enumeration of viral pathogens and determine the most appropriate treatment procedure, and (3) evaluate outfall-induced (via particulates and pathogens) responses of sessile invertebrates and other important marine animals. Four outfalls in Dade, Broward and Palm Beach counties are designated for intensive and/or comparative research by both marine and medical scientists. The project incorporates both field and laboratory work and involves cooperation with other ongoing research relating to outfalls as well as interaction with user groups. State-of-the-art scientific methods and quality-assurance techniques used during the two-year study ensure that objectives are met on schedule and that all results are scientifically supported. The results will be of use in evaluating the performance standards of ocean outfalls as a disposal method.
PROJECT MILESTONES: 10/78-Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;MUNICIPAL WASTES;MARINE DISPOSAL;FLORIDA;PLUMES;ENVIRONMENTAL TRANSPORT;SEAS;VIRUSES;AQUATIC ORGANISMS;FOOD CHAINS;BIOLOGICAL EFFECTS;SEWAGE;HEALTH HAZARDS;HUMAN POPULATIONS

<072749>
TITLE: Consequences of Crude Oil Contamination on Cold Climate Salt Marshes and Inshore Ecosystems-Phase I-Field Site Reconnaissance
PROJECT NUMBER: M608C-42
PRINCIPAL INVESTIGATOR: McRoy, C.R.
AFFILIATION: Alaska Univ., College (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: McFadden, R.
TYPE OF FUNDING: Grant No.-R805668-01
77 FUNDING: Environmental Protection Agency FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: The general objective of this research is to select crucial field sites for the study of the consequences of crude oil contamination on salt marshes and related ecosystems in Alaskan waters. Research will include a preliminary analysis of the plant and animal community structure, cycling of nutrients and primary productivity. The results will be used as the basis for designing an extensive research project to study the effects of crude oil contamination on marshes.
PROJECT MILESTONES: 09/78-Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;WATER POLLUTION;LAND POLLUTION;COASTAL REGIONS;OIL SPILLS;ENVIRONMENTAL EFFECTS;CLIMATES;MARSHES;ALASKA;PLANTS;ANIMALS;BIOLOGICAL EFFECTS;CHEMICAL EFFLUENTS;NUTRIENTS;PHOTOSYNTHESIS;AQUATIC ORGANISMS;HEALTH HAZARDS

<072750>
TITLE: Technical Studies of Cook Inlet Coastal Wetlands
PROJECT NUMBER: M608C-43
PRINCIPAL INVESTIGATOR: MacDonald, K.;Rabe, F.
AFFILIATION: Idaho Univ., Moscow (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kibby, H.V.
TYPE OF FUNDING: Grant No.-R805690-01
77 FUNDING: Environmental Protection Agency FY77:$50,200
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this project is to provide quantitative data on the primary production of a major coastal wetland site within Cook inlet, Alaska, and to identify and assess the functional interrelationships among wetlands, the adjacent terrestrial ecosystem and the estuarine ecosystem.
PROJECT MILESTONES: 09/78 Final report
KEYWORDS: ALASKA;COASTAL REGIONS;ESTUARIES;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;NUTRIENTS;ENVIRONMENTAL TRANSPORT;PLANTS;BIOMASS;PHOTOSYNTHESIS

<072751>
TITLE: Study of Tidal Datums as They Relate to the Upper Limit of Coastal Wetlands
PROJECT NUMBER: M608C-56
PRINCIPAL INVESTIGATOR: Thurlow, C.
AFFILIATION: Department of Commerce, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kibby, H.
TYPE OF FUNDING: Interagency agreement-D7-0803
77 FUNDING: Environmental Protection Agency FY77:$13,800
TECHNOLOGY: GENERAL SCIENCE (100%)

PROJECT DESCRIPTION: NOS will collect the following data in the vicinity of tidal gaging stations. The locations and specific number of stations will be selected by mutual agreement between both agencies. Land elevations will be selected along selected transects from mean low water datum to the upper limit of the marsh. Along these transects NOS will identify various tidal datums. NOS will analyze tidal data and prepare a report for each site that describes the frequency and duration of inundation for various land elevations identified in 1A above.
RESULTS: NOS will provide EPA with copies of all computer programs used in this study. NOS will provide EPA consultation on characteristics of tidal regimes.
PROJECT MILESTONES: 06/78 Final report.
KEYWORDS: COASTAL REGIONS;MARSHES;TIDE;WATER WAVES;DAILY VARIATIONS;DATA COMPILATION

<072752>
TITLE: Development of Criteria for Wetland Protection
PROJECT NUMBER: M608C-76
PRINCIPAL INVESTIGATOR: Kibby, H.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kibby, H.V.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$56,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: (1) To delineate the upland boundary of wetlands for the purpose of setting the jurisdictional limits for section 404 of PL 92-500 for coastal and Great Lakes marshes. (2) To determine the physiological requirements of plant species representative of wetland transition zones. (3) To provide environmental assessments which will determine the relative values of wetland zones with respect to overall ecosystem value.
APPROACH: (1) Field studies to determine which plant species represent the transition zone between wetland and upland. The upper limit of this transition zone will be related to a tidal datum. (2) Laboratory and field studies to determine the physiological requirements of transition zone species with respect to physical (e.g., total inundation frequency), water quality, and substrate factors. (3) Assess the social, economic, and ecologic impact of vegetative criteria developed to protect wetlands. This would include an evaluation of the relative values of various wetland types with respect to overall ecosystem values.
PROJECT MILESTONES: 01/77 Report on methodology for determining upper limit of wetlands. 01/78 Report on field test of relationship between tidal datums. 09/78 Final reports from grantees and inhouse staff.
KEYWORDS: GREAT LAKES;MARSHES;COASTAL REGIONS;TERRESTRIAL ECOSYSTEMS;PLANTS;GENETIC VARIABILITY;TIDE;WATER QUALITY;NUTRIENTS;ECONOMICS

<072753>
TITLE: Biological Indices for Assessing the Effects of Pollutional Stress on Marine Biotic Assemblages
PROJECT NUMBER: M608C-90
PRINCIPAL INVESTIGATOR: Swartz, R.C.;Baumgartner, D.J.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swartz, R.C.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: To determine the efficacy of biomathematical indices of various structural parameters (diversity, dominance, richness, spatial-temperal heterogeneity) as criteria of the impact of pollution in marine ecosystems.
APPROACH: Comparative study of structural changes in a variety of assemblages (benthos, fish, plankton, intertidal) exposed to different forms of pollution in different biogeographic provinces.
RESULTS: Several reports have been prepared on diversity indices. Site and species clustering techniques are now being analyzed.
PROJECT MILESTONES: 10/76 Fish benthos and plankton survey reports. 10/77 Report on population dynamics indices. 08/79 Final report on estuarine recovery. 06/80 Final projects reports.
KEYWORDS: AQUATIC ECOSYSTEMS;ESTUARIES;COASTAL WATERS;AQUATIC ORGANISMS;BENTHOS;FISHES;PLANKTON;BIOLOGICAL EFFECTS;WATER POLLUTION;REGIONAL ANALYSIS;BIOLOGICAL STRESS;SEAS

<072754>
TITLE: Development of a Multispecies Benthic Bioassay for the Toxicity of Dredged Materials
PROJECT NUMBER: M608C-91
PRINCIPAL INVESTIGATOR: Swartz, R.C.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swartz, R.C.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: To develop a bioassay procedure for assessing the toxicity of dredged materials to marine benthic communities.
APPROACH: Comparative study of the impact of clean and polluted sediments on benthic microcosms representing the dominant toxocenes of continental shelf communities, i.e., polychaetes, amphipods, and molluscs.
RESULTS: Experiments on the toxicity of sediments from Yaguina Bay, Oregon, Coos Bay, Oregon, and the Duwamish River, Washington, were initiated in April 1976.
PROJECT MILESTONES: 09/77 Report on distribution of PCB during and after spoil disposal operation. 10/77 Report on phytoplankton response in dredge spoil elutriates. 03/78 Report on influence of organics on the mobilization of metals. 12/78 Report on methods for chemical analyses of dredge spoils. 09/79 Report on effects of pollutants materials on marine plants. 03/80 Report on techniques to predict the pollutional impact of dredge spoil disposal. 05/80 Report on influence of dredge spoil disposal on benthic communities.
KEYWORDS: AQUATIC ECOSYSTEMS;SEDIMENTS;TOXICITY;DETRITUS;AQUATIC ORGANISMS;BIOASSAY;BENTHOS;CONTINENTAL SHELF;COASTAL WATERS;OREGON;WASHINGTON;WATER POLLUTION;POPULATION DYNAMICS;PACIFIC OCEAN

<072755>
TITLE: Spatial-Temporal Variations in the Structure of Macrobenthic Communities in the New York Bight South of Fire Island, New York
PROJECT NUMBER: M608C-92
PRINCIPAL INVESTIGATOR: Swartz, R.C.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swartz, R.C.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To define annual, seasonal, and spatial variations in the species composition, dominance, density, and diversity of benthic communities in the New York Bight.
APPROACH: Five replicate Smith-McIntyre grabs are collected quarterly at 15 stations in the study area. Species retained on a 1.0 mm screen are identified to the species level and enumerated. Data analysis involves a variety of structural parameters.
RESULTS: Surveys have been conducted since December 1972. A report on spatial-temporal heterogeneity is in preparation.
PROJECT MILESTONES: 01/77 Interim report on New York bight benthos. 01/79 Final report.
KEYWORDS: COASTAL WATERS;AQUATIC ECOSYSTEMS;CONTINENTAL SHELF;ATLANTIC OCEAN;NEW YORK;AQUATIC ORGANISMS;SEASONAL VARIATIONS;POPULATION DYNAMICS;BENTHOS;SAMPLING;DEPTH

<072756>
TITLE: Determination of Response of Aquatic Ecosystems to Chemical-Physical Factors in Estuaries
PROJECT NUMBER: M608C-93
PRINCIPAL INVESTIGATOR: Callaway, R.J.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Callaway, R.J.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$64,400
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GEOTHERMAL/General (25%);CONSERVATION/General (25%)
PROJECT DESCRIPTION: Determine physical-chemical factors associated with algal assay procedures in estuaries. Determine mechanisms associated with particulate distribution.
APPROACH: Combined field and laboratory studies in a small Oregon estuary are to be used in conjunction with a numerical model of circulation and (initially) nutrient response.
RESULTS: Survey field studies have been completed to assess logistic requirements, time lags in processing samples and data, etc.
PROJECT MILESTONES: 12/76 Report examining the theoretical basis of AAP and physical factors. 09/77 Model simulations. 06/78 Report on interpretation of AAP in estuarine waters.
KEYWORDS: AQUATIC ECOSYSTEMS;ESTUARIES;COASTAL WATERS;CHEMICAL COMPOSITION;BIOASSAY;ALGAE;BIOMASS;PARTICLES;NUTRIENTS;ENVIRONMENTAL TRANSPORT;OREGON;MATHEMATICAL MODELS;SAMPLING;AQUATIC ORGANISMS;POPULATION DYNAMICS

<072757>
TITLE: Water Quality Effects Caused by Waste Discharges
PROJECT NUMBER: M608C-95
PRINCIPAL INVESTIGATOR: Baumgartner, D.J.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Baumgartner, D.J.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$112,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GEOTHERMAL/General (25%);CONSERVATION/General (25%)
PROJECT DESCRIPTION: Develop scientific foundation for water quality criteria, effluent restrictions, and discharge practices associated with direct (outfalls, barges) and indirect (atmospheric fallout, drainage) sources of pollution.
APPROACH: Effects on total ecosystems and aquatic communities will be sought through studies of the transport, interaction, and accumulation of pollutants, singly and in combination from the point of entry into the aquatic system to the point of ultimate fate. Physical and chemical interactions between sediments, suspended particulates, and the water phase in mixing zone near the initial entry point, receive primary attention with respect to the Agency's need for data on acute and short-term effects. Long-term exposure in relatively dilute systems are of concern for long-lived pollutants likely to cause chronic disorders, subtle ecosystem effects, and food chain accumulation of undesirable materials. Laboratory simulation, controlled ecosystems, and field programs are conducted, especially in locations offering experimental opportunities as in new outfalls or barge dumping operations.
RESULTS: Progress has been achieved on determining the behavior of metals and biodegradable organics in sediments contaminated with sewage sludge. Plans have been made for plume studies and ecological effects in the vicinity of major ocean outfalls.
PROJECT MILESTONES: 03/77 Revision of Plume workbook. 08/77 Working document for the regions based on calculations. 09/78 Revision of Plume workbook, if necessary. 03/79 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER QUALITY;WATER POLLUTION;AQUATIC ORGANISMS;SEDIMENTS;PARTICLES;BIOLOGICAL EFFECTS;SEWAGE SLUDGE;MARINE DISPOSAL;PLUMES;ENVIRONMENTAL TRANSPORT;SEAS;POPULATION DYNAMICS

<072758>
TITLE: Impact of the Metula Oil Spill on the Subtidal Macrobenthos of the Straits of Magellan
PROJECT NUMBER: M608C-99
PRINCIPAL INVESTIGATOR: Swartz, R.C.;Baumgartner, D.J.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swartz, R.C.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: To determine the degree of hydrocarbon contamination of sediments and alterations in subtidal benthic community structure resulting from the METULA spill in the straits of Magellan.
APPROACH: Sediments and biological collections were made at 44 stations in the Straits. This project is closely coordinated with research conducted by Dr. Victor Gallardo, University of Concepcion, Chile.
RESULTS: Initial cruise aboard the R/V HERO was completed in April 1976.
PROJECT MILESTONES: 04/77 Preliminary report on the impact on subtidal communities. 02/78 Final report on initial impact of metula spill.
KEYWORDS: OIL SPILLS;SEAS;AQUATIC ECOSYSTEMS;ENVIRONMENTAL EFFECTS;WATER POLLUTION;SEAWATER;HYDROCARBONS;SEDIMENTS;AQUATIC ORGANISMS;BENTHOS;BIOLOGICAL EFFECTS;POPULATION DYNAMICS;ENVIRONMENTAL TRANSPORT

<072759>
TITLE: National Eutrophication Survey
PROJECT NUMBER: M608A-70
PRINCIPAL INVESTIGATOR: Gakstatter, J.H.;Lambou, V.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Gakstatter, J.H.
77 FUNDING: Environmental Protection Agency FY77:$196,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The goal of the National Eutrophication Survey (NES) is to reduce uncertainties regarding the threat of accelerated eutrophication in the nation's freshwater lakes and reservoirs. The overall objective of the endeavor is to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations and impacts on selected freshwater lakes as a basis for the formulation of comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and non-point source pollution abatement in lake watersheds.
APPROACH: Over 800 lakes and reservoirs in the contiguous 48 states were sampled during the period of 1972-75. Each water body was sampled three times during one year at multiple sites and depths. Coincident to the lake sampling program major tributaries and point source inputs were also sampled monthly for one year. The resulting data permitted an evaluation of trophic condition, nutrient inputs, and limiting nutrient for each water body.
RESULTS: Field work for the survey was completed in November 1975, and data evaluation is scheduled to continue until January 1, 1977.
PROJECT MILESTONES: 09/78 Final lake reports.
KEYWORDS: LAKES;FRESH WATER;WATER RESERVOIRS;WATER QUALITY;NUTRIENTS;WATERSHEDS;MANAGEMENT;WATER POLLUTION ABATEMENT;SAMPLING;MONITORING

<072760>
TITLE: Relationship of Forest Management to Stream Productivity
PROJECT NUMBER: M608A-72
PRINCIPAL INVESTIGATOR: Miller, W.E.;Shiroyama, T.;Greene, J.C.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Miller, W.E.
77 FUNDING: Environmental Protection Agency FY77:$42,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Algal assays will be conducted on samples collected from 16 sites representing three major experimental watershed study areas to: (1) determine nutrient contributions (including biological availability) from forest manipulation, (2) determine order of nutrient limitations, (3) evaluate the geographical and climatological impact upon nutrient impact from manipulation sites, (4) define the interaction of suspended sediments and inorganic and organic phosphorus content upon algal growth, and (5) determine whether a relationship between TOC and bioavailability of nutrients can be established.
PROJECT MILESTONES: 09/77 Final report.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;MANAGEMENT;WATERSHEDS;STREAMS;WATER QUALITY;FRESH WATER;NUTRIENTS;AQUATIC ECOSYSTEMS;CLIMATES;GEOGRAPHY;SEDIMENTS;PHOSPHORUS;ENVIRONMENTAL TRANSPORT;BIOLOGICAL EFFECTS;ALGAE;GROWTH;BIOMASS;OXYGEN;BIOASSAY

<072761>
TITLE: Effects of Stream Perturbations on Subarctic Freshwater Systems
PROJECT NUMBER: M608A-65
PRINCIPAL INVESTIGATOR: Schallock, E.W.;Lotspeich, F.B.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Schallock, E.W.
77 FUNDING: Environmental Protection Agency FY77:$56,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This study is designed to describe the effects of stream disturbance over time and to assess the significance of the effects on the physical, chemical, and biological features of a subarctic stream. The stream disturbance will be the construction of the Trans-Alaska Oil Pipeline as it is placed beneath the Chatanika River in interior Alaska.
APPROACH: Baseline data at stations above and below the crossing have been collected. After the crossing has been completed, the stations will be monitored for selected parameters to assess the impact of the

disturbance and how rapidly the stream recovers or stabilizes.
RESULTS: The study should be completed in 1978.
PROJECT MILESTONES: 09/78 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;ALASKA;ARCTIC REGIONS;STREAMS;FRESH WATER;WATER QUALITY;CONSTRUCTION;EXCAVATION;ENVIRONMENTAL EFFECTS;BIOLOGICAL RECOVERY;ALASKA OIL PIPELINE

<072762>
TITLE: Modeling in Aquatic Ecosystem
PROJECT NUMBER: M608A-66
PRINCIPAL INVESTIGATOR: Larsen, D.P.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Larsen, D.P.
77 FUNDING: Environmental Protection Agency FY77:$154,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To issue water quality criteria and publish effluent standards as mandated by sections 307(a) and 304(a), the Environmental Protection Agency conducts research on effects of pollutants on representative or key sensitive organisms in freshwater and marine systems, as well as on ecosystem levels and parameters. When combined with these studies, modeling of the ecosystem response to pollutant stress can be an important link between a better understanding of the systems and a prediction ability that allows better management of resources. Modeling in freshwater ecosystems includes: (1) nonpoint source loading and its effect on ecology of streams, (2) nutrient budget, nutrient recycling sediment dynamics in lakes, (3) nutrient manipulation and other restorative techniques of lakes. Modeling in marine ecosystems includes characterization of dredged materials and their effects in ocean dumping.
PROJECT MILESTONES: 09/80 Final report
KEYWORDS: AQUATIC ECOSYSTEMS;WATER QUALITY;FRESH WATER;SEAWATER;STANDARDS;WATER POLLUTION;BIOLOGICAL STRESS;BIOLOGICAL EFFECTS;WATER RESOURCES;MANAGEMENT;POINT POLLUTANT SOURCES;STREAMS;ENVIRONMENTAL EFFECTS;NUTRIENTS;ENVIRONMENTAL TRANSPORT;LAKES;DETRITUS;SEDIMENTS;SEAS;COASTAL WATERS;MUNICIPAL WASTES;MARINE DISPOSAL

<072763>
TITLE: Socio-Economic Impact of Lake Improvement Projects at Mirror/Shadow and White Clay Lakes
PROJECT NUMBER: M608A-9
PRINCIPAL INVESTIGATOR: Klessig, L.L.
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Jaksch, J.A.
77 FUNDING: Environmental Protection Agency FY77:$180,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This project will (1) ascertain and evaluate present and potential impacts of two specific lake restoration projects; (2) recommend substantive and procedural changes to interested agencies; and (3) contribute to the development of a general methodology for social and economic evaluation of water quality improvement projects.
PROJECT MILESTONES: 02/80 Final report.
KEYWORDS: WISCONSIN;WATER QUALITY;LAKES;MODIFICATIONS;SOCIO-ECONOMIC FACTORS;ECONOMIC IMPACT;SOCIAL IMPACT;LAND RECLAMATION

<072764>
TITLE: Trophic Dynamics and Freshwater Ecosystems
PROJECT NUMBER: M608A-98
PRINCIPAL INVESTIGATOR: Powers, C.F.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Powers, C.F.
77 FUNDING: Environmental Protection Agency FY77:$112,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To develop an understanding of the effects of environmental pollutants, both stimulatory and inhibitory, on the structure and function of marine and freshwater ecosystems. This includes determination of sources, transport, transformations, and fates of pollutants, their uptake, accumulations, and magnification by food chains, and human health implications.
APPROACH: Field studies of natural and perturbed river-lake-estuarine-marine systems, and pilot scale and laboratory simulations, are carried out on specific pollutants to determine their antagonistic/synergistic effects on entire systems. Results of carefully controlled laboratory experiments and assays are followed by controlled pilot scale field studies in experimental ponds and tanks, and results applied to whole system studies.
RESULTS: Laboratory and pilot field studies have recently been employed to assess the effect and usefulness of nutrient inactivants in reducing primary production, and studies are being continued in a natural lake on the effects of waste interception on overall productivity. Studies are in the design stage on the cycling and fate of selected heavy metals in aquatic systems.
PROJECT MILESTONES: 09/78 Report on nutrient recycling in phytoplankton population. 09/79 Report on nutrient recycling in zooplankton, macroinvertibrate. 09/80 Report on nutrient recycling on a community basis.
KEYWORDS: AQUATIC ECOSYSTEMS;NUTRIENTS;MINERAL CYCLING;PHYTOPLANKTON;INVERTEBRATES;WATER POLLUTION;RIVERS;LAKES;ESTUARIES;SYNERGISM;TOXICITY;BIOLOGICAL MODELS;METALS;ENVIRONMENTAL TRANSPORT

<072765>
TITLE: Effects of Heavy Metals on Pacific Northwest Aquatic Species
PROJECT NUMBER: M608A-98
PRINCIPAL INVESTIGATOR: Chapman, G.A.;McCrady, J.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Chapman, G.A.
77 FUNDING: Environmental Protection Agency FY77:$42,000

TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
PROJECT DESCRIPTION: Development of water quality criteria for heavy metals.
APPROACH: Biological and chemical assays to determine the toxic and safe levels of heavy metals to aquatic organisms (primarily Co, Cu, and Zn and salmonid fishes).
RESULTS: Conduct acute bioassays to determine 96-hour LC50 values in natural and reconstituted water of various hardness and alkalinity using atomic absorption and specific ion electrodes to measure total metal and free metal respectively. The REDEQL computer program will compare these results with theoretical equilibria. Conduct avoidance tests to relate metal levels which produce depopulation by avoidance to those which are otherwise toxic. Investigate effects of acclimation and metal form on avoidance.
PROJECT MILESTONES: 06/77 Report on effect of Cu, Cd and Zn on species. 12/78 Report on toxicity of Cu, Cd and Zn to Pacific northwest aquatic species. 12/78 Complete construction of artificial streams. 12/79 Interim report on effect of other inorganic pollutants. 06/80 Report on bioaccumulation of heavy metals by algae and invertebrate. 09/81 Impact of non-renewable energy resource wastes upon heavy metals.
KEYWORDS: MARSHES;BRINES;SURFACE WATERS;CALIFORNIA;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;PLANTS;PH VALUE;HABITAT;INVENTORIES;BIOLOGICAL EFFECTS;BIOLOGICAL MODELS

<072766>
TITLE: Transition Zone Between Marsh and Uplands
PROJECT NUMBER: M608C-12
PRINCIPAL INVESTIGATOR: Harvey, H.T.
AFFILIATION: California State Univ., Fullerton (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kibby, H.V.
77 FUNDING: Environmental Protection Agency FY77:$2,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This project will develop a set of vegetative criteria for the transition zone between wetlands and uplands in the coastal region of California.
PROJECT MILESTONES: 03/78 Final report.
KEYWORDS: METALS;COPPER;CADMIUM;ZINC;TOXICITY;BIOLOGICAL ACCUMULATION;WATER QUALITY;STANDARDS;FISHES;AQUATIC ORGANISMS;TOLERANCE;BEHAVIOR;AVOIDANCE;CONDITIONED REFLEXES

<072767>
TITLE: Ecosystem Responses to Alternative Pesticides in the Environment
PROJECT NUMBER: M714F-2
PRINCIPAL INVESTIGATOR: Goodman, E.D.
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Gillett, J.W.
TYPE OF FUNDING: Grant No.-R803859-03
77 FUNDING: Environmental Protection Agency FY77:$130,600
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);CONSERVATION/General (33%)
PROJECT DESCRIPTION: Develop models to assist in evaluating the effects of pesticides on various ecosystems, e.g., an orchard and a lake, using euthion and altrazine as typical agents.
PROJECT MILESTONES: 09/77 Final report.
KEYWORDS: EUTHION;ALTRAZINE;PESTICIDES;MINERAL CYCLING;BIOLOGICAL MODELS;ECOSYSTEMS;LAKES;TREES;FRUITS;ENVIRONMENTAL TRANSPORT;ECOLOGICAL CONCENTRATION

<072768>
TITLE: Ecosystem Responses to Alternative Pesticides in the Terrestrial Environment--A Systems Approach
PROJECT NUMBER: M714F-37
PRINCIPAL INVESTIGATOR: Goodman, E.D.
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Gillett, J.W.
TYPE OF FUNDING: Grant No.-R805624-01
77 FUNDING: Environmental Protection Agency FY77:$116,000
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);CONSERVATION/General (33%)
PROJECT DESCRIPTION: The immediate objective is to formulate and validate a model for the effects of azinphosmethyl (Guthion) applied to apple orchards. Generalization to other compounds and terrestrial ecosystems is the ultimate objective.
APPROACH: Work planned includes continuation of experimental field treatment and sampling, laboratory culture and toxicological testing of soil/litter invertebrates, and mathematical modeling of pesticide movement and faunal impacts. One season's samples from the antecedent grant have been analyzed to determine rain-induced vertical movement of pesticide, but no runoff was obtained that year. A second year's samples are being collected in summer, 1977, and will be analyzed to provide the missing parameterization data. Air borne losses will also be measured in 1978.
RESULTS: Computer programs for direct model parameterization from raw field data are being developed. Laboratory data are being used to aid in development of organism submodels. First validation will be attempted using 1978 field data.
PROJECT MILESTONES: 09/80 Final report.
KEYWORDS: PESTICIDES;ENVIRONMENTAL TRANSPORT;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL MODELS;APPLES;TREES;TOXICITY;INVERTEBRATES;SAMPLING;MATHEMATICAL MODELS;ECOLOGICAL CONCENTRATION

<072769>
TITLE: Terrestrial Microcosm Project
PROJECT NUMBER: M714F-87
PRINCIPAL INVESTIGATOR: Gillett, J.W.;Gile, J.D.
AFFILIATION: Environmental Protection Agency, Corvallis, Oreg. (USA). Corvallis Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Corvallis, Oreg. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Gillett, J.W.
TYPE OF FUNDING: Agency in-house effort-In-house
77 FUNDING: Environmental Protection Agency FY77:$56,000

PROJECT DESCRIPTION: To design and operate terrestrial laboratory test system as a screen for pesticides re environmental disposition and ecological effects.
APPROACH: A 75 x 101 cm box 61 cm high with artificial soil, controlled lighting, and purified air and water inputs has probes and associated apparatus to permit monitoring of fate of 14C-labeled pesticides administered to chamber containing a variety of plants, macroinvertebrates, and vertebrates.
RESULTS: Preliminary tests with 14C-dieldrin and 14C-parathion show effective mass balance tracking of system and quantifiable effects relative to present Microtus canicaudus (gray-tailed vole) toxicology. 14C-Parathion, methyl parathion, and p-nitrophenol are currently being tested; 14C-hexachlorobenzene, pentachlorophenol, pentachloronitrobenzene, and captan are to be tested next.
PROJECT MILESTONES: 04/76 Summary reports comparing parathion, methyl parathion and p-nitro-phenol. 01/77 Summary reports following application of 2, 4, 5-T. 07/80 Apply selected substitute chemicals to existing model ecosystems. Review of initial scientific and mini-economic reviews.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;BIOLOGICAL MODELS;PESTICIDES;ENVIRONMENTAL TRANSPORT;MINERAL CYCLING;ECOLOGICAL CONCENTRATION;BIOLOGICAL MODELS;BIOASSAY;MEASURING INSTRUMENTS;WATER POLLUTION MONITORS;DESIGN

<072901>
TITLE: Develop Methods for Identification and Concentration Measurement of Fine Particles in Aquatic Organisms
PROJECT NUMBER: N-608-2
PRINCIPAL INVESTIGATOR: Olson, G.P.
ADDRESS: Environmental Research Laboratory, Duluth, MN 55801
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Olson, Gayle P.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$25,600
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop, evaluate and use electron microscope procedures for identification and concentration determination of fine particles, including asbestos fibers, in tissue from aquatic organisms that have been exposed to such fine particles.
APPROACH: Low temperature ashing on enzymatic hydrolysis of tissue, followed by resuspension on a nuclipore filter and prep for electron microscope observations will be done.
RESULTS: Methodology work has been completed on low temperature ashing and detection limits of the particles in the tissue.
PROJECT MILESTONES: (1) 1/77 Work plan. (2) 10/76 Start lab work. (3) 8/78 Draft final report. (4) 12/78 Submit publication.
KEYWORDS: PARTICLE SIZE;AEROSOLS;AQUATIC ORGANISMS;BIOASSAY;WATER POLLUTION;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;TOXICITY;ASBESTOS;FIBERS;EXPERIMENT PLANNING;MEASURING METHODS;CARCINOGENS;BIOCHEMISTRY;MEASURING INSTRUMENTS;CHEMICAL ANALYSIS

<072902>
TITLE: Toxic Effects on the Aquatic Biota from Coal and Oil Shale Development
PROJECT NUMBER: N-644-A-80
PRINCIPAL INVESTIGATOR: Thurston, R.V.
ADDRESS: Montana State University, Bozeman, MT 59715
AFFILIATION: Florida Inst. of Tech., Jensen Beach (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Thurston, Robert Vance
TELEPHONE: C(406)994-3371
TYPE OF FUNDING: Grant No.-R803950-03
77 FUNDING: Environmental Protection Agency FY77:$1,084,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil Shale (40%);CONSERVATION/General (10%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale (30%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The overall objective of this investigation is to provide predictive information with regard to potential toxicants in the aquatic environment resulting from coal and oil shale extraction and conversion. The specific objectives are to identify and quantify those chemical products of coal and oil shale extraction and conversion which may reach surface waters, and to determine by both field studies and laboratory bioassays the degree to which those chemicals may be acutely or chronically toxic to fish and aquatic invertebrates, or may become involved as part of the food chain.
APPROACH: Four categories of energy development will be considered: coal extraction, oil shale extraction and processing, coal gasification, and coal-to-energy conversion. Potential toxicants to the aquatic environment are being identified by a combination of field, laboratory, and literature studies, as well as by information gained from cooperative input from other energy-related research programs. Concurrent chemical and biological laboratory and field bioassays as well as aquatic distribution studies dictate which toxicants are most deleterious to the aquatic biota. Feedback from these bioassays and distribution studies dictate what additional or alternate emphasis is required in the laboratory and field chemical studies.
RESULTS: Results published in reports.
PROJECT MILESTONES: (1) 8/77 Complete five reports on coal stripmining effects on chemistry and biota. (2) 9/77 Reports on biological and chemical effects on coal combustion. (3) 9/77 Reports on baseline studies for oil shale extraction. (4) 1/78 Synthesis report on aquatic effects of coal stripping. (5) 1/78 Synthesis report on aquatic effects of coal combustion. (6) 1/78 Preliminary repots on toxicity and

analyses of coal gasification. (7) 12/78 Completion reports on aquatic effects of coal mining and combustion oil shale extraction and coal gasification.
KEYWORDS: COAL INDUSTRY;OIL SHALE INDUSTRY;AQUATIC ECOSYSTEMS;TOXICITY;BIOLOGICAL EFFECTS;CHEMICAL EFFLUENTS;WATER POLLUTION;BIOASSAY;FOOD CHAINS;COAL MINING;COAL GASIFICATION;ENERGY CONVERSION;DATA COMPILATION;ENVIRONMENTAL TRANSPORT;BASELINE ECOLOGY;COMBUSTION PRODUCTS;SURFACE MINING;COAL;OIL SHALES

<072903>
TITLE: Continuous Flow Bioassays Using Natural Periphyton Communities with Emphasis on the Effects of Coal Leachate
PROJECT NUMBER: N625A-79
PRINCIPAL INVESTIGATOR: Gerhart, D.Z.;Holmetrand, L.L.;Wood, T.J.;Richter, J.R.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Miller, W.
TYPE OF FUNDING: Grant No.-R803932-03
77 FUNDING: Environmental Protection Agency FY77:$55,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: (1) To quantify the effects of coal leachate on species composition and structures of periphyton communities; (2) to identify leachate components with inhibitory or stimulatory effects; (3) to elucidate possible synergistic or antagonistic interactions among leachate components.
APPROACH: Periphyton communities are grown in laboratory streams on artifield substrates. The bioassay facility utilizes water from Lake Superior and is located at the EPA's National Environmental Research Laboratory in Duluth, Minnesota. In experiments which last from 3 to 8 weeks, periphyton communities are dosed with various concentrations of coal leachate, coal distillate, or fractions thereof, and growth response is measured as changes in biomass (chlorophyll and ash-free dry weight). Algal communities are also examined microscopically to detect changes in species composition and diversity.
RESULTS: Coal leachate appears to stimulate the growth of algae. Current efforts are focusing on identifying the specific chemical factors responsible for this effect.
PROJECT MILESTONES: 01/76 Quantified effects of coal leachate on periphyton communities. 06/76 Identified stimulatory and inhibitory leachate components. 05/78 Identify synergistic or antagonistic leachate interactions.
KEYWORDS: COAL;LEACHING;ENVIRONMENTAL IMPACTS;AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;FRESH WATER;BIOLOGICAL EFFECTS;ALGAE;PLANT GROWTH;SYNERGISM;CARBON;COAL INDUSTRY

<072904>
TITLE: Organic Leaching and Particulate Dispersion from Coal
PROJECT NUMBER: N625A-81
PRINCIPAL INVESTIGATOR: Sydor, M.;Caple, R.;Carlson, R.M.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kuehl, D.W.
TYPE OF FUNDING: Grant No.-R803952-03
77 FUNDING: Environmental Protection Agency FY77:$180,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
PROJECT DESCRIPTION: A major thrust of this project will remain the monitoring of polynuclear aromatic hydrocarbons (PAH's) at the micropollutant level (ppm or less).
APPROACH: The high pressure liquid chromatography-gas chromatography (HPLC-GC) identification methodology developed in these laboratories for the analysis of trace PAH's in coal leachates, and in general water samples, will be extended and applied to such problems as the bioconcentration of PAH's in fish tissue, aiding in the analysis of ''second-order'' PAH's (i.e., metabolites, photochemical oxidation products, aqueous disinfection products), and in the PAH analysis of coal steam distillates.
RESULTS: The ultimate goal of the proposed investigation is to determine the long-range influence of a coal loading facility on a Great Lake Harbor in terms of transport of coal particulate matter, using physical and chemical measurements and application of numerical modeling for water quality to the Duluth-Superior Harbor.
PROJECT MILESTONES: 05/77-Chlorination of dissolved polynuclear aromatics; 06/77-Quantitation of polynuclear aromatic hydrocarbons in H20 by HPLC-GC; 07/77-A selective synthesis of polymethylated naphthalenes; 07/77-End on 2nd year progress report; 07/77-Transport in the Duluth harbor; 06/77-Hepatic mixed-function oxidase activity in rainbow trout exposed.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;NAPHTHALENE;CONDENSED AROMATICS;MONITORING;BIOLOGICAL MODELS;AQUATIC ECOSYSTEMS;COAL INDUSTRY;ENVIRONMENTAL IMPACTS;WATER POLLUTION;TROUT;METABOLISM;PHOTOCHEMICAL OXIDANTS;BIOLOGICAL EFFECTS;DISINFECTANTS;GREAT LAKES;STATISTICAL MODELS;MATHEMATICAL MODELS;AEROSOLS;PARTICLES;ENVIRONMENTAL TRANSPORT

<072905>
TITLE: Analytical Procedures for Measuring Vinylidene Chloride
PROJECT NUMBER: N608-10
PRINCIPAL INVESTIGATOR: Teasley, J.I.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Teasley, J.I.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$35,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Objective of the study is the development and/or modification of existing analytical procedures which will measure both qualitatively and quantitatively vinylidene chloride as well as its products of degradation in environmental substrates.
APPROACH: Techniques of chromatography will be utilized including GLOO, HPIC and head-space analyses. Detection devices will include e.c., flame-ionization and ultraviolet. Phase separations will be employed to separate the parent component and its possible metabolites from various media. Aquatic animals will then be exposed to ascertain the possible uptake, accumulation and depuration of vinylidene chloride, as

well as the possible acute toxicity.
PROJECT MILESTONES: 04/78-Publish air/water analytical chemistry procedures.
KEYWORDS: AIR POLLUTION;EARTH ATMOSPHERE;WATER POLLUTION;CHEMICAL ANALYSIS;AQUATIC ORGANISMS;UPTAKE;BIOLOGICAL ACCUMULATION;TOXICITY;BIODEGRADATION;ENVIRONMENTAL TRANSPORT;CHLORINATED ALIPHATIC HYDROCARBONS

<072906>
TITLE: Chronic Toxicity of Toxicant Mixtures to Fish and Aquatic Invertebrates
PROJECT NUMBER: N608-11
PRINCIPAL INVESTIGATOR: Spehar, R.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Spehar, R.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$9,600
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);GEOTHERMAL/General (33%)
PROJECT DESCRIPTION: Develop and test methods for determining the chronic toxicity of chemicals to aquatic organisms. Utilize sensitive life stages of various aquatic organisms to compare different test designs for determining the chronic and acute toxicity of chemical mixtures.
APPROACH: Lab work will begin in late 1977 and continue for two years.
PROJECT MILESTONES: 12/77-Start project; 09/79-Draft final report.
KEYWORDS: TOXICITY;CHRONIC INTAKE;CHEMICAL EFFLUENTS;ORGANIC COMPOUNDS;INORGANIC COMPOUNDS;MEASURING METHODS;AQUATIC ORGANISMS;TOLERANCE;BIOLOGICAL EFFECTS

<072907>
TITLE: Ventilation Patterns of Bluegill Sunfish (Lepomis Macrochirus)
PROJECT NUMBER: N608-12
PRINCIPAL INVESTIGATOR: Carlson, R.W.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Carlson, R.W.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$12,800
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: (1) Define the ventilating patterns of bluefill sunfish (Lepomis macrochirus) as measured with dual external, unimplanted electrodes during both normal respiration and while undergoing toxicant stress. (2) Compare strip-chart recording of local water pressure and strip-chart recordings of action potentials taken simultaneously to show one-to-one correspondence of respiratory information obtained by both methods. (3) Define and categorize all of the varied action potentials recorded from a fish using dual, external unimplanted electrodes. These action potentials will be associated with any of the various muscle movements that a fish may make, including locomotor activity, breathing, coughing, etc.
PROJECT MILESTONES: 10/76-Begin laboratory work; 09/77-Finish laboratory work; 12/77-Final report.
KEYWORDS: FISHES;RESPIRATION;BIOLOGICAL MODELS;BIOLOGICAL STRESS;ELECTRODES;AUTOMATION;BEHAVIOR;WATER POLLUTION;BIOLOGICAL EFFECTS

<072908>
TITLE: Automated System for Monitoring Ventilatory Movements of Fish
PROJECT NUMBER: N608-13
PRINCIPAL INVESTIGATOR: Drummond, R.A.;Telega, P.;Andrew, R.W.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Drummond, R.A.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$16,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Develop computer programs that will automatically tabulate cough and opercular rates of fish, before and during exposure to toxicants, perform necessary data reduction and statistically analyze the results.
APPROACH: Electrodes are placed at each end of a chamber containing one free-swimming fish. Bio-electric (action potentials) signals associated with the animals' movements are picked up by the electrodes and transmitted to high-gain amplifiers. The amplified analog signals are digitalized and then transmitted to a mini-computer for analysis.
RESULTS: In the process of developing a computer program that will be capable of distinguishing action potentials produced by coughing movements from those associated with opercular movements, swimming activities and other background noises.
PROJECT MILESTONES: 08/77-Mini-computer purchased; 09/78-Computerized system installed and operating as planned.
KEYWORDS: FISHES;RESPIRATION;BIOLOGICAL MODELS;AUTOMATION;COMPUTER CODES;TOXICITY;DATA PROCESSING;DATA ANALYSIS;WATER POLLUTION

<072909>
TITLE: Cough Response of Bluegill Sunfish (Lepomis Macrochirus) Exposed to Phenols
PROJECT NUMBER: N608-14
PRINCIPAL INVESTIGATOR: Carlson, R.W.;Drummong, R.A.;Fiandt, J.T.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Carlson, R.W.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$19,200
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Determine if increases in cough of bluegill sunfish can be used to rank phenols according to their toxicity.

APPROACH: The lowest concentration which causes a significant increase in cough rate of bluegills will be determined for each phenolic compound tested. The phenolic compounds tested will be ranked according to the lowest effective concentrations which cause a significant increase in cough rate; i.e., the lower this concentration is, the more toxic the compound. This ranking will be compared to one obtained from the results of acute bioassay tests completed for each compound. Both cough response and acute bioassays will be evaluated for their usefulness as methods for verifying the structure-activity vs toxicity model for phenolic compounds.
PROJECT MILESTONES: 09/76-Begin lab work; 09/77-End lab work; 12/77-Final report.
KEYWORDS: FISHES;RESPIRATION;WATER POLLUTION;TOXICITY;PHENOLS;BIOASSAY;BIOLOGICAL MODELS

<072910>
TITLE: Relationships of Cadmium Complexation to Toxicological Responses of Aquatic Life
PROJECT NUMBER: N608-15
PRINCIPAL INVESTIGATOR: Poldoski, J.E.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Poldoski, J.E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$6,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Methods will be developed for measuring and predicting cadmium-binding in natural water and determining relationships of measurements to effects of cadmium on aquatic organisms.
APPROACH: Both atomic adsorption and electrochemical methods will be used to measure metals forms in water and metals accumulated in Daphnia magna. This work is nearing completion.
PROJECT MILESTONES: 02/75-Start lab work; 09/77-End lab work; 12/77-Draft final report.
KEYWORDS: CADMIUM;TOXICITY;AQUATIC ORGANISMS;TOLERANCE

<072911>
TITLE: Biological Activity/Toxicity of Copper Forms in Natural Waters
PROJECT NUMBER: N608-16
PRINCIPAL INVESTIGATOR: Andrew, R.W.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Andrew, R.W.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: To determine the toxicity of various forms of copper (cupric) in natural waters, i.e., their effect on aquatic organisms. Previous work has shown a direct correlation of toxicity to Daphnia magna and fathead minnows with cupric-ion activity.
APPROACH: Present work is directed at development of ion-selective electrodes for measurement (and monitoring) of cupric-ion activities in both laboratory and field bioassays.
PROJECT MILESTONES: 03/78-Publication of scientific paper; 09/78-Completion of laboratory studies; 12/78-Final report.
KEYWORDS: COPPER;TOXICITY;BIOLOGICAL EFFECTS;ENVIRONMENTAL TRANSPORT;WATER POLLUTION;AQUATIC ECOSYSTEMS;DAPHNIA;TOLERANCE

<072912>
TITLE: Significant Alteration of a Chemical Structure by Biological Methods
PROJECT NUMBER: N608-17
PRINCIPAL INVESTIGATOR: Tyo, R.M.;Eaton, J.G.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Tyo, R.M.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The utilization of a biological system as a principal and efficient method to study the stability, breakdown, or removal of an organic material in a wastewater.
APPROACH: Observe the changes in these materials in or by a bench model advance waste treatment system.
PROJECT MILESTONES: 03/77-Start sewage loading; 06/77-Establish loading capacities; 09/77-Establish loading capacities and standards; 02/79-Establish loading capacities and system effects of a PCB replacement; 09/78-Evaluate type of system as a desirable tool to demonstrate.
KEYWORDS: SEWAGE SLUDGE;POLYCYCLIC AROMATIC HYDROCARBONS;BIODEGRADATION;WASTE WATER;ORGANIC COMPOUNDS;WASTE MANAGEMENT;REMOVAL;PURIFICATION;ENVIRONMENTAL TRANSPORT

<072913>
TITLE: Environmental Research Laboratory--Duluth
PROJECT NUMBER: N608-20
PRINCIPAL INVESTIGATOR: Leonard, E.N.,Kuehl, D.W.;Veith, G.D.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kuehl, D.W.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this work is to identify and quantitate organic chemicals, which bioaccumulate in fish exposed to disinfected wastewaters. The approach involves analyzing fish made available from a demonstration project in the state of Michigan, where fish were exposed to nonindustrial and industrial municipal wastewaters after treatment and disinfection with chlorine, bromine chloride, ozone and chlorine followed by dechlorination.
APPROACH: The analytical techniques will include liquid extractions, gel permeation, reverse phase high

pressure liquid chromatography and CC/MS. Current work includes developing extraction procedures for residues in fish resulting from chlorinated and brominated wastes and preliminary identifications of chlorinated and brominated residues.
PROJECT MILESTONES: 11/77-Qualitative and quantitative determinations of residues in fish.
KEYWORDS: FISHES;BIOASSAY;BIOLOGICAL ACCUMULATION;DISINFECTANTS;WASTE WATER;MUNICIPAL WASTES;CHLORINE;BROMINE;OZONE;DECHLORINATION;TOXICITY;CHLORINATED ALIPHATIC HYDROCARBONS;BROMINATED ALIPHATIC HYDROCARBONS;ORGANIC CHLORINE COMPOUNDS;ORGANIC BROMINE COMPOUNDS;WATER POLLUTION;BIOLOGICAL EFFECTS;CONTAMINATION

<072914>
TITLE: Development of Behavioral Monitoring System for Aquatic Insect Bioassays
PROJECT NUMBER: N608-3
PRINCIPAL INVESTIGATOR: Anderson, R.L.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Anderson, R.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$9,600
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this project is to build, calibrate and test a device which will measure water flow at low velocities.
APPROACH: The approach is based on hot-thermistor probes and current plans are directed toward using the system to monitor low velocity currents in natural and laboratory settings.
PROJECT MILESTONES: (1) 01/77 Work plan. (2) 10/76 Start-lab work. (3) 04/78 End lab work. (4) 06/78 Draft final report. (5) 09/78 Submit publication.
KEYWORDS: BEHAVIOR;MONITORING;AQUATIC ORGANISMS;INSECTS;MEASURING INSTRUMENTS;LABORATORY EQUIPMENT;DESIGN;FABRICATION;PERFORMANCE TESTING;CALIBRATION;WATER POLLUTION;BIOLOGICAL EFFECTS

<072915>
TITLE: Determine the Significance of Benthic Organisms Living in Hydrosoil on Fate and Distribution of Persistent Pesticides in Aquatic Systems
PROJECT NUMBER: N608-4
PRINCIPAL INVESTIGATOR: Anderson, R.L.;Mueller, L.H.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Anderson, R.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$57,600
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective is to determine the rate and extent of mirex incorporation in sediment alone, sediment and insects and insects alone. A second objective is to measure the loss from the sediment and sediment with insects.
APPROACH: The approach will be to use water saturated with mirex and expose the sediment and insects for periods up to 28 days. Samples taken at regular intervals will monitor the uptake and release.
RESULTS: Current plans are aimed toward developing a continuing program which will include different types of sediments and test animals.
KEYWORDS: PLANKTON;ENVIRONMENTAL TRANSPORT;PESTICIDES;ORGANIC CHLORINE COMPOUNDS;SEDIMENTS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL MODELS;INSECTS;METABOLISM

<072916>
TITLE: Develop Automated Analytical Methods for Detecting Phenols in Water
PROJECT NUMBER: N608-5
PRINCIPAL INVESTIGATOR: Fiandt, J.T.;Puglisi, F.A.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Fiandt, J.T.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$9,600
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: To develop automated colorimetric methods for the analysis of phenols in support of acute bioassays of these compounds.
APPROACH: A technicon autoanalyzer was modified to perform these analyses using MBTH as the color-producing reagent, following the basic method of Gales.
PROJECT MILESTONES: (1) 09/76 Work plan. (2) 10/76 Start lab work. (3) 12/76 Method available.
KEYWORDS: PHENOLS;BIOASSAY;AUTOMATION;SPECTROSCOPY

<072917>
TITLE: Comparative Thermal Responses of Young-of-the-Year Largemouth Bass from Northern and Southern Populations
PROJECT NUMBER: N608-6
PRINCIPAL INVESTIGATOR: McCormick, J.H.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: McCormick, J.H.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$41,600
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this project is to determine if thermal response data derived from studies of fish samples from one latitudinal location in the U.S. provide a valid foundation for estimates of the anticipated thermal responses of the same species from other locations in the U.S.
APPROACH: The approach is to determine if thermal limits for survival, growth and development of the largemouth bass show significant differences between samples of bass obtained from the Minnesota-Wisconsin

area and from Tennessee. The experiment is further designed to evaluate the effects of where the tests are conducted. To accomplish this the same work plan, developed at ERL-Duluth, is being employed simultaneously at the ERDA lab at Oak Ridge and at the ERL-Duluth lab using interchanged subsamples of the same stocks of fish. Laboratory work at the ERL-Duluth laboratory has been completed and data processing is in progress.
RESULTS: Lab work at the ERDA lab is planned to extend into 1978.
PROJECT MILESTONES: (1) 03/76 Work plan. (2) 04/76 Lab work started. (3) 08/77 Lab work completed. (4) 10/77 Draft final report. (5) 02/78 Manuscript submitted.
KEYWORDS: THERMAL POLLUTION;BIOLOGICAL STRESS;FISHES;TEMPERATURE EFFECTS;MINNESOTA;WISCONSIN

<072918>
TITLE: Effects of Large Concentrations of Suspended Fine Particles (Red Clay) on Availability and Toxicity of Copper to Fathead Minnows
PROJECT NUMBER: N608-7
PRINCIPAL INVESTIGATOR: Mattson, N.R.;Olson, G.F.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mattson, N.R.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$24,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of this study are to determine if a common fine sediment such as red clay can affect the toxicity of copper, and to determine if the copper becomes bound to the red clay particles.
APPROACH: Bioassays will be performed with filtered lake water plus five concentrations of copper, and with filtered lake water plus clay particles as approximately 50 mg/liter and the copper concentrations, on juvenile fathead minnows. Chemical tests will be performed to determine for copper the degree to which the metal is sorbed or bound to the clay particles.
RESULTS: Dosing methods have been developed and fish exposures are under way, with test completion anticipated in May, 1978.
PROJECT MILESTONES: (1) 12/76 Work plan. (2) 01/77 Start lab work. (3) 01/78 End lab work. (4) 03/78 Draft final report. (5) 05/78 Submit for publication.
KEYWORDS: PARTICLES;CLAYS;COPPER;WATER POLLUTION;FISHES;TOXICITY;TOLERANCE

<072919>
TITLE: Effects of Lowered Diel Fluctuating Oxygen on Black Crappie Spawning Success
PROJECT NUMBER: N608-8
PRINCIPAL INVESTIGATOR: Carlson, A.R.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Carlson, A.R.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$41,600
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this laboratory study was to determine the spawning success of the black crappie, Pomoxis nigromaculatus under several diel fluctuating dissolved oxygen (DO) concentrations after exposure overwinter to several constant reduced DO regimes.
RESULTS: The experiment has been completed and a manuscript is being prepared for publication in early 1978.
PROJECT MILESTONES: (1) 08/76 Work plan. (2) 09/76 Start of lab work. (3) 07/77 End of lab work. (4) 09/77 Draft final report. (5) 03/78 Submit for publication.
KEYWORDS: FISHES;DAILY VARIATIONS;REPRODUCTION;OXYGEN;BIOLOGICAL EFFECTS

<072920>
TITLE: Effects of Reduced Fluctuating Dissolved Oxygen Concentrations on the Survival and Growth of Juvenile Channel Catfish and Yellow Perch
PROJECT NUMBER: N608-9
PRINCIPAL INVESTIGATOR: Carlson, A.R.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Carlson, A.R.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$28,800
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this laboratory research is to determine the effects of several diel fluctuating dissolved (DO) regimes on the survival and growth of juvenile channel catfish, Ictalurus punctatus, and yellow perch, Perca flavescens.
APPROACH: The fish will be exposed in duplicate chambers at optimum temperatures for growth to several diel fluctuating DO regimes. Exposure will last 60 days.
RESULTS: The experimental apparatus has been built and experimentation will start during September when the fish become available.
PROJECT MILESTONES: (1) 05/77 Work plan. (2) 07/77 Start lab work. (3) 12/77 End lab work. (4) 02/78 Draft final report. (5) 05/78 Submit publication.
KEYWORDS: FISHES;DAILY VARIATIONS;OXYGEN;METABOLISM;BIOLOGICAL EFFECTS;POPULATION DYNAMICS;LIFE CYCLE;SURVIVAL CURVES;ANIMAL GROWTH

<072921>
TITLE: Development of Toxicity Tests with Early Life Stages of Fish
PROJECT NUMBER: N608-18
PRINCIPAL INVESTIGATOR: McKim, J.M.;Christensen, G.M.;Leonard, E.N.;Bendit, D.;Tucker, J.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: McKim, J.M.
TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Environmental Protection Agency FY77:$121,600
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this research is to further develop existing methods for toxicity tests with the early life stages of fish and to shorten the time required for these tests from several months to several weeks, making them more feasibile for on-site testing and for screening large numbers of toxic chemicals.
APPROACH: The approach will involve the development of more suitable endpoints of effect through in-depth embryological, physiological, biochemical and histological measurements throughout the embryo-larval-early juvenile period of development.
RESULTS: Current work is involved with early morphological development, and the early development of selected enzyme systems in a warmwater fish exposed to toxic chemicals.
PROJECT MILESTONES: (1) 06/78 Embryo-larval fish toxicity test system ready for field use. (2) 10/79 Effects of several toxicants on embryological development of fish. (3) 06/79 Impact of several toxicants on the develcpment of selected enzymes.
KEYWORDS: FISHES;TOXICITY;TOLERANCE;BIOASSAY;TOXIC MATERIALS;PHYSIOLOGY;BIOCHEMISTRY

<072922>
TITLE: Development and Evaluation of Methods for Detection of Bacterial Indicators of Pollution in Water
PROJECT NUMBER: N608-19
PRINCIPAL INVESTIGATOR: Veith, G.L.;Fiandt, J.T.;Holcombe, G.;Kuehl, D.W.;Phipps, G.L.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISICN: Environmental Research Laboratory
MONITOR: Veith, G.D.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The objective of this project is to determine if a correlation exists between selected biological endpoints and the chemical structure of selected groups of classes of organic compounds. If strong correlations exist, then the possibility of predicting the biological effects of groups of compounds instead of individual compounds might become possible.
APPROACH: The approach involves determining the toxic effects of a single group of chemicals (related structurally) to a single fish species. The initial chemical parameter to be correlated with biological effect will be partition coefficient.
RESULTS: Current work involves correlating the partition coefficients of 12 phenolic compounds with acute and chronic toxicity and bioaccumulation.
PROJECT MILESTONES: (1) 11/78 Correlation of chemical structure with acute toxicity of 12 phenolic compounds. (2) 12/78 Correlation of chemical structure with chronic toxicity of 6 phenolic compounds. (3) 02/78 Correlation of chemical residues in fish with chemical structure.
KEYWORDS: BACTERIA;BIOLOGICAL INDICATORS;WATER POLLUTION;FISHES;PHENOLS;TOXICITY;METABOLISM;BIOLOGICAL ACCUMULATION

<072923>
TITLE: Atmospheric Input of Trace Metals to Lake Michigan
PROJECT NUMBER: N608A-10
PRINCIPAL INVESTIGATOR: Eisenreich, S.J.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mullin, M.D.
TYPE OF FUNDING: Grant No.-R805172-01
77 FUNDING: Environmental Protection Agency FY77:$21,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of the research project is to determine loadings and deposition rates of selected trace metals to Lake Michigan from atmospheric sources.
APPROACH: The trace metal content of monthly integrating, bulk precipitation samples collected at 22 land-based stations, 2 in-lake buoy collectors and 2 wet/dry units will be measured. The bulk precipitation samples were collected at sites in Wisconsin, Illinois, Indiana and Michigan bordering Lake Michigan from July, 1975 to December, 1976. Trace metals (Zn, Cd, Pb, Cu, Ni, Fe, Co and Mn) will be analyzed by Atomic Absorption Spectrophotometry. Trace metal data will be reported in concentration units (micrcng/l), deposition rates (microng/cm2/month) and in total loadings to the Lake on an annual basis. Statistical techniques will be used to identify sources where possible.
PROJECT MILESTONES: 07/78 Final report due.
KEYWORDS: FRESH WATER;AQUATIC ECOSYSTEMS;AIR POLLUTION;DEPOSITION;ENVIRONMENTAL TRANSPORT;TRACE AMOUNTS;ZINC;CADMIUM;LEAD;COPPER;NICKEL;IRON;COBALT;MANGANESE;ECOLOGICAL CONCENTRATION;QUANTITATIVE CHEMICAL ANALYSIS;LAKE MICHIGAN;WATER QUALITY

<072924>
TITLE: Optimal Sampling Strategies for Water Quality in Large Lakes
PROJECT NUMBER: N608A-12
PRINCIPAL INVESTIGATOR: Canale, R.P.;Powers, W.F.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Dolan, D.M.
TYPE OF FUNDING: Grant No.-R803754-02
77 FUNDING: Environmental Protection Agency FY77:$38,600
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The overall objective of the grant is to develop a methodology that will specify the optimal sampling strategy for large lakes by minimizing costs and experimental error and maximizing the value of the sampling information obtained.
PROJECT MILESTONES: (1) 09/76 Methodology developed, first example presented. (2) 09/77 Second example completed, sample delivered.
KEYWORDS: LAKES;SAMPLING;WATER QUALITY;OPTIMIZATION

<072925>
TITLE: Accumulation and Fate of Potentially Hazardous Substances in Recent Sediments of Lake Huron and Saginaw Bay
PROJECT NUMBER: N608A-14
PRINCIPAL INVESTIGATOR: Robbins, J.A.;Johansen, K.A.;Krezoski, J.R.;Remmert, K.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mullin, M.D.
TYPE OF FUNDING: Grant No.-R804686-02
77 FUNDING: Environmental Protection Agency FY77:$60,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The aim of this study is twofold: (1) to obtain present and historical rates of accumulation of metals and nutrients in the fine-grained deposits of Lake Huron and (2) to evaluate the role of resuspension and sediment-water exchange processes in the regulation of water quality.
APPROACH: Sedimentation rates are determined primarily from vertical profiles of lead-210 with fallout cesium-137 providing supplementary information. Concentration data in combination with sedimentation rates give estimates of the net flux of elements to sediments. Resuspension effects and particle sinking rates will be determined from standard and automated microtraps. Long-term resuspension effects will be estimated from resurvey of cesium-137 fine-grained deposits in the Bay. Diver-collected cores will be sectioned and sampled for pore water under conditions approximating the in-situ environment and direct flux measurements on recovered cores will complement pore water studies. The role of benthic fauna on sediment-water exchange will be investigated both in the field and in the laboratory. Multiple radiotracer methods will be used to determine the effect of selected benthos on their sedimentary environment.
PROJECT MILESTONES: 10/78-Final report due.
KEYWORDS: HAZARDOUS MATERIALS;SEDIMENTS;LAKE HURON;WATER QUALITY;PARTICLE RESUSPENSION;SODIUM;MAGNESIUM;CALCIUM;POTASSIUM;MANGANESE;IRON;ZINC;COPPER;NICKEL;LEAD;CHROMIUM;CADMIUM;ABORPTION SPECTROSCOPY;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL TRANSPORT;ACTIVATION ANALYSIS;NEUTRONS;ALUMINIUM;TITANIUM;ARSENIC;BARIUM;BROMINE;CESIUM;CERIUM;HAFNIUM;LANTHANUM;LUTETIUM;ANTIMNY;SELENIUM;SAMARIUM;THORIUM;URANIUM;VANADIUM;LEAD 210;CESIUM 137;SEDIMENTS;SEDIMENTATION;RADIOECOLOGICAL CONCENTRATION;YTTERBIUM;ERBIUM;PLANKTON;BIOLOGICAL EFFECTS

<072926>
TITLE: Polychlorobiphenyls in Precipitation in Lake Michigan Basin
PROJECT NUMBER: N608A-16
PRINCIPAL INVESTIGATOR: Murphy, T.J.
AFFILIATION: De Paul Univ., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mullin, M.D.
TYPE OF FUNDING: Grant No.-R803915
77 FUNDING: Environmental Protection Agency FY77:$1,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of the project were: (1) to determine the concentration of polychlorobiphenyls (PCBs) in precipitation in the Lake Michigan basin and to estimate the relative importance of this source of PCBs to Lake Michigan; (2) to obtain information on the distribution of PCBs in the atmosphere between material present as vapor and that absorbed on particulate matter, in order to understand the mechanism of transport of these compounds by the atmosphere.
RESULTS: PCB concentrations in the parts per billion range obtained from gas samples from a vented landfill indicate that PCB containing materials incorporated into landfills may be an important source of PCBs to the atmosphere.
PROJECT MILESTONES: 08/77-Final report in preparation.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;CHLORINATED AROMATIC HYDROCARBONS;ORGANIC CHLORINE COMPOUNDS;AROMATICS;ECOLOGICAL CONCENTRATION;FRESH WATER;AQUATIC ECOSYSTEMS;AIR POLLUTION;SANITARY LANDFILLS;ENVIRONMENTAL IMPACTS;ATMOSPHERIC PRECIPITATIONS;ENVIRONMENTAL TRANSPORT

<072927>
TITLE: Nutrient and Plankton Relationships in Northern Lake Michigan
PROJECT NUMBER: N608A-17
PRINCIPAL INVESTIGATOR: Schelske, C.L.;Stoepner, E.P.;Cannon, J.E.;Moll, R.A.;Simmons, M.S.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mullin, M.D.
TYPE OF FUNDING: Grant No.-R804503-01
77 FUNDING: Environmental Protection Agency FY77:$153,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The purpose of this investigation is the characterization of northern Lake Michigan in terms of physical, chemical and biological environments and to provide data for comparison with future studies of the degree and rate of environmental change. Some of the objectives are: (1) to determine the vertical, horizontal and seasonal variations in selected nutrients and other chemical and physical parameters; (2) to determine the effects of islands and their associated morphometry on enviro-conditions and to contrast environmental conditions near islands with nearshore areas of the mainland; (3) to analyze phytoplankton, rotifer, and crustacean zooplankton species composition and abundance in northern Lake Michigan; (4) to utilize data on phytoplankton and zooplankton community structure as an indicator of the trophic status of waters in northern Lake Michigan; (5) to provide phytoplankton and zooplankton data that will be useful in conjunction with other parts of the study to assess biological responses to nutrient conditions in northern Lake Michigan waters.
PROJECT MILESTONES: 07/78-Final report due.
KEYWORDS: NUTRIENTS;PLANKTON;LAKE MICHIGAN;BASELINE ECOLOGY

<072928>
TITLE: Cladophora Measurements Using Remote Sensing
PROJECT NUMBER: N608A-19
PRINCIPAL INVESTIGATOR: Wezernak, C.T.
AFFILIATION: Environmental Research Inst. of Michigan, Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mullin, M.D.
TYPE OF FUNDING: Grant No.-R803611
77 FUNDING: Environmental Protection Agency FY77:$4,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of the project are to develop and/or demonstrate remote sensing techniques for mapping Cladophora using passive multispectral scanner data collected from low aircraft altitudes and to define the capability of passive multispectral remote sensing for estimating Cladophora biomass.
APPROACH: Remote sensing and supporting field data will be collected during June 1975 over a 5 km study area along the shoreline of Lake Ontario at a location near Rochester, New York. Processing of multispectral scanner data will include both analog and digital techniques to show the distribution of Cladophora and to relate spectral characteristics to standing crop.
PROJECT MILESTONES: 01/78-Final report due.
KEYWORDS: FRESH WATER;AQUATIC ECOSYSTEMS;REMOTE SENSING;WATER QUALITY;AERIAL MONITORING;FUNGI;BIOMASS;MAPS

<072929>
TITLE: Determination of Atmospheric Phosphorus Addition to Lake Michigan
PROJECT NUMBER: N608A-20
PRINCIPAL INVESTIGATOR: Beeton, A.M.
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mullin, M.D.
TYPE OF FUNDING: Grant No.-R803238
77 FUNDING: Environmental Protection Agency FY77:$7,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: A network of twenty atmospheric precipitation stations around Lake Michigan, as well as sampling on Lake Michigan from ships and/or buoys, will be set up to collect samples for one year. These samples will be analyzed in Milwaukee at the Center for Great Lakes Studies for total and ortho phosphorus and possibly nitrate, ammonia and silica with the intent of calculating phosphorus loadings to Lake Michigan.
PROJECT MILESTONES: 08/77-Final report in preparation.
KEYWORDS: AIR POLLUTION;PRECIPITATION SCAVENGING;PHOSPHORUS;DEPOSITION;MONITORING;NITRATES;AMMONIA;SILICON OXIDES;ECOLOGICAL CONCENTRATION

<072930>
TITLE: Impact of Zooplankton Grazing Upon Phytoplankton in Eutrophic Saginaw Bay and Western Lake Erie
PROJECT NUMBER: N608A-22
PRINCIPAL INVESTIGATOR: McNaught, D.C.
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Thomas, N.A.
TYPE OF FUNDING: Grant No.-R804573
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The ability of the herbivorous zooplankton to regulate algal productivity in highly eutrophic Saginaw Bay (Lake Huron) and western Lake Erie will be determined. Total grazing, as well as size-selective feeding on small flagellates as well as large diatoms and blue-green algae will be measured in the field. This information on important carbon fluxes is vital to the modeling team responsible for the ultimate synthesis of data on Great Lakes ecosystems. Field studies of grazing will depend on 14C tagging techniques.
APPROACH: In the laboratory the feeding habits of rotifers, often ignored, will be investigated using new particle counting techniques combined with computer analysis. All of these investigations will be based on progress made by an experimental team during Upper Lakes Reference Study.
RESULTS: Results already show that the crustaceans control algal production in open lake only during the fall months. Biological control of the growth of blue-green algae failed to develop in mid-summer. Discovery of the degree of biological control in the most eutrophic areas of the Great Lakes is vital to understanding the functioning of these ecosystems, ultimately producing validated simulation models for them, and finally managing algal bloom problems.
PROJECT MILESTONES: 04/77-Annual report. 04/78-Annual report. 04/79-Annual report.
KEYWORDS: ZOOPLANKTON;PHYTOPLANKTON;EUTROPHICATION;LAKE ERIE;AQUATIC ECOSYSTEMS;METABOLISM;BIOLOGICAL MODELS

<072931>
TITLE: Assessment of Nearshore Benthic Microinvertebrates in Lake Michigan
PROJECT NUMBER: N608A-26
PRINCIPAL INVESTIGATOR: Mozley, S.C.;Winnell, M.W.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swain, W.R.
TYPE OF FUNDING: Grant No.-R805333-01
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objective of this project is to construct a thorough description of the composition, distribution and correspondence to prominent environmental features (e.g., sediment texture, concentrations of toxic chemicals) of benthic animals in Lake Michigan.
APPROACH: A set of 302 samples arrayed over the entire lake was collected by the Canada Centre for Inland Waters in 1975. These samples will be processed under the present contract and supplemented by an additional 252 samples concentrated in the nearshore areas (less than 60 m deep) of the main basin in July

1977. Data from both sets of samples will be analyzed particularly for information about indicator species, so that a benchmark for future comparisons and assessments of relative improvement or deterioration of the benthic environment will be available. Descriptions of other basic characteristics of the benthos, such as arrangements of species into assemblages, and geographical gradients in assemblages which are related to climate or circulation patterns in the lake will also be undertaken.
...OJECT MILESTONES: 06/77-Start grant. 05/78-Terminate grant. 08/78-Final report.
KEYWORDS: INVERTEBRATES;LAKE MICHIGAN;TOXIC MATERIALS;SEDIMENTS;PLANKTON;BASELINE ECOLOGY;CLASSIFICATION

<072932>
TITLE: Comparative Kinetic Studies of Nutrient Uptake and Growth in the Great Lakes Phytoplanktons
PROJECT NUMBER: N608A-28
PRINCIPAL INVESTIGATOR: Rhee, G.
AFFILIATION: New York State Dept. of Health, Albany (USA). Div. of Labs. and Research (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Bierman, V.J.
TYPE OF FUNDING: Grant No.-R804689-02
77 FUNDING: Environmental Protection Agency FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: In freshwater environments, limiting nutrient for biological production is frequently P followed by N. Recent studies of nutrient, limited growth in phytoplankton revealed that growth rate is regulated by intracellular nutrient pool(s). In case of P, cellular inorganic polyphosphate (PPi) is the growth regulating pool in Scenedesmus sp. and this pool also appears to affect P uptake along with external P levels. For N, such a reserve compound has not been investigated. Therefore, it will be investigated whether the involvement of PPi in P-limited growth and P uptake is universal in organisms belonging to various taxonomic groups and whether there exists N pool(s) similar to PPi for N-limited growth and N uptake. Attempts will be made to develop kinetic models for growth and N and P uptake involving nutrient pools. The transition between N and P limitation is an important aspect in polluted environments. Growth during this transition is described by a simple threshold equation of nutrient-limited growth. This implies that differing optimal N/P ratio in competing species may be a basis for competitive exclusion and coexistence. Therefore, the variability of the ratio in various species will be studied. In addition to the above problems, the effect of the major environmental variables, temperature and light, on growth and nutrient uptake will be investigated. Emphasis will be placed on the phytoplankters of the Great Lakes and experimental studies will involve the examination of kinetics in continuous culture.
PROJECT MILESTONES: 06/77 Manuscript accepted for publication in Limnology and Oceanography. 06/77 Chapter prepared for advances in aquatic microbiology.
KEYWORDS: GREAT LAKES;AQUATIC ECOSYSTEMS;FRESH WATER;PHYTOPLANKTON;NUTRIENTS;BIOMASS;PHOSPHATES;GROWTH;NITROGEN;MATHEMATICAL MODELS;MINERAL CYCLING;ENVIRONMENT;TEMPERATURE DEPENDENCE;GENETIC VARIABILITY;VISIBLE RADIATION;POPULATION DYNAMICS;PLANT GROWTH;ENVIRONMENTAL TRANSPORT

<072933>
TITLE: Survey of Nutrients and Hazardous Substances in Saginaw Bay, Michigan
PROJECT NUMBER: N608A-29
PRINCIPAL INVESTIGATOR: Smith, V.E.;Lee, K.W.
AFFILIATION: Cranbrook Inst. of Science, Bloomfield Hills, Mich. (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Bierman, V.J.
TYPE OF FUNDING: Grant No.-R804402-02
77 FUNDING: Environmental Protection Agency FY77:$168,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The distribution of major nutrients and hazardous substances in Saginaw Bay will be surveyed during 15 cruises in 1976. Objectives of the study are to: support the continuing development and verification of nutrient transport and productivity models; define the distribution and fate of hazardous substances in bay water sediments; and biota. Sampling and in situ monitoring will be conducted at 15 primary stations offshore and 5 secondary stations inshore (i.e., marsh and island littoral zones). Samples of sector, surface films, sediments and aquatic organisms will be analyzed for metals (zinc, copper, cadmium) and organic contaminants (chlorinated hydrocarbons, polynuclear aromatic hydrocarbons, phthalate esters). These and supplemental data will be used to develop a description of mass balance for Saginaw Bay. All cruises will coincide with satellite (ERTS) coverage of the area. This work is part of a continuing EPA study of water quality dynamics in Saginaw Bay, begun in 1973.
PROJECT MILESTONES: 03/79 Final report.
KEYWORDS: LAKE MICHIGAN;AQUATIC ECOSYSTEMS;NUTRIENTS;HAZARDOUS MATERIALS;ENVIRONMENTAL TRANSPORT;SEDIMENTS;AQUATIC ORGANISMS;WATER POLLUTION;MONITORING;COASTAL WATERS;ZINC;COPPER;CADMIUM;CHLORINATED AROMATIC HYDROCARBONS;POLYCYCLIC AROMATIC HYDROCARBONS;PHTHALIC ACID;ESTERS;WATER QUALITY

<072934>
TITLE: Inputs of Hazardous Organics from the Atmosphere to Saginaw Bay
PROJECT NUMBER: N608A-30
PRINCIPAL INVESTIGATOR: Murphy, T.J.
AFFILIATION: De Paul Univ., Chicago, Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mullin, M.D.
TYPE OF FUNDING: Grant No.-R805325-01
77 FUNDING: Environmental Protection Agency FY77:$41,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of this project are to determine the atmospheric inputs of polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) to Saginaw Bay in Lake Huron.
APPROACH: Precipitation and dry deposition samples will be collected at several locations around the Bay.

These samples will be analyzed for Aroclon 1242, 1254 and 1260, for the major PAHs present and for the PAHs known to be carcinogens.
PROJECT MILESTONES: 09/79-Final report due.
KEYWORDS: HAZARDOUS MATERIALS;AIR POLLUTION;ATMOSPHERIC PRECIPITATIONS;POLYCYCLIC AROMATIC HYDROCARBONS;WATER POLLUTION;LAKE HURON;DEPOSITION;CARCINOGENS;ECOLOGICAL CONCENTRATION

<072935>
TITLE: Sampling, Characterization Plus Analysis Manual for Dredged and Fill Materials
PROJECT NUMBER: N608A-31
PRINCIPAL INVESTIGATOR: Sweeney, R.A.
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mullin, M.D.
TYPE OF FUNDING: Grant No.-R805572-01
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Provide regulatory agencies with a state-of-the-art manual for sampling, characterization and methods of analysis to include quality assurance programs and represent areas relating to contaminants found in dredged and fill material and water quality assessments for aquatic disposal and contaminant area effluent or runoff. Further goals are to provide interpretive guidance concerning implementation of results of sampling, characterization, and analytical methods and to identify areas where present information or procedures are incomplete or inadequate and recommend necessary research to eliminate these limitations.
APPROACH: Material will be compiled via literature searches and consultation with those involved with the above activities.
PROJECT MILESTONES: 10/79-Manual ready for release.
KEYWORDS: SPOIL BANKS;MANUALS;SAMPLING;CHEMICAL ANALYSIS;BACKFILLING;CHEMICAL PROPERTIES;QUALITY ASSURANCE;WATER QUALITY;ENVIRONMENTAL IMPACTS;WATER POLLUTION;MONITORING

<072936>
TITLE: Heavy Metal Accumulation in Benthic Algal Communities
PROJECT NUMBER: N608A-35
PRINCIPAL INVESTIGATOR: Sickogoad, L.;Stoermer, E.F.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Swain, W.R.
TYPE OF FUNDING: Grant No.-R805146-01
77 FUNDING: Environmental Protection Agency FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Research is designed to estimate the impact of heavy metal contaminants on benthic algae.
APPROACH: The concentration phenomena will be observed at various levels of availability of trace metals. An in vitro laboratory effort will seek to provide a qualitative and quantitative assessment of specific site binding mechanisms in algal species common to the Great Lakes benthic communities.
RESULTS: Current planning calls for the use of STEM using energy dispersive x-ray analysis for intracellular analysis of metals.
PROJECT MILESTONES: 03/77-Start grant period. 05/78-Interim report. 06/79-Interim report. 08/80-Final report.
KEYWORDS: ALGAE;GREAT LAKES;METALS;CHEMICAL ANALYSIS;BIOASSAY;MONITORING;WATER POLLUTION

<072937>
TITLE: Nutritional Ecology of Great Lakes Cladophora Sp.
PROJECT NUMBER: N608A-36
PRINCIPAL INVESTIGATOR: Gerloff, G.C.
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Thomas, N.A.
TYPE OF FUNDING: Grant No.-R804402
77 FUNDING: Environmental Protection Agency FY77:$37,400
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The primary objectives of this project are to carry out laboratory studies on the nutritional requirements and characteristics of Cladophora glomerata, to evaluate its nutrition under field conditions, and to utilize the results in explaining the occurrence of nuisance Cladophora growths in the Great Lakes and in developing measures to reduce the growths. Emphasis in the laboratory aspects will be in evaluating the effectiveness of Cladophora glomerata in competing with diatoms and other organisms for P and other nutrients likely to be critical in the abundant growths of C. glomerata. C. glomerata and other Lake Michigan organisms will be grown in mixed cultures and made to compete for growth-limiting amounts of critical nutrients. The minimum solution concentrations at which C. glomerata can absorb adequate P and other key nutrients also will be established and compared with similar values for other competing organisms. The emphasis in the field work will be to establish whether the available supply of a specific inorganic or organic nutrient is a key factor in controlling nuisance Cladophora growths in Lake Michigan and particularly Green Bay. These evaluations will be by various biological assays with emphasis on the techniques of plant analysis.
PROJECT MILESTONES: 05/77 Annual report. 05/78 Final report.
KEYWORDS: FUNGI;NUTRITION;ECOLOGY;GREAT LAKES;ORGANIC COMPOUNDS;INORGANIC COMPOUNDS

<072938>
TITLE: Analysis of Planktonic Diatoms from Open Lake Michigan Water
PROJECT NUMBER: N608A-4
PRINCIPAL INVESTIGATOR: Beeton, R.H.
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Thomas, N.A.
TYPE OF FUNDING: Grant No.-R805138

77 FUNDING: Environmental Protection Agency FY77:$11,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Two-hundred thirty-five water samples will be analyzed, qualitatively and quantitatively, for species of planktonic diatoms. The samples, now concentrated and preserved, were taken year-round from 5 locations on 47 separate dates from a water intake of a railroad ferry on a transect across Lake Michigan. Analysis of these samples will identify possible differences between the diatoms of inshore and offshore waters and provide the first year-round data of the diatom community in offshore as well as inshore water of Lake Michigan. Various graphical displays and biometric analyses of the data such as contour and isometric projection graphs, principal components analysis and hierarchical or grouping will be used to aid in interpretation of the data. Multiple regression and canonical correlation analyses will be used to determine structural relationships between physicochemical parameters, previously analyzed, and the diatoms.
PROJECT MILESTONES: 02/78 Final report.
KEYWORDS: PLANKTON;LAKE MICHIGAN;WATER QUALITY;DIATOMS;CHEMICAL ANALYSIS;MONITORING;BIOLOGICAL VARIABILITY

<072939>
TITLE: Growth of Cladophora Glomerata--Relationships to Trace Nutrients, Herbivores and Ecosystem Functioning
PROJECT NUMBER: N608A-5
PRINCIPAL INVESTIGATOR: Patrick, R.;Bott, T.;Larson, R.;Rhyne, C.
AFFILIATION: Philadelphia Academy of Natural Sciences, Pa. (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Thomas, N.A.
TYPE OF FUNDING: Grant No.-R805106
77 FUNDING: Environmental Protection Agency FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: One objective of the proposed program is to investigate the effect of trace metal and organic phosphorus micronutrients on the growth of Cladophora glomerata. The other is to evaluate Cladophora as a food source for selected herbivores and omnivores. These studies will also aid in understanding how Cladophora growths develop in nature and will permit evaluation of the effect of Cladophora growth on ecosystem structure and functioning.
APPROACH: Cladophora growth studies of two types are planned: micronutrient addition experiments with unialgal cultures, and competition experiments with other algae in microcosms held under near natural conditions in a greenhouse laboratory. Feeding studies will include: food preference experiments, growth experiments, and energetics experiments. The effect of Cladophora growths on the structure and functioning of aquatic communities in streams will be studied in experimental ecosystem streams, in which natural communities can be maintained.
PROJECT MILESTONES: 12/77 Interim report. 12/78 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;NUTRIENTS;ALGAE;GROWTH;BIOMASS;POPULATION DYNAMICS;TRACE AMOUNTS;FRESH WATER;STREAMS

<072940>
TITLE: Application and Development of Eutrophication Planning Models for Lake Ontario
PROJECT NUMBER: N608A-7
PRINCIPAL INVESTIGATOR: Thomann, R.V.;Jeris, J.S.;O'Connor, D.J.;Matystik, W.F.;Bartone, C.
AFFILIATION: Manhattan Coll., New York (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Richardson, W.L.
TYPE OF FUNDING: Grant No.-R803630
77 FUNDING: Environmental Protection Agency FY77:$157,600
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The primary effort to date on the mathematical modeling of eutrophication in Lake Ontario has been directed towards several areas: (a) initial sensitivity runs using the Lake 3 model; (b) extensive compilation, reduction and plotting of the IFYGL data base; (c) completion of a verification analysis framework for the Lake 3 model; (d) development and preliminary verification of a model of Rochester embayment; (e) reduction and analysis of data on phytoplankton group for a multi-species model.
APPROACH: A detailed and intensive investigation using a three-dimensional representation of phytoplankton growth in Lake Ontario (Lake 3) is one of the objectives of these efforts. The lake wide Lake 1 model which previously has been verified and used for lake wide simulation will be used to further develop the kinetic interactions. Particular emphasis will be placed on an analysis to provide insight into the effect of long term model coefficients (sinking rate and nutrient losses) on phytoplankton dynamics. Work will also begin on a first conceptualization of a model of hazardous substances and the interaction of such a model with the biomass models of Lake 1 and Lake 3.
PROJECT MILESTONES: 01/78 Complete Lake-3 model of Lake Ontario and report. 01/76 Complete development phase of Rochester embayment model. 03/78 Refine Rochester embayment model--Phase II. 03/76 Complete eutrophication model framework for Lake Michigan. 03/78 Conceptualize multi-species model for Lake Ontario. 01/78 Initial report in *Eco* series report. 03/78 Verify and refine Lake-1 model to 8 years data for Lake Ontario.
KEYWORDS: FRESH WATER;EUTROPHICATION;PLANNING;BIOLOGICAL MODELS;LAKE ONTARIO;WATER QUALITY;BIOMASS

<072941>
TITLE: Effect of Cyanide on Freshwater Invertebrates
PROJECT NUMBER: N608A-75
PRINCIPAL INVESTIGATOR: Smith, L.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Drummond, R.
TYPE OF FUNDING: Grant No.-R802914
77 FUNDING: Environmental Protection Agency FY77:$132,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of this project are to determine the acute and chronic effects of cyanide, cyanide complexes, and other inorganic and organic material on freshwater fish and invertebrates. Subsidiary objectives are (a) to determine effects of temperature pH, and oxygen on cyanide toxicity; (b) to determine additive or synergistic relationships between heavy metals and cyanide; (c) to determine which life history stages of fish and invertebrates are the most sensitive; (d) to determine application

factors which can be applied to short term test results to predict safe levels of cyanide or cyanide complexes; (e) to determine cumulative effects of cyanide on successive generations of fish; (f) to determine the acute toxicity of various compounds to Daphnia magna and fathead minnows; (g) to determine the effects of these materials on the embryos and the larvae of fathead minnows, and (h) to determine the effects of these materials on Daphnia magna in a life cycle test. These objectives are considered to be important because chronic effects of cyanide and many other toxicants have not been described.
PROJECT MILESTONES: 11/77 Final report--volume 1.
KEYWORDS: FRESH WATER;INVERTEBRATES;CYANIDES;CHRONIC INTAKE;TOXICITY;METALS;DAPHNIA;FISHES;HEALTH HAZARDS;BIOLOGICAL EFFECTS;BIOLOGICAL ACCUMULATION;LIFE CYCLE

<072942>
TITLE: Development of Procedures Based on Hepatic Toxicities to Evaluate Effects of Chronic Exposure of Fishes to Environmental Contaminants
PROJECT NUMBER: N608A-78
PRINCIPAL INVESTIGATOR: Weber, L.J.;Seim, W.K.;Gingerich, W.K.
AFFILIATION: Oregon State Higher Education System, Salem (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Mokim, J.M.
TYPE OF FUNDING: Grant No.-R803090-04
77 FUNDING: Environmental Protection Agency FY77:$100
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The proposed work is to investigate the feasibility of utilizing for fishes clinical procedures which are accepted in determining the status of specific organ function in man.
APPROACH: The relative hepatotoxicity of two chlorinated benzene compounds, hexachlorobenzene and 1,2,4,trichlorobenzene will be investigated in Rainbow trout. The hepatotoxicity of each compound to trout will be assessed through clinical procedures which have previously been established as sensitive indicators of liver function in this fish. Histopathological studies will be conducted to correlate specific liver pathology with the degree of apparent functional impairment.
RESULTS: The study will evaluate liver function in the trout following regimes of both subacute and chronic exposure to the proposed toxicants.
PROJECT MILESTONES: 09/78 Evaluation of organ function tests with fish to predict chronicity.
KEYWORDS: BIOLOGICAL FUNCTIONS;TROUT;MAN;BIOLOGICAL INDICATORS;CHLORINATED AROMATIC HYDROCARBONS;ORGANIC CHLORINE COMPOUNDS;LIVER;PATHOLOGICAL CHANGES;TOXIC MATERIALS;HEALTH HAZARDS;WATER POLLUTION;AQUATIC ECOSYSTEMS

<072943>
TITLE: Renewal of Water Temperature Studies at the USEPA Monticello Field Station
PROJECT NUMBER: N608A-84
PRINCIPAL INVESTIGATOR: Stefan, H.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Hokenson, K.E.
TYPE OF FUNDING: Grant No.-R804736-01
77 FUNDING: Environmental Protection Agency FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: The main objective of the studies is to provide information on the water temperature regimes encountered in eight experimental field channels in which biological experiments are conducted. Heated water is discharged through these channels at low flow velocities.
APPROACH: Field measurements of water temperatures and mathematical models are used to achieve the objective. Field data are subjected to statistical and regression analysis to give information on longitudinal water temperature gradients, diurnal water temperature fluctuations, vertical stratification, longitudinal dispersion, and rate of surface heat loss. Correlation with weather parameters will be provided. Soil temperature conditions are also surveyed.
PROJECT MILESTONES: 07/75 Initiate field measurements. 04/77 Completed development of physical model. 09/77 Completed all field measurements for verification. 03/78 Complete draft final report.
KEYWORDS: WATER POLLUTION;THERMAL POLLUTION;ENVIRONMENTAL EFFECTS;BIOLOGICAL MODELS;TEMPERATURE GRADIENTS;DAILY VARIATIONS;STRATIFICATION;DIFFUSION;HEAT TRANSFER;WEATHER;SOILS

<072944>
TITLE: Development of Bioassay procedures for Defining Pollution of Harbor Sediments
PROJECT NUMBER: N608A-85
PRINCIPAL INVESTIGATOR: Bahnick, D.A.;Buikema, A.L.;Cairns, J.;Rutherford, C.L.;Swenson, W.A.
AFFILIATION: Wisconsin Univ., Madison (USA); Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Anderson, R.L.
TYPE OF FUNDING: Grant No.-R804918-01
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This project will measure the effectiveness of several bioassay procedures and chemical tests for defining quality of harbor sediments subject to removal by dredging.
APPROACH: Results of chemical tests for concentration of volatile solids, COD, total kjeldahl nitrogen, oil and grease, PCBs, selected pesticides and polynuclear aromatic hydrocarbons in harbor sediments and/or their interstitial waters will be determined and related to the following: (1) concentration of metals and organic pollutants in chironomicae removed from the sediments; (2) cough response of bluegill sunfish in bioassays using sediment interstitial waters; (3) survival of Daphnia sp. in bioassays with sediment and surficial waters; (4) behavior and survival of Hoxagenia sp. in harbor sediments; (5) bioaccumulating potential, as defined by the lipid/water partition coefficient of organic chemicals in interstitial water will be defined from relationships to concentration in Chironomidae; (6) activity of enzymes in sediment interstitial waters; and (7) bioconcentration of organic pollutants by fish.
RESULTS: The project will provide several reliable and inexpensive short-term tests for accurately defining the pollution status of potential harbour dredge materials.

PROJECT MILESTONES: 09/78 Final report.
KEYWORDS: WATER POLLUTION;SEDIMENTS;BIOASSAY;DREDGING;ENVIRONMENTAL EFFECTS;DREDGE SPOIL;POLYCYCLIC AROMATIC HYDROCARBONS;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL TRANSPORT;METALS;ORGANIC COMPOUNDS;FISHES;DAPHNIA;BEHAVIOR;BIOLOGICAL ACCUMULATION;ENZYMES;HARBORS;WATER QUALITY;INLAND WATERWAYS;BIOLOGICAL LOCALIZATION

<072945>
TITLE: Structure Activity Correlation Studies
PROJECT NUMBER: N608A-86
PRINCIPAL INVESTIGATOR: Magnuson, V.R.;Harriss, D.K.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: McSerley, J.A.
TYPE OF FUNDING: Grant No.-R804953-02
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: A computerized data base dealing with toxicity and bioaccumulation of compounds along with relevant physical parameters will be established. Subsequently, this data base will be used to determine correlations among the physical parameters of the compounds and their toxicity and bioaccumulation. Such correlation studies will allow development of a model to predict toxicity and bioaccumulation of other compounds not in the data base.
PROJECT MILESTONES: 11/78-Grant award; 12/78-Research complete
KEYWORDS: HAZARDOUS MATERIALS;TOXICITY;DATA COMPILATION;BIOLOGICAL ACCUMULATION

<072946>
TITLE: The Generalization of Water Quality Criteria Using Chemical Models
PROJECT NUMBER: N608A-87
PRINCIPAL INVESTIGATOR: Harriss, D.K.;Magnuson, V.R.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: McSerley, J.A.
TYPE OF FUNDING: Grant No.-R804996-02
77 FUNDING: Environmental Protection Agency FY77:$61,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The final goal for this project is the correlation of toxicity in a particular ecosystem with chemical speciation and use of these correlations to determine realistic water standards. Biological activity most commonly correlates best with specific forms of species of contaminants and water quality standards would be more soundly structured on the probability of an offending species being present or available. Three areas of activity are involved in meeting project goals: A. Predictive computer modeling utilizing speciation and toxicity data; B. Assembling a data base on speciation from literature, experiment, and estimation. C. Collection and interpretation of toxicity data from literature and experimentation. To date, substantial progress has been made on parts A and B.
PROJECT MILESTONES: 10/78-Complete draft of revised chemical speciation model; 10/79-Complete final revised chemical speciation model; 10/79-Apply model to representative water quality criteria.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER QUALITY;STANDARDS;CHEMICAL COMPOSITION;METALS;NONMETALS;TOXICITY

<072947>
TITLE: Chronic Bioassays with Daphnids as a Tool for Predicting the Toxicity of Complex Industrial Effluent to the Biota of a Receiving Stream
PROJECT NUMBER: N608A-99
PRINCIPAL INVESTIGATOR: Winner, R.W.
AFFILIATION: Miami Univ., Fla. (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Horning, W.D.
TYPE OF FUNDING: Grant No.-R805193-01
77 FUNDING: Environmental Protection Agency FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);GEOTHERMAL/General (33%)
PROJECT DESCRIPTION: To determine whether chronic effluent bioassays with daphnids can be used to determine how much that effluent must be diluted before it will not have an unacceptable effect on the biota of the receiving stream.
APPROACH: Five-weed bioassays will be conducted with dilutions of a complex industrial effluent using Daphnia magna and D. parvula. These will be compared to chronic bioassays run in undiluted stream water collected from stations downstream from the point of effluent discharge. Both kinds of bioassays will be compared to macroinvertebrate fish and pariphysic communities at downstream stations in the receiving waters. Toxicant concentrations at the sampling stations will be compared to effluent dilutions causing no adverse effect on bicassay test organisms to determine whether the bioassays can predict where the stream biota will have recovered from the effluent stress.
KEYWORDS: AQUATIC ECOSYSTEMS;CHEMICAL EFFLUENTS;TOXICITY;SURFACE WATERS;ENVIRONMENTAL TRANSPORT;BIOASSAY;DAPHNIA;BIOLOGICAL EFFECTS;INDUSTRY;LIQUID WASTES;WATER POLLUTION MONITORS;WATER POLLUTION

<072948>
TITLE: Analysis of Nutrient and Toxic Chemical Fluxes in Great Lakes Sediment
PROJECT NUMBER: N608A-9
PRINCIPAL INVESTIGATOR: Ditoro, D.M.;Jeris, J.S.;Matystic, W.
AFFILIATION: Manhattan Coll., New York (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Richardson, W.L.
TYPE OF FUNDING: Grant No.-R805229
77 FUNDING: Environmental Protection Agency FY77:$124,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The analysis of nutrient and toxic chemical fluxes in sediment require a set of

mathematical equations which describe both the mass transport of the material via the dispersion of the pore waters and the dissolved species and the solid phases of the sediment. In addition, it is necessary to formulate and test the proper chemical models which describe the interactions between the dissolved species and solid phases, whether they be precipitations/dissolutions or adsorptions/desorptions. It is these underlying theoretical problems and their applications to Great Lakes problem settings which is the subject of the proposed research. The general approach will be to formulate the mass transport equations together with the reversible reactions in a general way. The equations will be transformed into a set of much smaller and simpler equations which do not explicitly contain the reversible reaction kinetic terms which cause computational difficulties. The transformed equations can then be solved numerically or analytically in a simple and straightforward manner and the chemical equilibria calculations can also be done in a straightforward manner using chemical equilibrium.
PROJECT MILESTONES: 03/79-Finalize quantitative framework for mass transport in Sed.; 06/79-Application of framework to Lake Erie eutrophication; 12/79-Incorporate toxic substances in model; 03/80-Continue verification and improvement of Great Lake Eutrophication; 06/80-Prepare final project report.
KEYWORDS: GREAT LAKES;AQUATIC ECOSYSTEMS;CHEMICAL EFFLUENTS;NUTRIENTS;ENVIRONMENTAL TRANSPORT;TOXICITY;HAZARDOUS MATERIALS;MATHEMATICAL MODELS;SEDIMENTS;CHEMICAL ANALYSIS

<072949>
TITLE: Ventilatory Responses of Fish to Fluctuating Applications of Toxicants
PROJECT NUMBER: N608A-90
PRINCIPAL INVESTIGATOR: Cairns, J.;Dickson, K.L.;Vanderschalie, W.H.
AFFILIATION: Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Horning, W.B.
TYPE OF FUNDING: Grant No.-R805274-01
77 FUNDING: Environmental Protection Agency FY77:$49,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The principle objective of this project is to determine how the effects of a sublethal amount of toxicant on fish ventilatory behavior varies with the pattern of its application. A microcomputer will be used to precisely control toxicant levels and monitor fish responses, including breathing and coughing rates. Fish will be exposed in different tests to a previously determined sublethal quantity of toxicant over a 96 hour test period. The pattern of application of this fixed amount of toxicant will be either constant, continually increasing, continually decreasing, oscillating about a mean level, or introduced in short bursts of higher concentration. The change in ventilatory activity of each fish from its level prior to exposure to the toxicant will be evaluated statistically. Conclusions will be drawn on the implications of this data for setting waste effluent discharge standards and the operation of biological monitoring systems.
PROJECT MILESTONES: 07/78-Final report
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;CHEMICAL EFFLUENTS;HAZARDOUS MATERIALS;BIOLOGICAL EFFECTS;TOXICITY;FISHES;RESPIRATION;VARIATIONS;DOSE-RESPONSE RELATIONSHIPS

<072950>
TITLE: Development and Testing of an Automatic Fish Tracking and Monitoring System for the Monticello Ecological Research Station, Monticello, Minnesota
PROJECT NUMBER: N608A-91
PRINCIPAL INVESTIGATOR: Siniff, D.B.;Kuechle, V.B.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Kokanson, K.E.
TYPE OF FUNDING: Grant No.-R805290-01
77 FUNDING: Environmental Protection Agency FY77:$84,900
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This proposal specifies research and development which will be carried out at the Monticello Ecological Research Station, Monticello, Minnesota, which will be devoted towards the instrumentation of controlled environmental channels with automatic data recording equipment. This research and development will provide instrumentation to position fish in the channels to the nearest 50 feet. Additionally, data on environmental measurements such as temperature and other pollutant stresses as may be specified, will be recorded simultaneously with the position of the fish. Positioning will require attachment of miniature radio tags to the experimental animals. Subsequent to the development of the automatic data recording system the proposal outlines work to evaluate the effects of these miniature transmitters on the fish. We plan to compare various behavioral and physiological parameters between control and radio tagged fish using several attachment procedures. It is important that this work be executed since at the current time it is impossible to completely separate effects of instrumentation from the effects of pollutant stresses.
PROJECT MILESTONES: 08/77-Initiate field measurement of electromagnetic radiation system; 05/78-Initiate biological assessment of prototype transducers; 08/79-Project draft final report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER QUALITY;FISHES;TEMPERATURE DEPENDENCE;BEHAVIOR;PHYSIOLOGY;BIOLOGICAL STRESS;WATER POLLUTION;TELEMETRY;POPULATION DYNAMICS;RADIO EQUIPMENT;LABELLING;AUTOMATION;TRANSDUCERS

<072951>
TITLE: Influence of External Factors of Toxicity of Iron and Copper Cyanide
PROJECT NUMBER: N608A-92
PRINCIPAL INVESTIGATOR: Smith, L.L.;Broderius, S.J.;Adelman, I.R.
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Poldoski, J.E.
TYPE OF FUNDING: Grant No.-R805291-01
77 FUNDING: Environmental Protection Agency FY77:$31,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of the proposed research are to determine the toxicity of metallocyanide solutions with special reference to iron and copper compounds of cyanide as they are affected by environmental parameters. A second objective is to give special attention to photodecomposition. A third objective will be to investigate the chemistry of copper-cyanide complex solutions to help evaluate the toxicity of various copper-cyanide complex forms. The plan of work will be divided into two phases: the

first will be an investigation of photolysis reactions of iron cyanide as affected by various factors; the second will deal with the chemistry of cuprous and cupric cyanide complexes and the toxicity of the dicyanocuprate ion to the fathead minnow. After the effect of photodegeneration is determined chemically, the toxicity of resulting components will be determined. The chemistry of copper-cyanide complex solutions will be investigated by setting solutions in which cupric or cuprous copper and sodium cyanide are combined. The rates of dissociation and formation of the cuprous cyanide complex ion and the HCN equilibrium levels in solutions of varying total cyanide concentration of pH and cyanide-to-copper molar ratios will then be examined in detail
PROJECT MILESTONES: 07/78-Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;CHEMICAL EFFLUENTS;ENVIRONMENTAL EFFECTS;IRON COMPOUNDS;COPPER COMPOUNDS;CYANIDES;TOXICITY;FISHES;BIOLOGICAL EFFECTS;DECOMPOSITION

<072952>
TITLE: Factors Controlling the Geographical Distribution of the Asian Clam, Corbicula, in North America
PROJECT NUMBER: N608A-94
PRINCIPAL INVESTIGATOR: Abbott, R.T.;Harasewych, M.
AFFILIATION: Delaware Museum of Natural History, Dover (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Abbott, R.T.
TYPE OF FUNDING: Grant No.-R805679-01
77 FUNDING: Environmental Protection Agency FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Assemble and record the present geographical distribution of the introduced Asian Clam, Corbicula, in North America; and to relate this to temperature conditions in nature, as well as to ascertain experimentally the maximum and minimum lethal temperatures of the clam. Museum collections, biologist's collections and personal field surveys will be used to assemble data and specimens, the latter to be housed as voucher specimens in the Delaware Museum of Natural History. Bibliography being assembled and up-dated.
PROJECT MILESTONES: 10/78-Final report.
KEYWORDS: USA;MOLLUSCS;ECOLOGY;POPULATION DYNAMICS;TEMPERATURE DEPENDENCE;AQUATIC ECOSYSTEMS;BIOLOGICAL VARIABILITY;GEOGRAPHY

<072953>
TITLE: Toxicity of Selected Controlled Release Pesticides to Fish
PROJECT NUMBER: N714-1
PRINCIPAL INVESTIGATOR: Jarvinen, A.W.;Mueller, L.H.;Tyo, R.M.
AFFILIATION: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Jarvinen, A.W.
77 FUNDING: Environmental Protection Agency FY77:$16,000
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);CONSERVATION/General (33%)
PROJECT DESCRIPTION: To develop test methodology for short and long-term controlled release pesticide studies, to determine solubility and degradation product of selected controlled release pesticides, and to determine the hazard to aquatic life from the use of controlled release pesticide formulations which extend the persistence of so called non-persistent pesticides. Research will be conducted in three distinct phases over a 2-1/2 year period. These are as follows: a. Solubility, degradation, and methodology studies. These will be used for general supportive data and to determine methodology for studies in phases b and c. b. Short-term bioassays which include 96 hr statics and 30-day flowthrough tests on sensitive life stages, i.e., larval. c. Long-term studies that will include toxicant levels that will be used on target organisms in the natural environment. Encapsulated methyl parathion has been selected as the first controlled release pesticide for study. Methods for toxicant delivery are being determined. Since solvents immediately leach methyl parathion from the capsules, a method is being devised whereby water saturation can be achieved without solvent usage.
PROJECT MILESTONES: 11/76-Work proposal; 08/77-Began laboratory work; 08/79-End laboratory work; 11/79-Draft final report; 12/79-Submit for publication.
KEYWORDS: AQUATIC ECOSYSTEMS;PESTICIDES;TOXICITY;SOLUBILITY;DECOMPOSITION;BIOASSAY;LIFE CYCLE;AQUATIC ORGANISMS;VARIATIONS;PARATHION;ENVIRONMENTAL TRANSPORT;WATER POLLUTION

<072954>
TITLE: Microcosm and Theoretical Evaluation of Substitute Chemicals
PROJECT NUMBER: N714A-83
PRINCIPAL INVESTIGATOR: Warren, C.E.
AFFILIATION: Oregon State Higher Education System, Salem (USA)
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Eaton, J.G.
TYPE OF FUNDING: Grant No.-R804622-02
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);CONSERVATION/General (33%)
PROJECT DESCRIPTION: This research has the objective of determining the effects of dieldrin on the dynamics of populations of guppies and their prey organisms, amphipods, copepods, and microorganisms--interacting in laboratory ecosystems. The prey organisms of the guppies are supported primarily by the addition of food material prepared from dried alfalfa, and the guppy populations are exploited by removal at different rates in different treatment. Ancillary aquarium experiments on the effects of the pesticide on survival, reproduction, and growth of guppies and their prey organisms are conducted in order to be able to evaluate, by comparison to the ecosystem study results, the adequacy of such relatively simple and more generally employed experiments for predicting effects in more complex ecological systems. These aquarium studies will, in addition, provide information of value in interpreting the effects of the pesticide in the laboratory ecosystem experiments.

PROJECT MILESTONES: 09/76-Complete construction of test systems and add test organisms; 09/77-Add pesticide to test systems and begin collection; 09/78-Continue collection of microcosm and individual organism; 09/79-Complete all experimental work; 10/79-Complete draft of final report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;PESTICIDES;TOXICITY;FISHES;POPULATION DYNAMICS;AQUATIC ORGANISMS;FOOD CHAINS;DIELDRIN;BIOLOGICAL EFFECTS;ENVIRONMENTAL TRANSPORT

<073001>
TITLE: Chemical Modeling of Metallic Waste Disposal
PROJECT NUMBER: P-608-C-2
PRINCIPAL INVESTIGATOR: Morel, F.M.M.
ADDRESS: 77 Massachusetts Ave., Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Davey, Earl W.
TYPE OF FUNDING: Grant No.-R803738
77 FUNDING: Environmental Protection Agency FY77:$30,600
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: EXTRACTION (33%);COMBUSTION OR END USE (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: A methodology has previously been developed for the study of metallic wastes in combined domestic and industrial sewage.
APPROACH: The methodology is based on general chemical model of the waste and of various dilutions of the waste with seawater and has been applied to the specific case of the Los Angeles County wastewater discharge. It is proposed to extend and improve this work using a new case study such as the dumping of concentrated acidic metallic wastes. The proposed work will involve inclusion of new chemical data in the model, improvement of existing computer program for efficiency and convenience, simplification and generalization of absorption subroutines and, if necessary, implementation of specific kinetic subroutines related to the acid waste disposal problem.
RESULTS: The goal of the project is to improve our predictive capabilities for routine use in the various monitoring, impact assessment and regulation activities associated with metallic waste disposal.
PROJECT MILESTONES: (1) 5/78 Final report entitled, ''Chemical modeling of metallic waste disposal.''
KEYWORDS: NON-FERROUS METALS;METALS;WASTE DISPOSAL;ENVIRONMENTAL IMPACTS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;SEWAGE;SEAWATER;CHEMICAL REACTION KINETICS;LEACHING;MATHEMATICAL MODELS;MEASURING METHODS;MARINE DISPOSAL;INDUSTRIAL WASTES;WASTE WATER;IRON;METAL INDUSTRY;ELECTROPLATING

<073002>
TITLE: Standard Program for Environmental Impact Assessment: Phase I Ichthyoplankton Sampling
PROJECT NUMBER: P-608-C-5
PRINCIPAL INVESTIGATOR: Saila, S.A.;Hyman, M.A.M.
ADDRESS: Graduate School of Oceanography, Kingston, RI 02881
AFFILIATION: Rhode Island Univ., Kingston (USA). Graduate School of Oceanography
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Beck, Allan D.
TYPE OF FUNDING: Grant No.-R-804216-01
77 FUNDING: Environmental Protection Agency FY77:$10,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: It is proposed that the Environmental Protection Agency develop an environmental impact program for a representative estuarine site in Narragansett Bay, Rhode Island. These studies would be aimed at selecting and monitoring representative important species.
APPROACH: Inherent variability and biases of any gear used will be determined, specifically as relates to the problem of avoidance. Preliminary studies of small scale temporal and spatial variability will be conducted before establishing ongoing monitoring programs.
RESULTS: The study proposed here will serve as the first phase of the much longer duration program implied above. This study is aimed primarily at understanding the biases and variability inherent in ichthyoplankton sampling, presently accepted standard ichthyoplankton gear will be used to the greatest extent possible to permit comparisons with past and ongoing studies.
PROJECT MILESTONES: (1) 3/78 Final report entitled, ''A standard program for environmental impact assessment: Phase I Ichthyoplankton sampling.''
KEYWORDS: ENVIRONMENTAL IMPACTS;PLANKTON;BIOASSAY;TEMPERATURE EFFECTS;EXPERIMENT PLANNING;AQUATIC ECOSYSTEMS;AVOIDANCE;BIOLOGICAL INDICATORS;HEALTH HAZARDS;MONITORING;SITE SELECTION;FOSSIL-FUEL POWER PLANTS;STANDARDS

<073003>
TITLE: Sublethal Effects of Oil on Behavior and Chemical Senses of Marine Animals
PROJECT NUMBER: P-608-C-6
PRINCIPAL INVESTIGATOR: Atema, J.;Jacobson, S.;Oleszko-Szuts, S.
ADDRESS: 881 Commonwealth Ave., Boston, MA 02215
AFFILIATION: Boston Univ., Mass. (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Miller, Don
TYPE OF FUNDING: Grant No.-R-803833-03
77 FUNDING: Environmental Protection Agency FY77:$57,000

TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coasts;HYDROGRAPHIC AREAS/Other hydrographic areas All coasts
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To determine if and how petroleum hydrocarbons affect chemoreception and chemically-stimulated behavior in marine animals. Chemoreception and behavior of lobsters: (a) Measure effects of 0.1-1.5 ppm No. 2 fuel oil (Water Accommodated Fraction) on feeding and general behavior of lobsters: detailed behavior analysis. Determine the narrow range of exposure levels that cause effects on chemically stimulated behavior, without causing gross neuromuscular deficiencies. (b) Document stimulus effects of direct application of 1-10 ppm No. 2 fuel oil (WAF) on neurophysiological responses of antennular chemoreceptors of lobsters. (c) Determine effects of different petroleum hydrocarbon fractions on lobster behavior and chemoreception using selected compounds from chemically separated fractions. (d) Determine contribution of oil-affected chemoreception on behavioral deficits: neurophysiology and morphology of oil-exposed lobster antennules, comparison of oil effects on lobsters with and without antennules, synthesis of project results. Chronic effects on field populations: (a) Compare feeding, substrate selection, and anti-predator behavior of three inshore species (Crangon septemspinosus, Fundulus heteroclitus, and Pseudopleuronectes americanus) from oil spill and uncontamined sites along Buzzards Bay, Massachusetts. (b) Compare feeding and general behavior of lobsters (Homarus americanus)
APPROACH: Behavioral and neurophysiological bioassays; flow-through oil dosing; chemical monitoring of exposure levels.
RESULTS: Low sublethal levels of No. 2 fuel oil (WAF) interfere with lobster feeding behavior and oil acts as a chemical stimulus on distance chemoreceptors.
PROJECT MILESTONES: (1) 10/78 Final Report entitled, ''Sublethal effects of oil on behavior and chemical senses of marine animals.
KEYWORDS: PETROLEUM;BIOLOGICAL EFFECTS;TOXICITY;BEHAVIOR;NEUROLOGY;PHYSIOLOGY;AQUATIC ORGANISMS;MORPHOLOGICAL CHANGES;FUEL OILS;DIET;LOBSTERS;HYDROCARBONS;CHRONIC INTAKE;OIL SPILLS;BIOASSAY;CHEMICAL ANALYSIS;AVOIDANCE;CHEMORECEPTORS;SENSE ORGANS;WATER POLLUTION

<073004>
TITLE: Chemical Studies Directed Toward Ecological Damage Assessment of Petroleum Discharges into the Marine Environment
PROJECT NUMBER: P-608-C-11
PRINCIPAL INVESTIGATOR: Quinn, J.G.
ADDRESS: Graduate School of Oceanography, Kingston, RI 02881
AFFILIATION: Rhode Island Univ., Kingston (USA). Graduate School of Oceanography
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Lefcourt, P.
TYPE OF FUNDING: Grant No.-R805477-01
77 FUNDING: Environmental Protection Agency FY77:$65,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Other coasts All coasts;HYDROGRAPHIC AREAS/Other hydrographic areas All coasts
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To conduct analytical chemical studies in support of ecological damage assessment of acute and chronic discharges of petroleum into the near-shore marine environment. These studies will include the following: (1) Chemical analyses of petroleum compounds in selected samples of water, sediments and organisms using a variety of analytical procedures (e.g., column, thin-layer, liquid and gas chromatography; infrared and fluorescence spectroscopy; and combined gas chromatography-mass spectrometry). (2) Development of new methods and modification of existing procedures in support of toxicological and field studies. (3) Participation with other federal laboratories in the development and intercalibration of standard reference materials and methods for petroleum analysis.
APPROACH: Samples will be collected from selected spills of opportunity and sites of chronic oil discharges. The basic analyses of these samples will involve extraction, isolation of petroleum compounds by column and/or thin-layer chromatography, and analysis by gas chromatography using packed metal columns and glass capillary columns. Selected sample extracts will also be analyzed by high pressure liquid chromatography, infrared and fluorescence spectroscopy, and combined gas chromatography-mass spectrometry. In combination with field evaluation and laboratory toxicological investigations, the proposed research will allow a highly integrated, multidisciplinary study of the fate and effects of oil on the marine ecosystem.
PROJECT MILESTONES: (1) 9/80 Final report entitled, ''Chemical studies directed toward ecological damage assessment of petroleum discharges into the marine environment.
KEYWORDS: PETROLEUM;OIL SPILLS;AQUATIC ECOSYSTEMS;WATER POLLUTION;BIOLOGICAL EFFECTS;BIOASSAY;SEPARATION PROCESSES;GAS CHROMATOGRAPHY;INFRARED SPECTRA;FLUORESCENCE SPECTROSCOPY;ENVIRONMENTAL TRANSPORT;TOXICITY;CHEMICAL ANALYSIS

<073005>
TITLE: Culture of Marine Algae for Experimental Use
PROJECT NUMBER: P-60-BC-15
PRINCIPAL INVESTIGATOR: Steele, R.L.
ADDRESS: South Ferry Road, Narragansett, RI 02881
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Steele, R.L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$45,600
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);ANALYTICAL (50%)

REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coasts;HYDROGRAPHIC AREAS/Other hydrographic areas All coasts
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLCGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To culture selected macro-algae for use as bioassay organisms to detect toxic levels of oil, oil products, and other pollutants.
RESULTS: Levels of sensitivity for two species, Fucus edentatus and Laminaria saccahrina have been determined. Other brown algae demonstrating different life cycles are to be tested. Results are to be published in proceedings of IX Int. Seaweed Symposium
PROJECT MILESTONES: (1) 11/76 Effects of oil on reproductive phases of Fucus. (2) 6/77 Paper on methodology of oil on Laminaria and Fucus. (3) 8/77 Paper on effects of oil on Laminaria. (4) 6/78 Effects of oil on Ectocarpus or similar alga. (5) 6/79 Effects of heavy metals on selected marine algae.
KEYWORDS: ALGAE;LABORATORY ANIMALS;BIOSYNTHESIS;BIOASSAY;BIOLOGICAL INDICATORS;WATER POLLUTION;PETROLEUM;PETROLEUM PRODUCTS;METALS;CULTIVATION TECHNIQUES;AQUATIC ORGANISMS

<073006>
TITLE: Effects of Thermal Addition on Marine Fouling Community Dynamics
PROJECT NUMBER: P-608-C-20
PRINCIPAL INVESTIGATOR: Scott, J.
ADDRESS: Environmental Research Laboratory, Narragansett, RI 02881
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Miller, Don O.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$114,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coasts;HYDROGRAPHIC AREAS/Other hydrographic areas All coasts
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Project objective is to supplement the existing data base for marine water quality criteria for temperature. Of particular interest is the consequences of long-term, low level thermal elevations on marine systems. Attention is given here to the indirect effects of prolonged thermal addition on interspecific relationships and community dynamics. The fouling community is employed as the study assemblage.
APPROACH: Ceramic panels are submerged in replicated tanks which are maintained at 0, 2, 4, and 6 degrees C over the natural ambient temperature cycle. Estuarine water is delivered to the near-sea level laboratory barge by a low speed, low head pump equipped with recessed impeller. Field developed and laboratory developed communities are monitored monthly by a non-destructive 75-point sampling technique to document community structure. Life cycle aspects of community dominants are recorded from the community plates or other special study plates, providing data on spawning and larval recruitment and density growth patterns, attainment of reproductive maturity and senescence. There is good diversity on larval plates in this laboratory system, but as the community develops, only three or four species remain as dominants.
RESULTS: Project will run a total of 15 months as a single experiment at ERL-Narragansett. A parallel study being conducted with the warm temperate fouling community at Duke University Marine Laboratory, Beaufort, NC, will continue for an additional two years to further examine conclusions from the Narragansett study.
PROJECT MILESTONES: (1) 7/75 Begin, design, and fabrication of experimental system. (2) 3/76 Experimental system on line, no heat. (3) 8/76 Experimental system on line, with heat. (4) 11/77 Complete thermal exposure tests. (5) 6/78 Complete written reports.
KEYWORDS: BIOLOGICAL FOULING;TEMPERATURE EFFECTS;THERMAL EFFLUENTS;POPULATION DYNAMICS;WATER POLLUTION;THERMAL POLLUTION;SIMULATION;BIOLOGICAL EFFECTS;CERAMICS;BIOLOGICAL VARIABILITY

<073007>
TITLE: Behavioral and Physiological Indices of Pollution Stress in Zooplankton and Invertebrate Larvae
PROJECT NUMBER: P-60-BC-21
PRINCIPAL INVESTIGATOR: Miller, D.C.;Lang, W.;Pechemk, J.
ADDRESS: EPA-ERL, Narragansett, RI 02881
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Miller, Don C.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$114,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Other coasts All coastal regions;HYDROGRAPHIC AREAS/Other hydrographic areas All coastal regions
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to elucidate a series of sub-lethal behavioral and physiological parameters to quantify pollutant stress in zooplankton and motile invertebrate larvae. Parameters to be studied include patterns and rates of swimming, motile responses to specific stimuli (light, gravity, food or other chemical cue), feeding, growth and energy budget, and histology.
APPROACH: Behaviors are recorded on video tape and shifts in behavioral patterns quantified by computerized analysis of the tape. Images of study organisms are expressed as X-Y coordinates for each video frame and then analyzed on a time basis to calculate such variables as linear velocity, angular velocity, and rate of change of direction. Behaviors of interest are those which are clearly typical of the field situation and which can be related to population success. Response to environmental cues which influence water column position (vertical migration) of estuarine forms, or swimming responses to sex pheromes are two cases in point. In addition, consequences of pollutant dosing on feeding and metabolic physiology of developing larvae or zooplankton are conducted simultaneously in order to further relate overt behavioral

alterations to developmental success. Metabolic, feeding, assimilation, and growth rates are determined to construct an energy budget for dosed and non-dosed organisms. These budgets are utilized, along with long-term developmental success, to interpret observed shifts in motile behavioral response.
!SULTS: Studies to date with larvae of several species (Balanus spp; Cancer spp; Crepidula fornicata) indicate that the proposed sub-lethal parameters will demonstrate adverse toxicant effects at one to two orders of magnitude below that indicated by general developmental parameters alone.
PROJECT MILESTONES: (1) 6/76 Computerized system delivery, initial in-house project. (2) 6/77 System proven for routine behavioral research. (3) 9/78 Report on behavioral/growth studies with barnacle larvae. (4) 12/78 Report on physiological studies with Crepidula larvae. (5) 6/79 Report on behavioral/physiological studies with Cancer larvae. (6) 12/80 Final report on project.
KEYWORDS: ZOOPLANKTON;BIOLOGICAL MODELS;CHEMICAL EFFLUENTS;PHYSIOLOGY;WATER POLLUTION;LARVAE;BEHAVIOR;TOXICITY;BIOLOGICAL EFFECTS;METABOLISM;COMPUTER CALCULATIONS;EQUIPMENT;BIOLOGICAL STRESS

<073008>
TITLE: Development of a Benthic Bioassay System Employing Natural Assemblages
PROJECT NUMBER: P-608-C-22
PRINCIPAL INVESTIGATOR: Davis, W.
ADDRESS: EPA-ERL, Narragansett, RI 02881
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Miller, Don C.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$38,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;COASTS/Other coasts All coastal regions;HYDROGRAPHIC AREAS/Other hydrographic areas All coastal regions
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this research is to develop a benthic bioassay system, with an ecologically meaningful set of sub-lethal response parameters for the deposit-feeding fauna (e.g., Nephtys, Yoldia, and Nucula).
APPROACH: Initial research tasks include development of techniques to quantify sub-lethal effects of pollutant stress on these three dominant benthic deposit feeders, and examination of certain biological aspects (growth rates, reproductive seasons, burrowing rate--metabolic rate/temperature relationship, laboratory food requirements) which are requisite to intelligent design of a future laboratory benthic bioassay system. The final phase entails scaling up small laboratory benthic test systems used for the above work to make them omerable for routine bioassay testing of an array of organic, inorganic, and mixed contaminants. Burrowing rates and behavior, feeding and growth were studies on the polychaete Nephtys incisa by direct observation of thin aquaria or indirectly while held in laboratory ''in-situ'' sediment set ups. Observations made over the full annual temperature range (0-24 degrees, at 6 degrees increments) were compared with field benthic observations and collections of the worm. Whole animal metabolism is measured seasonally in the laboratory to provide an energetic base line. This work will be completed by December, 1977. Development of the definitive laboratory benthic bioassay system will require size experiments to define optimum size and configuration of the test unit, adoption of criteria to assess achievement of chemical equilibria benthic sediments, and determining methods to establish the benthic fauna and to achieve uniform flow-through toxicant dosing. Upon final development of this test procedure, whole system responses will be explored as additional indices of pollution stress to supplement the single species indices cited above.
RESULTS: (1) 1/76 Initiate response parameter development for benthic deposit feeders. (2) 6/78 Complete response parameter development for benthic deposit feeders. (3) 6/78 Initiate laboratory benthic bioassay system development. (4) 12/79 Benthic bioassay pilot studies complete. (5) 12/80 Verify performance benthic bioassay system with diverse toxicant complete.
KEYWORDS: PLANKTON;BIOASSAY;WATER POLLUTION;BIOLOGICAL MODELS;CHEMICAL ANALYSIS;BIOLOGICAL STRESS;TOXICITY;BIOLOGICAL EFFECTS;METABOLISM;CHEMICAL EFFLUENTS;TEMPERATURE EFFECTS

<073009>
TITLE: Effects of Thermal Additions on the Dynamics of Fouling Communities at Beaufort, N.C.
PROJECT NUMBER: P-625-A-1
PRINCIPAL INVESTIGATOR: Sutherland, J.P.;Kirby-Smith, W.W.
ADDRESS: Duke University, Durham, NC 27706
AFFILIATION: Duke Univ., Durham, N.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Miller, Don
TYPE OF FUNDING: Grant No.-R 803856-02
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (90%);NUCLEAR/General (10%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (25%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Other coasts Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Construction of a laboratory system which will provide running seawater at ambient temperature and at 2 degrees C, 4 degrees C, and 8 degrees C above ambient.
APPROACH: Fouling development and changes in fouling community structure will be followed at each temperature for several years on clay tile plates (232 square centimeter) submerged in October 1975 and April 1976. Larval recruitment at each temperature will also be monitored. Parallel experiments will be conducted simultaneously on plates submerged under the Duke Marine Lab dock.
RESULTS: Data will be used to determine the effect of heated effluents on community structure and function.

PROJECT MILESTONES: 12/78 Final report entitled ''Effects of Thermal Additions on the Dynamics of Fouling Communities at Beaufort, N.C.''
KEYWORDS: NORTH CAROLINA;BIOLOGICAL FOULING;TEMPERATURE EFFECTS;LARVAE;THERMAL EFFLUENTS;THERMAL POLLUTION;WATER POLLUTION;BIOLOGICAL EFFECTS;SEAWATER;CLAYS;PLUMES;ENVIRONMENTAL TRANSPORT;POWER PLANTS;SIMULATION

<073010>
TITLE: A Facility for the Experimental Analysis of Coastal Marine Ecosystems
PROJECT NUMBER: P-625-A-7
PRINCIPAL INVESTIGATOR: Griffin, J.
ADDRESS: Graduate School of Oceanography, Kingston, RI 02881
AFFILIATION: Rhode Island Univ., Kingston (USA). Graduate School of Oceanography
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Schneider, Eric D.
TYPE OF FUNDING: Grant No.-R803902-03
77 FUNDING: Environmental Protection Agency FY77:$980,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coasts;HYDROGRAPHIC AREAS/Other hydrographic areas All coasts
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (a) To develop a facility and methodology for the experimental analysis of coastal marine ecosystems and their response to energy-related environmental stresses. (b) To relate the experimental results to ecosystem theory and its implications for the management of coastal marine environments.
APPROACH: Replicate meso-scale experimental ecosystems simulating a variety of coastal marine environments will be developed and maintained at a special shore-based laboratory. A number of stresses or environmental perturbations associated with energy development will then be applied over a range of intensities to these systems before, during, and after the application of stress. Similar field experiments may also be carried out on a small scale in some environments.
RESULTS: The first project will involve 9 shore-based experimental water columns (5 m deep x 2 m dia.) with associated bottom sediments and benthos. The microcosms will first be studied for replicability and for differences between tanks that are run as open or closed systems with respect to seawater flow. After this preliminary work is completed, a series of experiments involving the addition of water soluble petroleum hydrocarbons at concentrations of 100 and 1000 mu g/l will begin.
PROJECT MILESTONES: 6/78 Final report entitled ''A Facility for the Experimental Analysis of Coastal Marine Ecosystems.''
KEYWORDS: COASTAL WATERS;AQUATIC ECOSYSTEMS;MONITORING;CHEMICAL ANALYSIS;BIOLOGICAL MODELS;HYDROCARBONS;PETROLEUM;MEASURING METHODS;MANAGEMENT;ENVIRONMENT

<073011>
TITLE: Kaneohe Bay--Responses of a Tropical Estuary to Relation of Sewage Stress
PROJECT NUMBER: P608C-9
PRINCIPAL INVESTIGATOR: Smith, S.V.;Laws, E.A.;Hirota, J.;Jokiel, P.L.;Evans, E.C.;Henderson, R.S.;Grovhoug, S.G.
AFFILIATION: Hawaii Univ., Honolulu (USA); Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Perez, K.T.
TYPE OF FUNDING: Grant No.-R803983-02
77 FUNDING: Environmental Protection Agency FY77:$184,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: To document the response of a tropical estuary ecosystem (Kaneohe Bay, Hawaii) to the removal of sewage stress and then to arrive at adequate theoretical bases to predict those responses.
APPROACH: To sample components of the ecosystem at frequent time interval approach over a period preceding the sewage diversion and then afterwards; to simulate the change in sewage regime in tank microcosms, and to build mathematical models which describe the responses. To accomplish these goals, the program is divided into seven working groups: chemistry, phytoplankton, zooplankton, nekton, benthes, microcosms, coordination.
RESULTS: Current plans call for beginning the above programs as soon as possible in order to get adequate baseline data before the projected early 1977 sewage diversion and then to continue for at least one year (if necessary, longer) past the time of diversion.
PROJECT MILESTONES: 11/78 Final report entitled, ''Kaneohe Bay: Responses of a tropical estuary...''
KEYWORDS: ESTUARIES;SEWAGE;HAWAII;WASTE DISPOSAL;BIOLOGICAL STRESS;AQUATIC ECOSYSTEMS;PHYTOPLANKTON;ZOOPLANKTON;BASELINE ECOLOGY

<073012>
TITLE: Neutron Activation Analysis of Marine Samples
PROJECT NUMBER: P608C-10
PRINCIPAL INVESTIGATOR: Dimeglio, A.P.;Riesenfeld, P.;Hoffman, G.L.
AFFILIATION: Rhode Island Nuclear Science Center, Narragansett (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Rogerson, P.F.
TYPE OF FUNDING: Contract No.-68-03-2543
77 FUNDING: Environmental Protection Agency FY77:$9,500
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: The contractor shall analyze marine samples of water, organisms, and sediments by instrumental neutron activation analysis. Samples will be provided by the project officer. Analysis shall include data reduction so that data can be returned to the principal investigator in concentration form (e.g. microgram element per gram sample). Samples to be analyzed will include (1) plankton, (2) bottom dwelling invertebrates, i.e. clams, worms, etc., (3) fish, (4) marine sediments, and (5) seawater. Under routine circumstances, a sample load of approximately 40 samples per week may be estimated. However,

changing program emphasis may require additional elements to be quantified or lower detection limits to be obtained. Such efforts are at the current state-of-the-art and will require developmental efforts to ensure data generated is legally defensible. In these cases, it is understood that fewer than 40 samples will be processed in a week. Reports shall consist of the results of analysis reported on a microgram per gram basis or other appropriate units. In addition, a summary letter report shall be prepared each month showing the number and kinds of samples analyzed.
PROJECT MILESTONES: Monthly summary letter reports, no final report.
KEYWORDS: SEAWATER;AQUATIC ORGANISMS;SEDIMENTS;ACTIVATION ANALYSIS;NEUTRONS;PLANKTON;INVERTEBRATES;FISHES;TECHNOLOGY ASSESSMENT;WATER QUALITY;MONITORING

<073013>
TITLE: National Marine Pollution Monitoring Program
PROJECT NUMBER: P608C-12
PRINCIPAL INVESTIGATOR: Goldberg, E.D.
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Hoffman, G.
TYPE OF FUNDING: Grant No.-R800215-01
77 FUNDING: Environmental Protection Agency FY77:$56,200
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
PROJECT DESCRIPTION: A surveillance of four collectives of pollutants in U.S. coastal waters is being carried out through their concentrations in two sentinel organisms--mussels and barnacles. The pollutant species include heavy metals (lead, cadmium, mercury, selenium, zinc, silver and copper), chlorinated hydrocarbons (DDT residues, polychlorinated biphenyls, hexachlorbenzene, dieldrin, endrin, heptachlor, benzene hexachloride, cis and trans chlordane and the insecticidal derivatives oxychlordane and heptachlorepoxide); artificial radionuclides (plutonium-238, plutonium-239 and -240; americium-241 and cesium-137); and petroleum hydrocarbons (to include measures of the concentrations of alkanes, cycloalkanes and aromatics, including 2, 3, 4, and 5 ring polynuclear condensed species). The program includes sites off the east, west and Gulf coasts of the U.S. as well as off Alaska, Guam and Samoa. Over two hundred and fifty samples will be taken during the first two years of the project and analyzed in 8 laboratories, two for each set of pollutants. Interlaboratory comparisons are being made on the pollutant analyses. The goals of the program will be the assessment to the U.S. coastal waters for the support of marine resources such as food from the sea, the vitality of communities of marine organisms and the continued use of non-living resources such as beaches and harbors and the prediction of future exposure levels of pollutants based upon the best existing information and models.
PROJECT MILESTONES: 12/77 Final report entitled, ''National Marine Pollution Monitoring...''
KEYWORDS: WATER POLLUTION;MONITORING;WATER QUALITY;USA;COASTAL REGIONS;MOLLUSCS;LEAD;CADMIUM;MERCURY;SELENIUM;ZINC;SILVER;COPPER;ORGANIC CHLORINE COMPOUNDS;PESTICIDES;DDT;POLYCYCLIC AROMATIC HYDROCARBONS;DIELDRIN;INSECTICIDES;PLUTONIUM 239;PLUTONIUM 240;PLUTONIUM 239;AMERICIUM 241;CESIUM 137;PETROLEUM PRODUCTS;ALKANES;CYCLOALKANES;AROMATICS;ALASKA;GUAM;FOOD CHAINS;AQUATIC ECOSYSTEMS;RECREATIONAL AREAS;MATHEMATICAL MODELS;ECOLOGICAL CONCENTRATION;RADIOECOLOGICAL CONCENTRATION

<073014>
TITLE: Contaminant Flux from Marine Sediments and Dredge Spoil Deposit
PROJECT NUMBER: P608C-13
PRINCIPAL INVESTIGATOR: Bender, M.L.
AFFILIATION: Rhode Island Univ., Kingston (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Payne, P.
TYPE OF FUNDING: Grant No.-R805129-01
77 FUNDING: Environmental Protection Agency FY77:$60,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The objectives of the proposed work are: (1) to gather information needed for developing guidelines for dredge spoil and sewage sludge disposal which will minimize the environmental impact of these wastes with regard to heavy metal and organic chemical pollutants, and (2) to determine circumstances under which the pollutant of sediments inhibits regeneration of nutrients.
APPROACH: To these ends, we propose three projects: (1) a study of benthic fluxes and pore water chemistry on and around a dredge spoil to assess the impact of pollutants on pore water chemistry, metal release by sediments, and nutrient regeneration; (2) further studies of benthic fluxes and pore water chemistry in Narragansett Bay to understand how sediment pollutant and chemical properties affect trace metal release; and (3) comparison of metal, hydrocarbon and PCB contents of dredge soils and surrounding sediments to assess the feasibility for using metals as tracers for hard-to-measure organic pollutants.
PROJECT MILESTONES: 04/80 Final report entitled, ''Contaminant flux from marine sediments and...''
KEYWORDS: WATER POLLUTION;SEWAGE SLUDGE;WASTE DISPOSAL;ENVIRONMENTAL IMPACTS;DREDGE SPOIL;NUTRIENTS;PLANKTON;RECOMMENDATIONS;WATER CHEMISTRY;SEDIMENTS;ENVIRONMENTAL TRANSPORT;TRACE AMOUNTS;METALS;ORGANIC COMPOUNDS;TRACER TECHNIQUES;POROSITY

<073015>
TITLE: Evaluation of Microcosm Responses to Various Anthropogenic and Environmental Factors
PROJECT NUMBER: P608C-14
PRINCIPAL INVESTIGATOR: Perez, K.;Morrison, G.;Lackie, N.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Perez, K.
TYPE OF FUNDING: Agency in-house effort
FUNDING: Environmental Protection Agency FY77:$235,600
CHNOLOGY: FOSSIL FUEL/General (100%)
OJECT DESCRIPTION: Determine the feasibility and applicability of the systems (microcosm) approach to pollution studies.
APPROACH: Replicate 150 liter microcosms are maintained under controlled regimes of light, turbulence, temperature, benthic surface area, and water turnover time. The tanks are manipulated by varying one or more of the above environmental factors and/or the addition of a stress agent (treated sewage). The system responses are measured in terms of phytoplankton numbers, species composition, chlorophyll and primary

productivity levels; zooplankton numbers and species composition; nutrient levels; benthic structure and function; total systems metabolism.
RESULTS: (1) Determination of the physical inputs necessary to enable the laboratory systems to behave in tl same manner as the defined natural system. (2) Determination of the persistance limits of large scale marine systems through the use of laboratory microcosms.
PROJECT MILESTONES: (1) 09/76 Papers presented Helgoland conference. (2) 08/77 Paper presented AIBS session on microcosms.
KEYWORDS: WATER POLLUTION;BIOLOGICAL STRESS;SEWAGE SLUDGE;PHYTOPLANKTON;METABOLISM;MATHEMATICAL MODELS;AQUATIC ECOSYSTEMS;PHOTOCHEMISTRY;TURBULENCE;TEMPERATURE DEPENDENCE;ENVIRONMENTAL IMPACTS;WASTE DISPOSAL

<073016>
TITLE: Nutritional Requirements of Marine Larval and Juvenile Fish
PROJECT NUMBER: P608C-16
PRINCIPAL INVESTIGATOR: Beck, A.D.;Simpson, K.L.;Poston, H.A.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.; Rhode Island Univ., Kingston (USA); Department of the Interior, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Beck, A.D.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$57,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The primary objective of this research is the development of methods and techniques to formulate laboratory diets for larval and juvenile marine fish. Such diets are needed in order to achieve high levels of survival and field-comparable growth of laboratory-cultured animals. If successful, the laboratory marine fish will exhibit minimum variability in the lab bioassay due to nutritional stress. Menidia menidia will be used as a test fish.
APPROACH: Test diets will be evaluated for protein availability and storage stability. The nutritional status of field and diet-fed populations will be compared. The life history stages will include eggs, yolk-sac larvae, post-yolk-sac larvae and juveniles.
RESULTS: Apparent nutritional needs will be determined by qualitative analysis of eggs, yolk-sac larvae, post-yolk-sac larvae and juveniles. The sources of nutrients will be determined by qualitative analysis of laboratory-prepared live or artificial food materials. The test diets formulated from qualitative information will then be assessed for protein availability and storage stability using growth studies with the test fish. Finally, the nutritional status of the larvae and juveniles will be compared with field populations using appropriate response parameters: survival, growth, biochemistry, behavior, and stress response.
PROJECT MILESTONES: (1) 12/77 Determine feasibility of existing artificial diets. (2) 10/78 Final report--nutritional requirements of Atlantic silversides. (3) 12/78 Standard laboratory diet for whole life cycle culture of Atlantic.
KEYWORDS: FISHES;NUTRITION;JUVENILES;LARVAE;BIOLOGICAL STRESS;AQUACULTURE;PROTEINS;ANIMAL GROWTH;SURVIVAL CURVES;BIOCHEMISTRY;BEHAVIOR;RESPONSE MODIFYING FACTORS

<073017>
TITLE: Development of Chronic Whole Life Cycle Bioassays
PROJECT NUMBER: P608C-17
PRINCIPAL INVESTIGATOR: Zarcogian, G.;Johnson, M.;Pesch, C.;Sosnowski, S.;Gentile, J.H.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Gentile, J.H.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$171,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: This research program is responsible for developing whole life cycle bioassays on a variety of marine species representing different benthic and epibenthic habitats and feeding types. Research presently involves partial and complete chronic bioassays, including bioaccumulation and depuration kinetics for molluscs and polychaetes. Whole life cycle sublethal studies are presently being performed with the epibenthic crustacean Mysidopsis bahia.
PROJECT MILESTONES: (1) 06/77 Flow-thru sediment bioassay--Neanthes arenaceodentata--copper toxicity. (2) 06/77 Whole life cycle chronic--Mysidopsis bahia--copper toxicity. (3) 01/78 Arsenic toxocity to oysters and scallops. (4) 06/78 Whole life cycle chronic--Neanthes arenaceodentata. (5) 06/78 Whole life cycle chronic--Misidopsis bahia and fuel oil. (6) 06/78 Whole life cycle chronic--Mulinea lateralis.
KEYWORDS: BIOASSAY;CHRONIC INTAKE;LIFE CYCLE;SEDIMENTS;ARSENIC;TOXICITY;MOLLUSCS;WATER POLLUTION;ENVIRONMENTAL TRANSPORT;TOLERANCE;CRUSTACEANS;COPPER;FISHES;BIOLOGICAL ACCUMULATION

<073018>
TITLE: Interlaboratory Bioassay Intercalibration
PROJECT NUMBER: P608C-18
PRINCIPAL INVESTIGATOR: Pesch, C.;Pesch, G.;Reish, D.;Sosnowski, S.;Gentile, J.;Nimmo, D.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Gentile, J.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$38,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: The objectives of these studies are to test a new bioassay method at different laboratories to determine the method variances due to operators, seawaters, and organism source.
APPROACH: Work has been completed on a polychaete bioassay using Capitella capitata using cadmium as a toxicant. Variances due to operator and water source and transport offset species were examined. A study using Mysidopsis bahia, whole life cycle flow-through assays evaluating sublethal parameters is currently under way. The Capitella study involved EPA, Univ. California, and France while the mepid study will include two EPA laboratories.

PROJECT MILESTONES: (1) 01/77 Complete research and draft manuscript on Capitella capitata fishes. (2) 06/77 Complete manuscript on Capitella capitata. (3) 06/77 Initiate studies on Mysidopsis bahia. (4) 06/78 Manuscript of Mysidopsis bahia calibration.
KEYWORDS: BIOASSAY;CALIBRATION;QUALITY ASSURANCE;CADMIUM;TOXICITY;ERRORS;RELIABILITY;SEAWATER;AQUATIC ORGANISMS;FRANCE;CALIFORNIA;FISHES;CRUSTACEANS;ENVIRONMENTAL TRANSPORT

<073019>
TITLE: Modulating Environmental Variable Bioassay System
PROJECT NUMBER: P608C-19
PRINCIPAL INVESTIGATOR: Voyer, R.;Gentile, J.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Gentile, J.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$57,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
PROJECT DESCRIPTION: Develop a flow-through bioassay system that allows for multiple fixed and modulating salinities and temperature. The system can be externally driven through stored (tape) information or real time using microprocessor to control values, flow, etc. The applications of this system include: laboratory studies using real time salinity/temperature conditions rather than the usual single fixed conditions; the incorporation of salinity/temperature extremes into routine screening bioassays; the use of this system for effluent and mixed waste testing in laboratories remote from field site but with site temperature and salinity profiles.
PROJECT MILESTONES: (1) 09/77 Complete system development for salinity and evaluate biological effects. (2) 06/78 Complete system development for temperature. (3) 06/79 Total evaluation of system for selected species and pollutants. (4) 06/80 Complete adaptation for use in mixed waste testing.
KEYWORDS: BIOASSAY;AQUATIC ECOSYSTEMS;SALINITY;PH VALUE;BIOLOGICAL EFFECTS;MICROPROCESSORS;WATER POLLUTION;TEMPERATURE EFFECTS;BIOLOGICAL INDICATORS;BIOLOGICAL STRESS;CHEMICAL EFFLUENTS;WASTE DISPOSAL;MONITORING

<073020>
TITLE: Cytogenetic Effects of Chemical Toxicants on Selected Indicator Systems
PROJECT NUMBER: P608C-23
PRINCIPAL INVESTIGATOR: Pesch, G.;Barry, M.;Best, J.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Pesch, G.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$53,200
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);GEOTHERMAL/General (33%)
PROJECT DESCRIPTION: Cytogenetic responses are employed to provide suitable screening methods for the detection of potential chemical mutagens or other DNA-damaging agents in both laboratory and field situations. In the laboratory, early developmental stages of several marine invertebrates, as well as cultured mammalian cells, shall be used. For field investigation, eggs and larvae from adult shellfish collected in spawning condition will be employed. Anaphase preparations are to be utilized for detection of chromosome aberrations such as breaks and bridges. Sister chromatid exchange is to be studied via metaphase preparations.
PROJECT MILESTONES: (1) 01/78 Validate methods for using eggs and larvae of polychaete Neanthes. (2) 06/78 Validate method for using eggs and embryos of the sea urchin, Arb. (3) 06/78 Validate method for sister chromatid exchange studies with CHO ce.
KEYWORDS: CYTOLOGY;GENETIC EFFECTS;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;TOXICITY;SEA URCHINS;CHROMOSOMAL ABERRATIONS;EMBRYOS;INVERTEBRATES;NEMATODES

<073021>
TITLE: Mutagenic Effects of Chemical Toxicants on Cultured Mammalian Cells
PROJECT NUMBER: P608C-24
PRINCIPAL INVESTIGATOR: Malcolm, A.R.;Young, R.R.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Malcolm, A.R.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$76,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The current project is concerned with the evaluation and application of the Chinese hamster ovary (CHO) cell system (5-bromodeoxyuridine/visible light selection procedure) as a method for the detection and assessment of small-scale mutations. Emphasis is on the induction, isolation and characterization of nutritional variants. (Compounds evaluated to date are primarily known genetic toxicants, including a broad spectrum of inorganic carcinogens.) Experimental parameters/factors assessed include system sensitivity to direct-acting compounds, effects of variation in the administration of dose, mutagen specificity and effects of variable expression time.
PROJECT MILESTONES: (1) 06/76 Standardization studies with ethylmethanesulfonate and 5-bromodeoxyuridine. (2) 02/77 Mutation assays with 6 inorganic compounds. (3) 12/77 Mutation assays with 7 additional compounds. (4) 02/78 Back mutation rates with several mutant clones of the CHO cell. (5) 06/78 Effects of variation in expression time with known genetic toxic.
KEYWORDS: CHEMICAL EFFLUENTS;WATER POLLUTION;ESTUARIES;HEALTH HAZARDS;BIOLOGICAL EFFECTS;MUTATIONS;BIOASSAY;GENETIC EFFECTS;TOXICITY;NUTRITION;INORGANIC COMPOUNDS;CARCINOGENS;HAMSTERS;TOLERANCE;ENVIRONMENTAL TRANSPORT;ORGANIC COMPOUNDS

<073022>
TITLE: Adenosine Triphosphate (ATP)
PROJECT NUMBER: P608C-25
PRINCIPAL INVESTIGATOR: Cheer, S.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Rogerson, P.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$38,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Techniques to accurately measure Adenosine Triphosphate (ATP) are desired for both water and sediment samples.
APPROACH: The basic technique for measuring ATP in water samples by the light-emitting luciferin-luciferose reaction is well established. However, many details of the methodology remain to be clarified. These include such variables as filter type, water volume, physiological state of the phytoplankton, and presence of bacteria. Similarly, problems with sediment samples include extraction effluency and coextraction of inhibition substances. These and other aspects of the ATP methodology remain to be clarified.
RESULTS: Improvements in the state-of-the-art for ATP analyses will be published in the open literature.
PROJECT MILESTONES: (1) 08/74 Improved method for ATP determination and (2) 06/78 Publication on modifications of ATP methodology.
KEYWORDS: ATP;AQUATIC ECOSYSTEMS;MONITORING;WATER POLLUTION;BIOASSAY;WATER;SEDIMENTS

<073023>
TITLE: Trace Element Analysis of Marine Systems
PROJECT NUMBER: P608C-26
PRINCIPAL INVESTIGATOR: Rogerson, P.;Hoffman, G.;Davey, E.W.;Galloway, W.B.;Riesenfeld, P.
AFFILIATION: Environmental Protection Agency, Narragansett, R.I. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Rogerson, P.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$342,000
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);GEOTHERMAL/General (33%)
PROJECT DESCRIPTION: Techniques to measure many trace elements in water, sediment, and organisms by a variety of analytical techniques are being developed. These techniques include flame and flameless atomic absorption, neutron activation, and alpha particle spectrometry.
APPROACH: Trace element levels in macrofauna and sediments are typically analyzed by flame atomic absorption spectrometry following digestion with concentrated nitric acid. Small organisms, low-level samples, and water are measured by flameless hollow graphite atomization techniques, with water also being measured by chelex preconcentration techniques. Neutron activation analysis is used for selected elements and for solid samples without prior digestion. Contaminant radioisotopes are investigated by alpha particle spectrometry following extensive pre-chemistry.
RESULTS: Data is continuously fed back into the various programs within the laboratory. In addition, new and innovative analytical techniques are published in the open literature. Manuscripts are in preparation describing marine tissue reference materials for atomic absorption, a hollow graphite atomic absorption technique for small organisms, quality control aspects of single organisms atomic absorption analysis, including interferences, and techniques to extend the detection limit for Ag, Cu, Cd, by hollow graphite atomic absorption. Techniques have been published for pre-concentration of many trace elements from seawater by Chelex absorption.
PROJECT MILESTONES: (1) 10/73 Apparatus for the concentration of trace elements in seawater and (2) 01/81 Miscellaneous journal publications.
KEYWORDS: TRACE AMOUNTS;AQUATIC ECOSYSTEMS;MEASURING INSTRUMENTS;WATER;SEDIMENTS;AQUATIC ORGANISMS;MEASURING METHODS;ARSENIC;COPPER;CADMIUM

<073024>
TITLE: Density Dependent Factors and Their Effects on Growth and Survival of Spotted Seatrout and Lined Sole Larvae (Abbrev)
PROJECT NUMBER: P608C-3
PRINCIPAL INVESTIGATOR: Houde, E.D.
AFFILIATION: Miami Univ., Coral Gables, Fla. (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Beck, A.D.
TYPE OF FUNDING: Grant No.-R804519-02
77 FUNDING: Environmental Protection Agency FY77:$18,500
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: Lined soles and spotted seatrout are being reared in the laboratory to help develop techniques for standardized culture of marine fish larvae. Presently supported research is designed to investigate effects of food concentration, stocking density and food types on survival and growth of larvae. Other factors being investigated include feeding rates and growth efficiencies in relation to size of larvae and type and concentrations of food. Foods that are being used are wild plankton (copepnauplii), the rotifer Brachinous plicatilis, and brine shrimp Artemia salina nauplii. Seatrout and lined soles can be reared from egg to juvenile on either wild plankton or rotifer-brine shrimp diets. Growth during the early larval stages is better on the wild plankton than on rotifers but survival is equally good on both foods. Additional proposed studies include studies on larvae behavior in relation to food types and food concentrations. Also, a comparison of reared and wild larvae of both species with respect to morphometrics and growth characteristics will be initiated during the proposed budget period. The goal of the project is to provide standardized procedure that will insure production of large numbers of marine fish larvae, with physiological characteristics similar to wild larvae, that could be used in pollution and toxicant bioassays.
PROJECT MILESTONES: 05/79 Final report entitled, "Density dependent factors and their effects..."
KEYWORDS: TROUT;SEAS;FISHES;ANIMAL GROWTH;SURVIVAL CURVES;POPULATION DYNAMICS;WATER POLLUTION;NUTRITION;ENVIRONMENTAL EFFECTS

<073025>
TITLE: Nutritional Requirements of Marine Larval and Juvenile Fish
)JECT NUMBER: P608C-4
[NCIPAL INVESTIGATOR: Simpson, K.L.;Chichester, C.O.;Lee, T.
AFFILIATION: Rhode Island Univ., Kingston (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Beck, A.D.
TYPE OF FUNDING: Grant No.-R803818-03
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The primary objective of this proposal is the development of methods and techniques to formulate laboratory diets for larval and juvenile marine fish. Such diets are needed in order to achieve high levels of survival and field-comparable growth of laboratory-cultured animals. If successful, the laboratory marine fish will exhibit minimum variability in lab bioassay due to nutritional stress. Menidia menidia will be used as a test fish.
APPROACH: Test diets will be evaluated for protein availability and storage stability. The nutritional status of field and diet-fed populations will be compared. The life history stages will include eggs, yolk-sac larvae, post-yolk-sac larvae and juveniles.
RESULTS: Apparent nutritional needs will be determined by qualitative analysis of eggs, yolk-sac larvae, post-yolk-sac larvae and juveniles. The sources of nutrients will be determined by qualitative analysis of laboratory-prepared live or artificial food materials. The test diets formulated from qualitative information will then be assessed for protein availability and storage stability using growth studies with the test fish, rat and rainbow trout. Finally, the nutritional status of the larvae and juveniles will be compared with field populations using appropriate response parameters: survival, growth, biochemistry, behavior and stress response.
PROJECT MILESTONES: 07/78 Final report entitled, ''Nutritional requirements of marine larval...''
KEYWORDS: FISHES;NUTRITION;WATER POLLUTION;AQUATIC ORGANISMS;JUVENILES;LARVAE;POPULATION DYNAMICS;RATS;BIOLOGICAL STRESS;BIOCHEMISTRY;SURVIVAL CURVES

<073026>
TITLE: Development and Application of Laboratory Microcosms for Perturbation Experiments of Coastal Marine Ecosystems
PROJECT NUMBER: P608C-8
PRINCIPAL INVESTIGATOR: Nixon, S.W.;Oviatt, S.A.;Perez, K.T.
AFFILIATION: Rhode Island Univ., Kingston (USA)
MONITORING AGENCY: Environmental Protection Agency, Narragansett, R.I. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Perez, K.
TYPE OF FUNDING: Grant No.-R805463-01
77 FUNDING: Environmental Protection Agency FY77:$75,500
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: (1) To develop marine microcosm methodology; (2) to compare small and large microcosm behavior; (3) to assess the effects of sewage addition and stresses operating along established sewage gradients and recovery from these perturbations; (4) to assess time varying perturbations of 3; (5) to use the microcosms to determine the effects of multiple stresses on estuarine ecosystems; and (6) to use the microcosms to understand stability and resiliency in estuarine ecosystems.
APPROACH: We propose to continue work with 12 experimental microcosms which are maintained in a water bath in the EPA Environmental Research Laboratory, Narragansett, RI. The tanks will be filled with hand bucketed water from Narragansett Bay to prevent damage to plankton, and intermixed to produce uniform initial conditions in all of the microcosms. New sediment will be collected by box core at the start of each series of experiments. The biological parameters in the microcosm will then be followed for one or two weeks to be sure that they are not diverging before specific experiments are begun.
RESULTS: Four series of experiments are planned as follows: (1) sealing experiments with light and turbulent mixing; (2) comparison of the behavior of small microcosms with large microcosms; (3) stress experiments on microcosms with different levels of sewage; and (4) mixed oligotrophic and eutrophic experiments.
PROJECT MILESTONES: 09/79 Final report entitled, ''Development and application of laboratory...''
KEYWORDS: COASTAL REGIONS;AQUATIC ECOSYSTEMS;SEWAGE SLUDGE;WASTE DISPOSAL;ENVIRONMENTAL IMPACTS;ESTUARIES;BIOLOGICAL STRESS;MONITORING;WATER POLLUTION;TOXICITY

<073101>
TITLE: Water Quality and Eutrophication Studies in Santa Rosa Sound in the Proximity of Escambia and Santa Rosa Counties, Florida
PROJECT NUMBER: Q-608-C-1-2
PRINCIPAL INVESTIGATOR: Moshiri, G.A.
ADDRESS: Pensacola, FL 32504
AFFILIATION: West Florida Univ., Pensacola (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Walsh, Gerald E.
TYPE OF FUNDING: Grant No.-R805366-01
77 FUNDING: Environmental Protection Agency FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
:OJECT DESCRIPTION: The proposed project is intended to monitor water quality parameters over a period of two years that will give detailed information concerning the present water quality status of Santa Rosa Sound, Escambia-Santa Rosa Counties, Florida.
APPROACH: From bi-weekly field samples, water quality parameters will be measured against a background of physico-chemical data. These parameters include B.O.D., inorganic and organic carbon, algal cell counts and types, and bacterial numbers and sizes. The major types of phosphate and nitrogenous species will be determined and correlated with algal population composition and primary production rates (to be measured in situ by the 14-C technique). The effects of nitrogen-phosphorus enrichment on algal productivity will

be determined by employing the primary productivity measurement technique on in situ cultures on a seasonal basis.
RESULTS: In addition to the regular sampling regimen, dual studies will be conducted to delineate daily trends in water quality parameters. Pilot investigations will be conducted periodically to indicate areas needing further investigation. It is anticipated that the information obtained from the proposed study will aid in the establishment of recommendations for the improvement of water quality in Santa Rosa Sound.
PROJECT MILESTONES: 7/78 Report.
KEYWORDS: FLORIDA;WATER QUALITY;EUTROPHICATION;SAMPLING;BACTERIA;PHOSPHATES;SULFUR COMPOUNDS;NITROGEN COMPOUNDS

<073102>
TITLE: Novel Techniques for Concentration and Separation of Toxic Substances from Estuarine Waters
PROJECT NUMBER: Q-608-C-1-5
PRINCIPAL INVESTIGATOR: Klein, E.
ADDRESS: 8000 GSRI Ave., Baton Rouge, LA 70808
AFFILIATION: Gulf South Research Inst., Baton Rouge, La. (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Richards, Normal L.
TYPE OF FUNDING: Grant No.-R805656-01
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental;COASTS/Other coasts All coastal regions;HYDROGRAPHIC AREAS/Other hydrographic areas All coastal regions
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to develop methods for the separation, concentration and identification of xenobiotics with mutagenic/carcinogenic properties from the estuarine environment.
PROJECT MILESTONES: 10/78 Report on methodology evaluation.
KEYWORDS: XENOBIOTICS;WATER POLLUTION;MEASURING METHODS;CHEMICAL ANALYSIS;MUTAGENS;CARCINOGENS;ESTUARIES;SEPARATION PROCESSES;MATERIALS;MONITORING

<073103>
TITLE: Investigation of Enzymatic Screening Tests for Mutagens in Environmental Pollutants
PROJECT NUMBER: Q-608-C-1-6
PRINCIPAL INVESTIGATOR: Schmidt-Collerus, J.
ADDRESS: University Park, Denver, CO 80208
AFFILIATION: Denver Univ., Colo. (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Richards, Normal L.
TYPE OF FUNDING: Grant No.-R80567-01
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Global;COASTS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas All coastal regions
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this research is to study the feasibility of the in vitro activation of microsomal drug-metabolizine enzyme systems for the development of a rapid and sensitive prescreening test for mutagenicity of synfuel related environmental pollutants, their derivatives and their metabolic products as they may occur on land and in aquatic and marine environments.
PROJECT MILESTONES: (1) 10/78 Preliminary evaluation of screening method. (2) 1/79 Report on validation of screening method.
KEYWORDS: FEASIBILITY STUDIES;BIOASSAY;MICROSOMES;ENZYMES;SYNTHETIC FUELS;CHEMICAL EFFLUENTS;METABOLISM;PETROLEUM;TOXICITY;AQUATIC ECOSYSTEMS;WATER POLLUTION;MUTAGENS;CARCINOGENS;HYDROCARBONS;PETROLEUM REFINERIES;REFINERY GASES;CHEMICAL EFFLUENTS;IN VITRO

<073104>
TITLE: Environmental Assessment and Bioassay Development
PROJECT NUMBER: Q-623-D-1-1
PRINCIPAL INVESTIGATOR: Walsh, G.
ADDRESS: Gulf Breeze, FL 32561
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Walsh, Gerald
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$62,100
TECHNOLOGY: FOSSIL FUEL/General (50%);CONSERVATION/Improved conversion efficiency (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Environmental Assessment and Bioassay Development.
APPROACH: Environmental Assessment of Complex Industrial Effluents Complex of Industrial and Municipal Processed Waste Water.

RESULTS: This program will provide to the Environmental Assessment Program of the OEMI assistance in the determination of the environmental acceptability of specific levels of control on industrial waste streams impacting marine and estuarine environments. This will involve the development of marine bioassay procedures for on site evaluation of the waste stream control. Decision criteria and the impact factors involved in environmental assessment will be developed in conjunction with other OHEE laboratories and OEMI.
PROJECT MILESTONES: (1) 6/77 Level 1 testing protocols for industrial assessment. (2) 6/78 Level 1 testing protocols for industrial assessment. (3) 6/79 Mobile testing system for biological assessment.
KEYWORDS: BIOASSAY;INDUSTRIAL WASTES;MUNICIPAL WASTES;WATER POLLUTION;HEALTH HAZARDS;BIOLOGICAL EFFECTS;DECISION MAKING;ENVIRONMENTAL IMPACTS;TOXICITY;WASTE WATER;CHEMICAL EFFLUENTS

<073105>
TITLE: Isolation and Study of Chloro-Organics Resulting from Chlorination or Seawater
PROJECT NUMBER: Q-625-A-1
PRINCIPAL INVESTIGATOR: Carpenter, J.H.;Smith Carroll, A.
ADDRESS: 4600 Rickenbacker Causeway, Miami, FL 33149
AFFILIATION: Miami Univ., Fla. (USA). Rosenstiel School of Marine and Atmospheric Sciences
MONITORING AGENCY: Environmental Protection Agency, Johns Island, S.C. (USA). Bears Bluff Field Station
DIVISION: Bears Bluff Field Station
MONITOR: Davis, William P.
TYPE OF FUNDING: Grant No.-R-803893-03
77 FUNDING: Environmental Protection Agency FY77:$230,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS/Chlorine compounds (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The proposed research seeks to identify the chlorine-containing and bromine-containing organic compounds that are formed when chlorine is added to seawater.
APPROACH: Initial emphasis would be placed on study of reaction conditions that occur during power plant operations; i.e., up to 2 hours at temperatures up to 38 degrees C with and without sunlight. Total organic halogenated compounds yield would be measured. The reaction products would be fractionated, using selective solubility and thin layer chromatography. Characterization would be carried out using gas chromatographic-mass spectral techniques and additional characterization would be based on uv and ir spectra with NMR for special cases.
PROJECT MILESTONES: 5/79 Final report.
KEYWORDS: ORGANIC CHLORINE COMPOUNDS;CHLORINE;SEAWATER;CHEMICAL ANALYSIS;SEPARATION PROCESSES;ORGANIC BROMINE COMPOUNDS;THERMAL POWER PLANTS;GAS CHROMATOGRAPHY;MASS SPECTROSCOPY;TOXICITY

<073106>
TITLE: Effects of Petroleum Compounds on Estuarine Fishes
PROJECT NUMBER: Q-625-F-1-1
PRINCIPAL INVESTIGATOR: Martin, B.J.;House, H.D.
ADDRESS: Southern Station, Box 18, Hattiesburg, MS 39401
AFFILIATION: University of Southern Mississippi, Hattiesburg (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Couch, John A.
TYPE OF FUNDING: Grant No.-R-804527-01
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: TRANSPORTATION (34%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (33%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South
PROJECT DESCRIPTION: The purpose of this project is to study chemically induced tumors in teleost fishes.
APPROACH: Both marine and freshwater species will be exposed to low levels of a known carcinogen for 300 days. Fish developing tumors or other pathologies during this period will be sacrificed and tissue from the liver, kidney, intestine, and gills will be studied histologically. Tissues from all the fish with no grossly apparent pathologies at the time the experiment is terminated will be studied in the same manner in order to detect any neoplasias or preneoplastic conditions.
RESULTS: It is expected that this research will: (1) provide evidence concerning the quantities of benzopyrene necessary to induce neoplasias; (2) supply additional data concerning tumors in teleosts; (3) establish the feasibility of using teleost fish as early indicators of carcinogenic substances in the aquatic environment, and (4) demonstrate that this type of system could be used to screen compounds for carcinogenic properties.
PROJECT MILESTONES: 10/78 Final report.
KEYWORDS: PETROLEUM;FISHES;CARCINOGENS;PATHOLOGICAL CHANGES;LIVER;KIDNEYS;SMALL INTESTINE;LUNGS;CARCINOGENESIS;NEOPLASMS;BIOLOGICAL INDICATORS;PHYSIOLOGY;WATER POLLUTION;TOXICITY;HYDROCARBONS

<073107>
TITLE: Environmental Effects of Offshore Drilling and Oil on the Marine Environment
PROJECT NUMBER: Q-625-A-2-1
PRINCIPAL INVESTIGATOR: Schuit, N.
ADDRESS: Naval Coastal Systems Laboratory, Panama City, FL
AFFILIATION: Naval Coastal Systems Lab., Panama City, Fla. (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Richards, Normal L.
TYPE OF FUNDING: EPA pass-thru funding-IAG 07-01134
77 FUNDING: Environmental Protection Agency FY77:$440,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (25%);TRANSPORTATION (25%);PROCESSING, CONVERSION (25%);WASTE MANAGEMENT (25%)

POLLUTANTS: METALS (30%);PARTICULATES (30%);ORGANICS (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shel
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The work to be funded under this IAG includes the conduct of research to (1) determine the environmental effects of offshore oil extraction, and (2) assess the effects on the marine environment of Bunker C fuel derived from shale oil.
APPROACH: In order to simulate the conditions of the marine environment, the use of the Stage I offshore platform owned and maintained by the NCSL, Panama City, Florida, will be required.
RESULTS: Environmental Effects of Offshore Drilling and Oil on the Marine Environment.
PROJECT MILESTONES: (1) 12/77 Complete field tests, phase I. (2) 5/78 Report on field tests, phase I. (3) 5/78 Start field tests, phase II. (4) 12/78 Complete field tests, phase II. (5) 12/78 Report on field tests, phase II.
KEYWORDS: OFFSHORE DRILLING;ENVIRONMENTAL IMPACTS;PETROLEUM DEPOSITS;NATURAL GAS DEPOSITS;FUEL OILS;SHALE OIL;SYNTHETIC PETROLEUM;AQUATIC ECOSYSTEMS;GULF OF MEXICO;OIL SPILLS;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;BIOLOGICAL MODELS;WATER POLLUTION;BARIUM;PETROLEUM

<073108>
TITLE: ADP Technical Support Services
PROJECT NUMBER: Q-625-A-1-2
PRINCIPAL INVESTIGATOR: McCutchen, R.
ADDRESS: P.O. Box 1900, Huntsville, AL 35807
AFFILIATION: General Services Administration, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITOR: Davies, Tudor T.
TYPE OF FUNDING: EPA pass-thru funding-IAGD7-01000
77 FUNDING: Environmental Protection Agency FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Indirect-support to pollutant screening (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The purpose of this IAG is to provide ADP technical services in support of the Environmental Research Laboratory, Gulf Breeze, research program. This includes work in support of the Bears Bluff Field Station of the Environmental Research Laboratory, Gulf Breeze. This will include support of the modelling program on the fate, persistence and effects of toxic materials on coastal waters, statistical services in the laboratory and data base management of the toxicology program.
PROJECT MILESTONES: (1) 5/77 Begin Data Base Management System. (2) 12/77 Attach Statistical Service Needs to Data Base Service. (3) 6/78 Operate Water Quality Models for Estuaries.
KEYWORDS: AUTOMATIC DATA PROCESSING SUPPORT;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;COASTAL WATERS;TOXICITY;WEATHERING;BIOLOGICAL EFFECTS;DATA ANALYSIS;MANAGEMENT;DATA PROCESSING;STATISTICAL MODELS;COMPUTER CALCULATIONS;AUTOMATION;DATA ACQUISITION;POLLUTION;ENVIRONMENT

<073109>
TITLE: Determine Toxicity to Marine Organisms of Petrochemicals and Energy Related Organic Solvents Derived from Offshore Activities and Ocean Dumping
PROJECT NUMBER: Q-625-A-2-2
PRINCIPAL INVESTIGATOR: Shimmez, S.;Tabatz, S.
ADDRESS: Gulf Breeze, FL 32561
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITOR: Richards, Norman L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$76,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coasts;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas All coasts
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
APPROACH: Offshore petroleum extraction may affect marine organisms and ecosystems in the Gulf of Mexico and other areas undergoing intensified petroleum exploitation, extraction, and transportation activities. The research objective is to access the effects of these emissions on marine organisms and communities. Bioassays on single species and communities will be continued on selected components of drilling muds. Work will be initiated on whole drilling muds and other pollutants emitted from extraction activities such as cutting and man-mobilized petroleum hydrocarbons.
PROJECT MILESTONES: (1) 9/77 Progress Report. (2) 10/78 Final Report.
KEYWORDS: PETROCHEMICALS;TOXICITY;SOLVENTS;OFFSHORE OPERATIONS;ENVIRONMENTAL IMPACTS;WASTE MANAGEMENT;AQUATIC ORGANISMS;WASTE DISPOSAL;BIOASSAY;DRILLING FLUIDS;PETROLEUM INDUSTRY;OIL SPILLS;ORGANIC NITROGEN COMPOUNDS;BARIUM

<073110>
TITLE: Genetic Variation and Resistance to Carcinogens in Natural Waters
PROJECT NUMBER: Q-625-F-1-2
PRINCIPAL INVESTIGATOR: Schultz, R.J.
ADDRESS: Biological Sciences Group, Storrs, CN 06268
AFFILIATION: Connecticut Univ., Storrs (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITOR: Richards, Norman L.
TYPE OF FUNDING: Grant No.-R805195-01
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)

ENERGY CYCLE: EXTRACTION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS/Pesticides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
IONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Global
EARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
ROJECT DESCRIPTION: The objective of this grant is to evaluate the feasibility of using isogenic fish to detect carcinogens.
RESULTS: The validated bioassay system would be used to test the carcinogenic properties of compounds from petroleum and shale oil.
PROJECT MILESTONES: (1) 1/78 Complete Toxicity Tests, Begin Carcinogen Exposure. (2) 6/79 Preliminary Evaluation of Carcinogen Methodology. (3) 6/80 Evaluation of Method for Carcinogen Bioassay.
KEYWORDS: CARCINOGENESIS;GENETIC VARIABILITY;BIOLOGICAL EFFECTS;RESPONSE MODIFYING FACTORS;CARCINOGENS;PETROLEUM INDUSTRY;NATURAL GAS INDUSTRY;ENVIRONMENTAL IMPACTS;PESTICIDES;FISHES;BIOLOGICAL INDICATORS;BIOASSAY;TOXICITY;OIL SHALE INDUSTRY;WATER POLLUTION

<073111>
TITLE: Sublethal Effects of Chlorine on Marine Vascular Plants and Decapod Crustaceans
PROJECT NUMBER: Q-625-A-3
PRINCIPAL INVESTIGATOR: Roberts, M.H. Jr.
ADDRESS: Gloucester Point, VA 23062
AFFILIATION: Virginia Inst. of Marine Science, Gloucester Point (USA)
MONITORING AGENCY: Environmental Protection Agency, Johns Island, S.C. (USA). Bears Bluff Field Station
MONITOR: Davis, William P.
TYPE OF FUNDING: Grant No.-R-803872-02
77 FUNDING: Environmental Protection Agency FY77:$112,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%);WASTE MANAGEMENT (33%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Chlorine, pesticides (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;COASTS/Other coasts All coastal regions;HYDROGRAPHIC AREAS/Other hydrographic areas All coastal regions
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of the research are to define effects of continuous exposure to chlorine on larval development, juvenile growth, and reproductive parameters for two selected marine decapod crustaceans, Panopeus herbstii and Pagurus longicarpus. Additionally the effects of chlorine on development of the coot clam, Mulinia lateralis, and blood serum constituents of the blue crab, Callinceres sapidus, will be studied.
RESULTS: Preliminary data suggest that responses occur only at chlorine doses close to the lethal concentration. Reliable test systems developed to date will be used to define chlorine effects.
PROJECT MILESTONES: (1) 9/77 Final Report.
KEYWORDS: COOT CLAM;BLUE CRAB;CHLORINE;ENVIRONMENTAL TRANSPORT;AQUATIC ORGANISMS;AQUATIC ECOSYSTEMS;BIOLOGICAL EFFECTS;TOXICITY;PLANTS;CRUSTACEANS;METABOLISM;PHYSIOLOGY;PESTICIDES;CARCINOGENS;ORGANIC CHLORINE COMPOUNDS

<073112>
TITLE: Detection of Carcinogenicity of Oils in Seawater; Use of Hybrid Fish and Food Chains
PROJECT NUMBER: Q-625-F-1-3
PRINCIPAL INVESTIGATOR: Humm, D.G.
ADDRESS: Department of Zoology, Chapel Hill, NC 27514
AFFILIATION: North Carolina Univ., Chapel Hill (USA). Dept. of Zoology
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITOR: Richards, Norman L.
TYPE OF FUNDING: Grant No.-R80465-02
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Pesticides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Detection of carcinogenicity of oils in seawater; use of hybrid fish and food chains
APPROACH: We have developed and are continuing the testing of quick, sensitive method of detection of water-borne carcinogens using laboratory reared fish, as a part of an overall screening system for carcinogens. We hope to extend the technique to a tissue culture system. Early applications are also planned to include the examination of the kinetics of transmission of carcinogens along naturally occurring food chains.
PROJECT MILESTONES: (1) 5/78 Report on Screening Method. (2) 12/78 Final Report on Validated Bioassay Method. (3) 12/79 Final Report on Method and Mechanism.
KEYWORDS: SEAWATER;PETROLEUM;OIL SPILLS;CARCINOGENESIS;BIOLOGICAL INDICATORS;FISHES;FOOD CHAINS;CARCINOGENS;WATER POLLUTION;HEALTH HAZARDS;BIOLOGICAL EFFECTS;TISSUE CULTURES;TISSUES;BIOCHEMICAL REACTION KINETICS;BIOASSAY

<073113>
TITLE: Determine the Dynamics of Dispersion and Dissipation in Marine and Estuarine Waters and the Effects on Marine and Estuarine Organisms
PROJECT NUMBER: Q-625-A-1-4
PRINCIPAL INVESTIGATOR: Davis, W.P.;Middaugh, D.;Badger, A.
ADDRESS: P.O. Box 368, Johns Island, SC 29455
AFFILIATION: Environmental Protection Agency, Johns Island, S.C. (USA). Bears Bluff Field Station
ONITORING AGENCY: Environmental Protection Agency, Johns Island, S.C. (USA). Bears Bluff Field Station
DIVISION: Bears Bluff Field Station
MONITOR: Davis, William P.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (100%)

ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coastal regions;HYDROGRAPHIC AREAS/Other hydrographic areas All coastal regions
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Determine the dynamics of dispersion and dissipation in marine and estuarine waters and the effects on marine and estuarine organisms.
APPROACH: Identification and quantification of halogenated compounds formed when chlorine is added to seawater. Initial emphasis will describe the inorganic and organic reactions which lead to long lasting by-products. Follow-up studies will investigate the complex and physical chemical fate of identified compounds in simulated and natural marine ecosystems, including complexing with sediments, or uptake and bioaccumulation by organisms. Analytical capability will be applied both to on-site experiment investigations and community studies by the Bears Bluff Field Station of the Environmental Research Laboratory, Gulf Breeze, Florida.
PROJECT MILESTONES: (1) 7/76 Publish Conference ''Environmental Impact of Water Chlorination''. (2) 12/77 Contribute to and Hold Conference on Halogenation. (3) 10/78 Preliminary Assessment of Halogenation. (4) 12/79 Final Assessment of Impact of Treatment.
KEYWORDS: ESTUARIES;ORGANIC HALOGEN COMPOUNDS;CHLORINE;BY-PRODUCTS;ENVIRONMENT;AQUATIC ECOSYSTEMS;WATER POLLUTION;BIOLOGICAL ACCUMULATION;FLORIDA;WATER;ENVIRONMENTAL TRANSPORT;DIFFUSION;AQUATIC ORGANISMS;HEALTH HAZARDS;TOXICITY

<073114>
TITLE: Marine Protozoan Microsomal Activation of Oil Pollutants to Mutagens
PROJECT NUMBER: Q-625-F-1-4
PRINCIPAL INVESTIGATOR: Lindmark, D.G.
ADDRESS: 1230 York Avenue, New York, NY 10021
AFFILIATION: Rockefeller Univ., New York (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
TYPE OF FUNDING: Grant No.-R805364-01
77 FUNDING: Environmental Protection Agency FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: ORGANICS/Pesticides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The project consists of the isolation of microsomes from various marine protozoa.
APPROACH: Work will be done on a small scale under laboratory conditions.
PROJECT MILESTONES: (1) 10/77 Visit ERL Gulf Breeze for Planning Session. (2) 8/78 Final Report.
KEYWORDS: PROTOZOA;PETROLEUM;MUTAGENESIS;PESTICIDES;BENCH-SCALE EXPERIMENTS;WATER POLLUTION;OIL SPILLS;CARCINOGENS;TOXICITY;WASTE MANAGEMENT;MICROSOMES

<073115>
TITLE: Effects of Drilling Fluids and Oil in Corals Occupying Hard-Bank Communities
PROJECT NUMBER: Q-625-F-1-5
PRINCIPAL INVESTIGATOR: Bright, T.J.
ADDRESS: Faculty Exchange Box H-Dept. of Oceanography, College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA). Research Foundation
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Richards, Norman L.
TYPE OF FUNDING: Grant No.-R805441-01
77 FUNDING: Environmental Protection Agency FY77:$22,600
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (33%);ORGANICS (33%);RADIATION (34%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Deep ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: An experimental design is proposed in which the behavioral and physiological reactions of scleractinian corals indigenous to hard bank communities in the Gulf of Mexico are determined in response to chronic low levels of drilling fluid components and shale oil products.
APPROACH: The design incorporates time-lapse-macrophotographic and respirometric techniques to measure the response parameters. The corals shall be exposed to the contaminants in ''flow through'' aquaria on board a platform twelve miles offshore of Panama City. Controls shall include parallel observations of corals exposed to uncontaminated sea water in identical ''flow through'' aquaria, and of corals transplanted to the site of the platform at a depth similar to that from which they were collected.
PROJECT MILESTONES: (1) 7/77 Begin Field Collection of Corals for Study. (2) 6/78 Report on Effects of Drilling Fluids on Corals.
KEYWORDS: CORALS;OFFSHORE DRILLING;PETROLEUM INDUSTRY;OIL SHALE INDUSTRY;NATURAL GAS INDUSTRY;ENVIRONMENTAL EFFECTS;PHYSIOLOGY;BEHAVIOR;GULF OF MEXICO;DRILLING FLUIDS;SULFUR DIOXIDE;TOXICITY;WATER POLLUTION

<073116>
TITLE: Effects of Compounds Produced from Petroleum Utilization on Selected Marine Invertebrates with Particular Emphasis on Neoplasia and Carcinogenesis
PROJECT NUMBER: Q-625-A-1-6
PRINCIPAL INVESTIGATOR: Mix, M.
ADDRESS: Department of General Science, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA). Dept. of General Science
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Couch, John A.
TYPE OF FUNDING: Grant No.-R-804427-02
77 FUNDING: Environmental Protection Agency FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)

ENERGY CYCLE: TRANSPORTATION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: ORGANICS (100%)
----ACTER OF STUDY: RESEARCH/Laboratory (100%)
ONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC REAS/Other hydrographic areas Coastal
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To determine the concentration (body burdens) of selected environmental chemical carcinogens in economically-important mollusks and crustaceans from Oregon bays, estuaries and inshore areas. (2) To determine if there is a potential public health hazard to man from consuming shellfish, harvested from Oregon bays, estuaries and inshore areas, which contain petroleum by-products that are carcinogenic. (3) To survey populations of bivalve mollusks, determine the incidence of neoplastic diseases in these populations and ascertain if there is any correlation between carcinogenic body burdens and the incidences of such diseases. (4) To identify point sources of chemical carcinogens that are present in Oregon bays and estuaries utilized in this study. (5) To determine rates of carcinogenic polycyclic aromatic hydrocarbon uptake and elimination in bivalve mollusks.
RESULTS: Extensive preliminary investigations have been conducted to determine which Oregon bays will be utilized in the study; ascertain which shellfish species will be used; locate sites at which shellfish can be continuously sampled. Bivalve mollusks from different habitats in the various bays are analyzed for the presence and amount of benzo(a)pyrene (BAP) monthly or bi-monthly. Histological sections are prepared so that diagnoses can be made and neoplastic diseases, if present, can be identified.
PROJECT MILESTONES: Final Report, May 78
KEYWORDS: PETROLEUM;BIOLOGICAL EFFECTS;METABOLISM;BODY BURDEN;NEOPLASMS;CARCINOGENESIS;ENVIRONMENTAL TRANSPORT;HEALTH HAZARDS;MOLLUSCS;CRUSTACEANS;ESTUARIES;FOOD CHAINS;POINT SOURCES;POLYCYCLIC AROMATIC HYDROCARBONS;BENZOPYRENE;WATER POLLUTION;PATHOLOGICAL CHANGES;BIOLOGICAL MODELS;TOXICITY

<073117>
TITLE: Toxic, Sublethal and Latent Effects of Selected Petroleum Hydrocarbons and Barium Sulfate on Marine Organisms
PROJECT NUMBER: Q-625-F-1-6
PRINCIPAL INVESTIGATOR: Rao, K.R.
ADDRESS: Department of Biology, Pensacola, FL 32504
AFFILIATION: West Florida Univ., Pensacola (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Richards, Norman L.
TYPE OF FUNDING: Grant No.-R804541-01
77 FUNDING: Environmental Protection Agency FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: TRANSPORTATION (34%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (33%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This investigation will examine the toxic, sublethal and latent effects of certain polycyclic aromatic hydrocarbons and barium sulfate on larval and adult stages of selected invertebrates and fish.
APPROACH: Experiments are designed to determine the effects of these compounds on: (a) crustacean molt cycles; (b) regenerative limb growth; (c) respiration; (d) heart rate; and (e) histology and ultrastructure of selected tissues.
RESULTS: Studies are aimed to determine the uptake by marine organisms of these pollutants from water and bioaccumulation through aquatic food chains. By using a combination of autoradiographic and convential analytical techniques the sites and extent of accumulation of pollutants in marine organisms will be determined.
PROJECT MILESTONES: (1) 7/77 Hold Symposium on Pentachlorophenol. (2) 1/88 Publish Symposium on Pentachlorophenol. (3) 5/78 Hold Symposium on Drilling Fluids. (4) 6/78 Hold Symposium on Carcinogens in the Aquatic Environment. (5) 9/79 Final Report on Grant.
KEYWORDS: TOXICITY;PETROLEUM;HYDROCARBONS;AQUATIC ORGANISMS;BARIUM SULFATES;CARCINOGENESIS;SULFUR DIOXIDE;TOXICITY;BIOLOGICAL EFFECTS;HEALTH HAZARDS

<073118>
TITLE: Rivulus Marmopatus: An Investigation of its Potential as a Cancer Research and Chemical Carcinogen Screening Organism
PROJECT NUMBER: Q-625-F-1-7
PRINCIPAL INVESTIGATOR: Koenig, C.C.
ADDRESS: Charleston, SC 29401
AFFILIATION: Charleston Coll., S.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Johns Island, S.C. (USA). Bears Bluff Field Station
DIVISION: Bears Bluff Field Station
MONITOR: Davis, William P.
TYPE OF FUNDING: Grant No.-805469-01
77 FUNDING: Environmental Protection Agency FY77:$86,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Rivulus marmopatus: An investigation of its potential as a cancer research and chemical carcinogen screening organism.
?ROACH: Recent evidence suggests a relationship between environmental contaminants and cancer. It should be recognized that cancer is thought to be a multistep process with genetic alteration as the initial step. The mutagenic activity of environmental contaminants may therefore give a good indication of potential carcinogenicity and teratogenicity may be an indication of mutagenicity. The need for a marine vertebrate sensitive to chemical carcinogens is great because there is good evidence that the coastal marine environment is being contaminated at an accelerated rate. The marine fish Rivulus marmoratus possesses numerous attributes that make it particularly attractive as a cancer research and/or screening organism. A

number of more obvious attributes of this fish include: hardiness, ease of maintenance, developmental aspects, short generation time, fecundity and unique genetic and reproductive aspects which are found in no other vertebrates (isogenic, homozygous clones of natural hermaphrodites which reproduce by internal self-fertilization). We propose to evaluate the potential of R. marmoratus as a cancer research and screening organism. Two general approaches will be taken: genetic characterization and correlation of effects with known chemical carcinogens. Information gathered from the genetic characterization (electrophoretic, transplantation and cytogenetic techniques will be used) may
PROJECT MILESTONES: Aug 79: Final Report
KEYWORDS: RIVULUS MARMORATUS;CARCINOGENS;NEOPLASMS;MUTAGENESIS;VERTEBRATES;BIOLOGICAL INDICATORS;FISHES;METABOLISM;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;GENETIC VARIABILITY;TERATOGENESIS;CARCINOGENESIS;BIOLOGICAL MODELS;HYDROCARBONS;WATER POLLUTION

<073119>
TITLE: Food Webs, Populations, and Productivity in a Southeast Coastal Marine Marsh
PROJECT NUMBER: Q-625-A-1-7
PRINCIPAL INVESTIGATOR: Chamberlain, N.A.
ADDRESS: Grice Marine Biological Lab-205 Fort Johnson, Charleston, SC 29412
AFFILIATION: Charleston Coll., S.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Johns Island, S.C. (USA). Bears Bluff Field Station
DIVISION: Bears Bluff Field Station
MONITOR: Davis, William P.
TYPE OF FUNDING: Grant No.-R804688-02
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this study is to establish life history and ecological information about salt marsh communities in the North Edisto estuary, Leadenwah Marsh.
APPROACH: This site was chosen because of its isolation from excessive influence of human activities. Additionally the site is adjacent to the E.P.A. Bears Bluff Field Station. There, studies on effects of low levels of halogenated pollutants upon mixed communities of marsh organisms are being done. Studies of the life histories of organisms on the oyster beds, mud, and marsh grass habitats will supply valuable baseline data about breeding cycles, ontogeny and trophic relationships, thereby providing insight for the ecosystem models run at Bears Bluff. The basic study plan combines expertise in mycology, plant physiology, parasitology, genetics, invertebrate and vertebrate zoology, and ecology.
RESULTS: The second year of the study will focus more closely on studies on productivity and trophic relationships among the marsh organisms. Under consideration (among other studies) are habitat selection and trophic relationships of: amphipods, fishes, and fish larvae in the upper marsh; intertidal and subtidal benthic crustacea; and fishes of the larger creeks.
PROJECT MILESTONES: Aug 78: Final Report
KEYWORDS: SALT MARSH COMMUNITIES;FOOD CHAINS;AQUATIC ECOSYSTEMS;MARSHES;ESTUARIES;BASELINE ECOLOGY;PLANTS;PHYSIOLOGY;BIOLOGICAL MODELS;AQUATIC ORGANISMS;POPULATION DYNAMICS;FISHES;CRUSTACEANS;AMPHIBIANS;INVERTEBRATES;ORGANIC HALOGEN COMPOUNDS;VERTEBRATES;PARASITES;WATER POLLUTION;BRINES

<073120>
TITLE: An Investigation of the Ecological Effects of Residual Ozone to Selected Estuarine Species
PROJECT NUMBER: Q-625-A-1-8
PRINCIPAL INVESTIGATOR: Burton, D.T.
ADDRESS: Department of Limnology, 19th and the Parkway, Philadelphia, PA 19103
AFFILIATION: Academy of Natural Sciences of Philadelphia, Pa. (USA). Dept. of Limnology
MONITORING AGENCY: Environmental Protection Agency, Johns Island, S.C. (USA). Bears Bluff Field Station
DIVISION: Bears Bluff Field Station
MONITOR: Davis, William P.
TYPE OF FUNDING: Grant No.-R804683-02
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS/Pathogens (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: An Investigation of the Ecological Effects of Residual Ozone to Selected Estuarine Species.
APPROACH: A cooperative effort is proposed between the Academy of Natural Sciences of Philadelphia and the University of Maryland to study the ecological effect of residual ozone to selected estuarine species. We propose to determine the toxicity of residual ozone, both lethal and sublethal effects, to selected commercially and/or recreationally important estuarine finfish and shellfish species and their life stages under various environmental conditions. We will also compare the toxicological effects of residual ozone to those residual chlorines which are being determined on the same species and life stages under the same experimental regimes set forth above. Finally, we propose to evaluate the environmental acceptability of ozone as an alternative to chlorine.
PROJECT MILESTONES: Aug 78: Final Report
KEYWORDS: AQUATIC ECOSYSTEMS;OZONE;TOXICITY;AQUATIC ORGANISMS;ENVIRONMENTAL TRANSPORT;ECOLOGICAL CONCENTRATION;CHLORINE;COMPARATIVE EVALUATIONS;FISHES;PATHOGENESIS;BIOLOGICAL EFFECTS

<073121>
TITLE: Susceptibility of Genetically Defined Stock of Fish to Chemical Carcinogens
PROJECT NUMBER: Q-625-F-1-8
PRINCIPAL INVESTIGATOR: Kallman, K.D.
ADDRESS: Broadwalk and West 8th Street, Brooklyn, NY 11224
AFFILIATION: New York Aquarium, Brooklyn (USA). Osborn Labs. of Marine Sciences
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Richards, Norman C.
TYPE OF FUNDING: Grant No.-R805389-01
77 FUNDING: Environmental Protection Agency FY77:$57,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: ORGANICS/Pesticides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coastal regions;HYDROGRAPHIC AREAS/Other hydrographic areas All coastal regions
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The effects of a number of polycyclic aromatic hydrocarbons (PAH) which are significant pollutants in the natural environment, will be studied in genetically defined stocks of fish of Xiphophorus and Rivulus. Many of these compounds are involved in chemical carcinogenesis in mammals.
APPROACH: Our aim is to determine whether strain differences exist in susceptibility to PAH-induced carcinogenesis and whether this can be correlated with the degree of heterozygosity. Some of the genetically defined stocks may become sensitive indicators for certain kinds of pollutants.
RESULTS: The susceptibility of genetically defined stock of fish to chemical carcinogens will be determined.
PROJECT MILESTONES: (1) 9/78 Report Preliminary Screening Data. (2) 9/79 Report on Final Screening of Five Compounds.
KEYWORDS: FISHES;METABOLISM;PESTICIDES;POLYCYCLIC AROMATIC HYDROCARBONS;ENVIRONMENTAL IMPACTS;BIOLOGICAL EFFECTS;CARCINOGENS;GENETIC VARIABILITY;BIOLOGICAL INDICATORS;TOXICITY

<073122>
TITLE: Design of Experiments, Statistical Analyses, and Evaluation of Aquatic Research Data
PROJECT NUMBER: Q-625-A-1-9
PRINCIPAL INVESTIGATOR: Domey, R.G.
ADDRESS: 7703 Floyd Curl Drive, San Antonio, TX 78284
AFFILIATION: Texas Univ., San Antonio (USA). Health Science Center
MONITORING AGENCY: Environmental Protection Agency, Johns Island, S.C. (USA). Bears Bluff Field Station
DIVISION: Bears Bluff Field Station
MONITOR: Davis, William P.
TYPE OF FUNDING: Grant No.-R805007-01
77 FUNDING: Environmental Protection Agency FY77:$45,700
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Consultation on designs of research analysis of aquatic research data, including evaluation and interpretation of research results when required.
APPROACH: The approach is mathematical/statistical accompanied by appropriate graphic representation.
RESULTS: Progress: Certain preliminary pilot statistical programs have been tested and the results are on file at the Gulf Breeze Environmental Research Laboratory, Bears Bluff Field Station, P.O. Box 368, Johns Island, South Carolina. Current plans: Proceed, as required; designs of experiments, further development of methods, data analysis, evaluation and interpretation of results, as needed.
PROJECT MILESTONES: Dec 78: Final Report
KEYWORDS: AQUATIC ECOSYSTEMS;EXPERIMENT PLANNING;MEASURING METHODS;DATA COMPILATION;WATER;ORGANIC NITROGEN COMPOUNDS;STATISTICAL MODELS;EVALUATION;ENVIRONMENT;STATISTICS

<073123>
TITLE: Determine the Species Level Effects of Selected Pesticides and Other Organic Compounds on Marine and Estuarine Organisms
PROJECT NUMBER: Q-714-A-2-1
PRINCIPAL INVESTIGATOR: Hansen, D.
ADDRESS: EPA, Gulf Breeze, FL 32561
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITOR: Lowe, Jack L.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$985,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (50%);CONSERVATION/Improved conversion efficiency (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (50%);ORGANICS/Pesticides (50%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Determine the species level effects of selected pesticides and other organic compounds on marine and estuarine organisms.
APPROACH: The following tasks will meet the objectives of this project: (1) Expose selected marine and estuarine organisms to pesticide-heavy metal combinations. Determine toxicological and physiological effects. Determine rates of pollutant accumulation. Rate of response of organisms to individual pollutants. (2) Expose marine and estuarine planktonic organisms to selected pesticides. Determine toxic concentrations in relation to variations in salinity and temperature. Determine bioaccumulation of pesticide. Determine effects of pesticides on growth characteristics. (3) Expose selected marine and estuarine algae and protozoa species to varying concentrations of toxic organics, such as pesticides, and heavy metal combinations. Determine effects of population dynamics by measuring toxicity growth and productivity. Compare effects of pollutants in combinations with effects of single individual compounds.

(4) Determine, for marine and estuarine organisms commonly utilized in laboratory investigations, the range of environmental parameters optimal for health and survival under unstressed conditions. Environmental parameters to be investigated include temperature, dissolved oxygen, salinity, etc. Determine requirements for culturing, holding and maintaining marine and estuarine organisms. Develop methods of rearing marine and estuarine organisms. Develop methods of rearing marine and estuarine organisms from egg stage to egg stage. (5) Expose selected marine and estuarine organisms to varying concentrations of organic and inorganic
PROJECT MILESTONES: (1) 1976 Research Reports and Publications--Approximately 30-40 reports on the acute and chronic effects of organic and inorganic chemicals on marine and estuarine organisms.
KEYWORDS: PESTICIDES;ORGANIC NITROGEN COMPOUNDS;AQUATIC ORGANISMS;POPULATION DYNAMICS;BIOLOGICAL ACCUMULATION;TOXICITY;METALS;SYNERGISM;BIOLOGICAL EFFECTS;TOLERANCE;AQUACULTURE;CHRONIC INTAKE;PHYSIOLOGY;BIOLOGICAL MODELS;FISHES;CHEMICAL EFFLUENTS

<073124>
TITLE: Detection of Carcinogenicity of Oils in Seawater--Use of Hybrid Fish
PROJECT NUMBER: Q625A-1-11
PRINCIPAL INVESTIGATOR: Humm, D.G.
AFFILIATION: North Carolina Univ., Chapel Hill (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Richards, N.L.
TYPE OF FUNDING: Grant No.-R804650-02
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
PROJECT DESCRIPTION: We have developed and are continuing the testing of a quick, sensitive method of detection of water-born carcinogens using laboratory reared fish, as a part of an overall screening system for carcincgens. We hope to extend the technique to a tissue culture system. Early applications are also planned to include the examination of the kinetics of transmission of carcinogens along naturally occurring food chains.
PROJECT MILESTONES: (1) 05/78 Report on screening method; (2) 12/78 Final report on Validated Bioassay Method; and (3) Final report on method and mechanism.
KEYWORDS: PETROLEUM;CARCINOGENS;SEAWATER;FISHES;BIOLOGICAL INDICATORS;FOOD CHAINS;MONITORING;ENVIRONMENTAL TRANSPORT;METABOLISM;MINERAL CYCLING

<073125>
TITLE: Mathematical Models of Fates of Pollutants in Estuaries
PROJECT NUMBER: Q608C-1-1
PRINCIPAL INVESTIGATOR: O'Connor, D.J.;Jeris, J.S.;Matystik, W.T.;Parley, K.J.
AFFILIATION: Manhattan Coll., New York (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Davies, T.T.
TYPE OF FUNDING: Grant No.-R804563-02
77 FUNDING: Environmental Protection Agency FY77:$136,600
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: The quantification of the inter-relationships among physical, chemical, and biological variables of estuarine systems, including analysis of two-layered estuarine transport, effects on suspended solids and salinity, adsorption/desorption mechanisms for hazardous substances, and food chain implications.
APPROACH: The development of mathematical model characterizing estuarine transport, verifying this model using field data for velocity profiles and salinity and solids distribution.
RESULTS: A model describing estuarine transport has been developed. Specific application will be made to the James River Estuary in order to address Kepone contamination problems.
PROJECT MILESTONES: (1) 09/77 Report on transport of a toxic pesticide in the James River Estuary; (2) 09/78 Report on ecosystem uptake and transport of Kepone (math model); and (3) 06/79 Final report on math model development for pesticide movement.
KEYWORDS: WATER POLLUTION;ENVIRONMENTAL TRANSPORT;ESTUARIES;PESTICIDES;MATHEMATICAL MODELS;UPTAKE;AQUATIC ECOSYSTEMS;SOLIDS;SALINITY;FOOD CHAINS;VIRGINIA

<073126>
TITLE: Role of Sediments in the Storage, Movement and Biological Uptake of Kepone in Estuarine Environments
PROJECT NUMBER: Q608C-1-3
PRINCIPAL INVESTIGATOR: Huggett, R.J.;Nichols, M.;Haven, D.S.
AFFILIATION: Virginia Inst. of Marine Science, Gloucester Point (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Davies, T.T.
TYPE OF FUNDING: Grant No.-R804993-01
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: The program will study the following aspects of Kepone in the James River, Virginia: (1) The distribution of Kepone in bottom sediments of the James will be determined. (2) The routes of sediment transport below Hopewell will be delineated. (3) Major sediment sinks will be located and the rates of sediment deposition at these sites will be determined. The size, location and mobility of the Kepone reservoir in the James can be determined from this information. (4) The effect of varying environmental conditions of pH and salinity on release of Kepone from sediments will be determined. This data will provide estimates of whether Kepone absorbed to sediments is released to the aqueous phase as the sediments are moved downstream into areas of higher pH and salinity. (5) The ability of filter feeding organisms to concentrate Kepone from contaminated sediments will be determined. Data from this study will provide for a determination of the potential hazards which dredging poses to a variety of filter feeding organisms.

PROJECT MILESTONES: (1) 09/77 Distribution of Kepone in James River sediment/biota/water and (2) 09/78 Report on biological and physical processes transporting Kepone.
KEYWORDS: WATER POLLUTION;ESTUARIES;SEDIMENTS;PESTICIDES;ENVIRONMENTAL TRANSPORT;TRANSLOCATION;VIRGINIA;MATHEMATICAL MODELS;SALINITY;PH VALUE;DREDGING;ENVIRONMENTAL IMPACTS;HYDROCARBONS;UPTAKE

<073127>
TITLE: Determination of the Environmental Impact of Several Substitute Chemicals in Agriculturally Affected Wetlands
PROJECT NUMBER: Q608C-1-4
PRINCIPAL INVESTIGATOR: Day, J.W.;Meyers, S.P.;Gambrell, R.P.
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Wilkes, P.C.
TYPE OF FUNDING: Grant No.-R804976-02
77 FUNDING: Environmental Protection Agency FY77:$99,200
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: A study designed to develop a model system approach to analysis of biocide effects, especially those of Guthion and other organophosphorous pesticides, in ecologically diverse localities in South Louisiana. Primary objective is to establish means of alleviating land use conflicts between chemical discharges from agriculture and wetland productivity. Phases of the study involve laboratory analyses of target compound stability under diverse physical, chemical, and microbial conditions and field investigations of organophosphorous chemical behavior, including runoff patterns, breakdown and bioaccumulation in the affected areas. Laboratory studies of the influence of pH, oxidation-reduction conditions, and salinity on the persistence of Guthion in wetland soils are under way. Baseline studies to characterize the community composition of plants, aquatic and benthic animals, and microbial populations at the field sites have been initiated. During the second year, laboratory studies on the effects of controlled physiochemical environments on the fate of the target compound will continue. Field applications of Guthion will be initiated and laboratory and field studies of the effects of the pesticides on community composition and metabolism will be conducted.
PROJECT MILESTONES: 10/79 Final report.
KEYWORDS: PESTICIDES;ORGANIC PHOSPHORUS COMPOUNDS;LOUISIANA;AQUATIC ECOSYSTEMS;ENVIRONMENTAL TRANSPORT;MICROORGANISMS;PLANTS;BASELINE ECOLOGY;AQUATIC ORGANISMS

<073128>
TITLE: Determine Dynamics of Polluted and Unpolluted Estuarine Ecosystems
PROJECT NUMBER: Q608C-10-1
PRINCIPAL INVESTIGATOR: Davies, T.T.
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Davies, T.T.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$97,500
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: Select undisturbed estuary. Identify physical, chemical and biological components of estuary by measuring spatial and temporal characteristics of water quality, flora and fauna. Determine interrelationships among ecosystem components by measuring such parameters as: nutrient cycling, productivity, species diversity, predation, energy flow, etc. For use in mathematical models, formulate coefficients and expressions which represent terms describing the ecosystem processes of natural, unstressed estuaries.
PROJECT MILESTONES: (1) 06/77 Publication of N inlet ecosystem study report and (2) 06/79 Publication of Santa Rosa sound model report.
KEYWORDS: ESTUARIES;BIOLOGICAL MODELS;BASELINE ECOLOGY;MATHEMATICAL MODELS;AQUATIC ECOSYSTEMS

<073129>
TITLE: Determine the Effects of Selected Complex Organic Wastes on Estuarine and Marine Organisms and Ecosystems
PROJECT NUMBER: Q608C-11-1
PRINCIPAL INVESTIGATOR: Walsh, G.;Borthwick, P.
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Develop procedures for sampling and conducting bioassays of complex organic wastes. Account for variations in effluent concentrations in sampling plan.
PROJECT MILESTONES: 06/77 Assessment of available methodology (static and flow-sewage sludge). 06/79 Methods manual.
KEYWORDS: BIOASSAY;HYDROCARBONS;ORGANIC COMPOUNDS;SAMPLING;WATER POLLUTION;AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;SEWAGE SLUDGE;WASTE DISPOSAL;ENVIRONMENTAL TRANSPORT;ENVIRONMENTAL IMPACTS;AQUATIC ORGANISMS

<073130>
TITLE: Dynamics of an Estuary as a Natural Ecosystem
PROJECT NUMBER: G615C-3-1
PRINCIPAL INVESTIGATOR: Vernberg, F.J.;Kitchens, W.
AFFILIATION: South Carolina Univ., Columbia (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Walsh, G.
TYPE OF FUNDING: Grant No.-R804407-01
77 FUNDING: Environmental Protection Agency FY77:$5,400
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: This study consisted of two separate but completely interrelated substudies: (1)

macroecosystem study; and (2) microecosystem study. For purposes of clarity the objectives of each are presented separately, although it is understood that the results of each are interrelated. Macroecosystem: The present study was designed to study the dynamics of a relatively undisturbed marsh-estuarine ecosystem. There are two basic interrelated objectives of this study: (1) to establish baseline data on a undisturbed estuary to provide a scientific basis for comparative studies on the effects of various stresses of pollutants on other estuarine environments; and (2) to develop models of an estuarine ecosystem which would predict the probable effects of environmental perturbation. Microecosystem: The long range objectives of this study were twofold: (1) the prime objective was to develop and test replicate experimental salt marsh units at the microecosystem level as diagnostic tools for the assessment of both long and short term pollution effects on the Spartina alterniflora salt marsh community. (2) Since this study was conducted in conjunction with the ecosystem analysis of North Inlet Estuary, these simulated marshes will be utilized to test, as well as to provide some data relevant to the general overall ecosystem model being constructed for the area.
PROJECT MILESTONES: 02/78 Final report.
KEYWORDS: ESTUARIES;BIOLOGICAL MODELS;AQUATIC ECOSYSTEMS;BASELINE ECOLOGY;ENVIRONMENTAL IMPACTS;MONITORING;DIAGNOSTIC TECHNIQUES

<073131>
TITLE: Effects of Pollutants on Microbial Activities in Estuarine Surface Films
PROJECT NUMBER: Q710A-1-1
PRINCIPAL INVESTIGATOR: Ahearn, D.G.;Cook, W.L.;Abdelal, A.;Crow, S.A.
AFFILIATION: Georgia State Univ., Atlanta (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Bourquin, A.W.
TYPE OF FUNDING: Grant No.-R804477-02
77 FUNDING: Environmental Protection Agency FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Studies of the rates of bioaccumulation and/or degradation of select hydrocarbons, pesticides and chlorinated aromatics by representative surface slick microorganisms are in progress. Minimal mutagenic and inhibitory concentrations of these compounds are being determined for various physiolcgical groups. Attempts are underway to develop assay organisms for the biodetection of potentially harmful chemicals in estuarine waters.
PROJECT MILESTONES: 05/79 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;HYDROCARBONS;PESTICIDES;ORGANIC CHLORINE COMPOUNDS;CHLORINATED ALIPHATIC HYDROCARBONS;AROMATICS;MUTAGENESIS;BIOASSAY;AQUATIC ORGANISMS;BIOLOGICAL ACCUMULATION;ENVIRONMENTAL TRANSPORT;BIOLOGICAL MODELS;ENVIRONMENTAL IMPACTS;WATER POLLUTION

<073132>
TITLE: Determine the Organism and Ecosystem Level Effects of Anti-Fouling Biocides and Disinfectants on Estuarine Organisms and Ecosystems
PROJECT NUMBER: Q714A-1-2
PRINCIPAL INVESTIGATOR: Davis, W.P.;Middaugh, D.;Erickson, S.;Yohum, R.;Crane, A.;Paulk, H.
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$469,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: Expose selected estuarine organisms to various concentrations of antifouling biocides and disinfectants such as chlorine. Determine acute toxicity to important life stages. Determine chronic effects such as behavioral changes, reproductive success, etc., on estuarine organisms. In addition, expose natural estuarine communities to various concentrations of biocides and disinfectants. Determine effects on community composition, rates of development, population dynamics, species, diversity, etc.
PROJECT MILESTONES: 10/76 Report. 09/77 Report. 09/78 Report. 09/79 Report. 09/80 Report.
KEYWORDS: AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;AQUATIC ORGANISMS;BIOLOGICAL FOULING;CHLORINE;DISINFECTANTS;BIOLOGICAL EFFECTS;ENVIRONMENTAL TRANSPORT;CHRONIC INTAKE;CHLORINATION;WATER;COMMUNITIES;POPULATION DYNAMICS;BEHAVIOR;ANIMAL GROWTH;PLANT GROWTH;PESTICIDES

<073133>
TITLE: Determine the Effects of Selected Pesticides and Other Organic Compounds on Marine and Estuarine Ecosystems
PROJECT NUMBER: Q714A-3-1
PRINCIPAL INVESTIGATOR: Garnas, D.
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Garnas, D.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$234,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Develop balanced laboratory ecosystem for use in determining effects of pollutants on estuarine ecosystems. Develop hardware for system. Choose organisms as representative of Gulf Coast area estuaries.
PROJECT MILESTONES: 09/78 Report. 09/79 Report. 09/80 Report. 09/81 Report. 09/82 Report. 09/83 Report.
KEYWORDS: PESTICIDES;AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;ENVIRONMENTAL TRANSPORT;MEASURING INSTRUMENTS;AQUATIC ORGANISMS;PREFERRED SPECIES;ESTUARIES;WATER POLLUTION

<073134>
TITLE: Determine the Pesticide-Microbial Interactions in the Estuarine Environment
PROJECT NUMBER: A714A-4-1
PRINCIPAL INVESTIGATOR: Bourquin, A.
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Isolate naturally occurring estuarine microorganisms. In laboratory, expose to varying concentrations of selected pesticides. Determine pesticide effects on growth rates. Identify degradation products. Expose microorganisms to pesticides in combination with commonly occurring petroleum hydrocarbons. Determine effects on growth rate. Identify pesticide and hydrocarbon breakdown products. Identify, in naturally occurring estuarine oil slicks, microbial degradation and degradation products of pesticides. In addition, incubate selected pesticides in natural seawater, sterile and non-sterile, at varied salinities and temperatures and under light and dark conditions. Determine the effects of these parameters on pesticide degradation rates and products formed.
PROJECT MILESTONES: 09/77 Report. 09/78 Report. 09/79 Report. 09/80 Report.
KEYWORDS: PESTICIDES;ESTUARIES;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;BIOLOGICAL MODELS;ANIMAL GROWTH;MICROORGANISMS;METABOLISM;TOXICITY;BIODEGRADATION;ENVIRONMENTAL TRANSPORT

<073135>
TITLE: Determine Significance of Occurrence in Marine Estuarine Environments of Carcinogenic Compounds, with Emphasis on Organic Compounds
PROJECT NUMBER: Q714A-5-1
PRINCIPAL INVESTIGATOR: Couch, J.A.
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$187,600
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Expose marine and estuarine organisms to infectious pathogen agents in the presence of environmentally occurring chemicals. Determine the effects of chemicals on the pathogenicity of the agents. Expose selected marine and estuarine species to suspected carcinogens, teratogens and mutagens. Determine the relation between chemical oncogenesis and chemical concentrations. Compare results with those obtained for mammals.
PROJECT MILESTONES: 09/77 Report. 09/78 Report. 09/79 Report. 09/80 Report.
KEYWORDS: AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;ESTUARIES;HYDROCARBONS;CARCINOGENS;AQUATIC ORGANISMS;PATHOLOGICAL CHANGES;TERATOGENESIS;CARCINOGENESIS;MUTAGENESIS;MAMMALS;COMPARATIVE EVALUATIONS;BIOLOGICAL EFFECTS;TOXICITY

<073136>
TITLE: Relationship of Virus Occurrence and Environmental Effects to Marine and Estuarine Organism Response to Chlorinated Hydrocarbons (Abbrev.)
PROJECT NUMBER: Q714A-6-1
PRINCIPAL INVESTIGATOR: Couch, J.A.;Schoor, W.;Foss, P.
AFFILIATION: Environmental Protection Agency, Gulf Breeze, Fla. (USA). Environmental Research Lab.
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$140,700
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Relate virus growth and occurrence to exposure of shrimp to chlorinated hydrocarbon pesticides. Determine the biochemical and biological characteristics of the pink shrimp polyhedrous virus. In addition, expose selected estuarine and marine organisms to mirex, related compounds and derivatives of same. Determine ATPase inhibition. Quantify development of antibodies. Determine degree of in vitro reactivation of inhibited enzyme systems. Develop method to relate specific antibody production to mirex levels in animal tissues.
PROJECT MILESTONES: 11/76 Report. 04/78 Report. 09/79 Report. 09/80 Report.
KEYWORDS: VIRUSES;CHLORINATED ALIPHATIC HYDROCARBONS;ORGANIC CHLORINE COMPOUNDS;TISSUES;SHRIMP;TOLERANCE;TOXICITY;BIOCHEMISTRY;AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;ENZYMES;ANTIBODIES;BIOLOGICAL EFFECTS

<073137>
TITLE: Determination of the Site(s) of Action of Selected Pesticides by an Enzymatic-Immunobiological Approach
PROJECT NUMBER: Q615C-6-3
PRINCIPAL INVESTIGATOR: Koch, R.B.
AFFILIATION: Mississippi State Univ., State College (USA)
MONITORING AGENCY: Environmental Protection Agency, Gulf Breeze, Fla. (USA)
DIVISION: Environmental Research Laboratory
MONITOR: Schoor, W.P.
TYPE OF FUNDING: Grant No.-R803458-03
77 FUNDING: Environmental Protection Agency FY77:$37,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
PROJECT DESCRIPTION: Preparation procedures of BSA-Kelevan have been perfected, and samples prepared for use as antigen for rabbit immunization. A preparation high in content of covalently linked Kelevan was used for production of a highly active antibody toward fibrinogen-Kel. The Kelevan active antibody preparation was used in biochemical studies of ATPase inhibition and reactivation using fire ant head and dog brain homogenate fractions. Preliminary results are very promising and show quite definitely that Kepone and DCPD inhibition of ATPase activities is reversible. The kinetics of the reactivation process will be determined, including the mole capacity of the Ig fraction for Kepone and DCPD. Studies will be conducted to determine the relative affinity of the Ig fraction for Kepone compared to the affinity of purified

ATPase for Kepone. The reactivation of Kepone inhibited ATPase activities will be compared for different tissues from a single animal and for the same tissue from different animals. Finally efforts will be initiated to covalently attach antibody to a solid support system.
PROJECT MILESTONES: 02/78 Final report.
KEYWORDS: PESTICIDES;BIOLOGICAL MODELS;AQUATIC ECOSYSTEMS;WATER POLLUTION;ATP-ASE;RABBITS;ENZYMES;IMMUNOLOGY

<074001>
TITLE: Support for the Advisory Center on Toxicology, National Academy of Sciences
PROJECT NUMBER: X629-1
PRINCIPAL INVESTIGATOR: Wands, R.C.;Ulvedal, F.;Pollard, J.P.
AFFILIATION: National Academy of Sciences - National Research Council, Washington, D.C. (USA); Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Deputy Assistant Administrator for Health and Ecological Effects
MONITOR: Ulvedal, F.
77 FUNDING: Environmental Protection Agency FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The Office of Naval Research administers this Interagency Agreement (IAG) with the National Academy of Sciences for the support of the Advisory Center on Toxicology which is funded jointly by EPA and other federal agencies. This IAG provides that the Advisory Center on Toxicology collect, maintain and evaluate toxicology data from all sources, and will upon request provide information and advice on matters involving toxicology based on this data to the EPA's Office of Research and Development.
PROJECT MILESTONES: (1) 01/77 Toxicology and health effects of cadmium. (2) Emergency and continuous exposure limits for ammonia. (3) Emergency exposure limits for carbon dioxide. (4) Emergency exposure limits for ethanol. (5) Emergency exposure limits for hydrogen chloride. (6) 01/78 Guidelines for short-term exposure of the public to air pollutants.
KEYWORDS: HAZARDOUS MATERIALS;TOXICITY;DATA COMPILATION

<074101>
TITLE: The Impact of Coal-Fired Power Plants on the Environment
PROJECT NUMBER: Z-625-A-82
PRINCIPAL INVESTIGATOR: Loucks, O.L.
ADDRESS: 750 University Ave., Board of Regents of the University of Wisconsin System, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA). Center for Biotic Systems
MONITORING AGENCY: Environmental Protection Agency, Duluth, Minn. (USA). Environmental Research Lab.
DIVISION: Environmental Research Laboratory
MONITOR: Glass, G.
TYPE OF FUNDING: Grant No.-R-803971-04
77 FUNDING: Environmental Protection Agency FY77:$339,900
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: TRANSPORTATION (33%);ELECTRICITY GENERATION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: METALS (30%);ORGANICS (30%);SPECIFIED OTHER POLLUTANTS/Sulfur oxides (40%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (20%);FULL SCALE DEMONSTRATION (80%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This proposal requests support to continue investigation of environmental changes due to construction and operation of a coal-fired power generating station, two units 527 megawatts each.
APPROACH: The approach is inter-disciplinary, with discrete sections focused on: Aquatic Invertebrates, Fish, Hydrogeology, Water Use Analysis, Wetlands Ecology, Remote Sensing, Aquatic Chemistry, Hazardous Chemicals in Fish, Assessment of a Cooling System, Plume Chemistry, Visual Changes, Mass Flow and Balance of Water, Air, and Chemicals. Data are available through the Columbia Data Bank, IES, Madison.
RESULTS: Originally research was commenced in 1971 under a grant from three Wisconsin power companies. The third year of the current phase of the project will be completed in July 1978. The site is on the floodplain of the Wisconsin River near Portage, Wisconsin. Primary attention is given to the impact on the aquatic environment. A portion of the study is developing, in concert with the Wisconsin Public Service Commission, the Wisconsin Department of Natural Resources, and three Wisconsin public utilities, criteria for the siting of generating facilities.
PROJECT MILESTONES: (1) 74 Complete base line data gathering-air, water, plants and animals. (2) 3/76 Complete construction impacts of power plant and cooling lake. (3) 12/77 Complete data gathering on short-term impacts of operation. (4) 7/78 Complete draft siting criteria document. (5) 7/78 Complete major reports on all impacts on unit 1. (6) 7/79 Complete data gathering on short-term impacts of unit 2. (7) 7/80 Complete major reports on all impacts of units 1 and 2. (8) 12/80 Complete integrative and evaluation studies of impact.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL IMPACTS;AQUATIC ECOSYSTEMS;WATER REQUIREMENTS;CONSUMPTION RATES;WATER;COOLING SYSTEMS;REMOTE SENSING;BIOLOGICAL EFFECTS;AIR POLLUTION;MATHEMATICAL MODELS;PLANTS;METEOROLOGY;ENVIRONMENTAL TRANSPORT;WATER POLLUTION;CHEMICAL EFFLUENTS;CONSTRUCTION;OPERATION;WATERSHEDS;SITE SELECTION;DATA ACQUISITION

<075901>
TITLE: Ammonia Toxicity to Fishes
PROJECT NUMBER: V619-93
PRINCIPAL INVESTIGATOR: Thurston, R.V.;Russo, R.C.
AFFILIATION: Montana State Univ., Bozeman (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Deputy Assistant Administrator for Energy, Minerals and Industry
MONITOR: Brungs, W.
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
PROJECT DESCRIPTION: The objective of the proposed research is to determine the effect on fishes of exposure to fluctuating ammonia concentrations above the proposed EPA criterion level of 0.01 mg/liter HH3(g). Laboratory bioassays will be carried out employing ammonia concentration fluctuation regimes of two types: (1) diurnal fluctuations, and (2) intermittent fluctuations. The experiments to investigate diurnal fluctuations will involve fluctuations in a pattern simulating the diurnal cycle typical of many wastewater treatment plant discharges; i.e., peaks during mid- and late-day, and a low during the early morning hours. The experiments to determine the effect of intermittent fluctuations, simulating accidental

discharges, will include subjecting test fish for only a few hours or days to doses of ammonia at high concentrations known to be acutely toxic. Test fishes will be rainbow trout and fathead minnows. iological parameters to be measured include mortality/survival, blood ammonia concentrations, tissue egeneration, and fish behavior. Bioassay test methods will closely approximate those recommended by the PA Committee on Methods for Toxicity tests with Aquatic Organisms.
PROJECT MILESTONES: 10/78 Final report.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;AMMONIA;FISHES;TOXICITY;DAILY VARIATIONS;MORTALITY;SURVIVAL TIME

<075902>
TITLE: Technology Assessment of Western Energy Resource Development
PROJECT NUMBER: V6240-1
PRINCIPAL INVESTIGATOR: White, I.L.
AFFILIATION: Oklahoma Univ., Norman (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Deputy Assistant Administrator for Energy, Minerals and Industry
MONITOR: Plotkin, S.
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (34%);NUCLEAR/General (33%);GEOTHERMAL/General (33%)
PROJECT DESCRIPTION: To identify a broad range of desirable and undesirable consequences likely to result from the development of western U.S. energy resources (coal, oil shale, uranium, geothermal, oil, natural gas); to identify, evaluate, and compare policies that will promote desirable consequences and eliminate or reduce undesirable ones; and to identify critical research projects which will enhance the ability of all levels of government to make optimal decisions about future energy development in the West.
APPROACH: The analysis includes a series of impact assessments which examine the physical and social/cultural/economic impacts of development at six sites and the region as a whole. These impact assessments are used, in combination with extensive contacts with decisionmaking and other individuals and groups affected by and concerned with western energy development, to identify critical problems and issues which are then examined in more detail. A critical part of this follow-up analysis is to identify the institutional and political context in which the impacts are evaluated and dealt with, in order to pinpoint situations where the present regulatory, institutional, or political system cannot properly deal with impacts and to identify appropriate solutions to these shortcomings.
RESULTS: A Phase I report (Energy from the West) dealing principally with impact assessment has been published. The remaining work will focus on policy analysis of critical problems and issues, with some effort at expanding the technologies examined and completing some details of the impact assessments.
PROJECT MILESTONES: (1) 03/76 Completion publication of work plan. (2) 08/76 Publication of phase I report, Energy from the West. (3) 03/76 Publication of final impact assessment report. (4) 01/79 Publication of series of policy-oriented final reports.
KEYWORDS: USA;REGIONAL ANALYSIS;ENERGY SOURCES;DECISION MAKING;SOCIO-ECONOMIC FACTORS;COAL;OIL SHALE INDUSTRY;URANIUM;GEOTHERMAL ENERGY;FUEL OILS;NATURAL GAS;FOSSIL FUELS;NUCLEAR POWER PLANTS;OIL WELLS;NATURAL GAS WELLS;ENVIRONMENTAL IMPACTS;FOSSIL-FUEL POWER PLANTS;COMPARATIVE EVALUATIONS;ENERGY POLICY

Energy Research and Development Administration/Argonne National Laboratory

<080001>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals, External Radiation Toxicity. Neutron and Gamma-Ray Toxicity Studies
PROJECT NUMBER: 000101
PRINCIPAL INVESTIGATOR: Thompson, J.F.
ADDRESS: Division of Biological and Medical Research, Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$1,514,000
TECHNOLOGY: NUCLEAR/General (40%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (50%);GENERAL SCIENCE (10%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION/Fission neutron;RADIATION/Cobalt-60 gamma (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:. BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To provide information needed in direct support of radiation risk estimates at low doses for fission and fusion technologies. Studies of relationships between cell killing, alterations in tissue proliferation rates, and the potential for cancer and degenerative diseases also have general relevance to hazard assessment for fossil fuel conversion processes. The data to be obtained on life shortening, cancer, and other diseases in fission neutron- or gamma-irradiated mice will permit predictive models to be formulated whereby health hazards in humans exposed to low doses of low- or high-LET radiations can be predicted. This program supports directly predictions of health hazards due to atmospheric release of radionuclides, alterations in levels of background radiation, occupational exposures sustained during reactor operation or fuel element reprocessing, and medical uses of low- or high-LET radiations.
APPROACH: Populations of laboratory mice are irradiated with fission neutrons or Co-60 gamma radiation in large-scale studies of late effects, viz. life shortening, age-specific rates of cancer and other diseases, and late injury to the immune, vascular, and hematopoietic systems. Dose-response relationships for life shortening and other end points after single neutron doses are established over a range of 5-240 rad, and for gamma doses over the range of 90-788 rad. Dose-response relationships are also established for long-term exposures, at low dose rates, which continue for duration of life, or over 50% to 20% of the control life span of the animals. The experiments focus specifically on radiation doses expected to produce 2 to 20% life shortening so that predictive mathematical models may be formulated to estimate the relative biological effectiveness of neutrons and excess risk at doses relevant to population or occupational exposure levels. Studies of late effects on cell population will increase our understanding of factors important in (radiation) carcinogenesis and other health hazards. A small complementary

experiment with a longer-lived rodent species, the white-footed mouse, exposed to single doses of neutron or gamma radiation, or to gamma radiation for duration of life provides interspecies response information which will assist with the interpretation of results from animal
RESULTS: Dose-response relationships for life shortening, cancer, and other late effects end points will be established accurately and predictive models will be developed so that risk estimates for fission neutrons or gamma radiation may be made with much greater confidence. The results of these experiments are expected to have impact on the setting of exposure standards for low-LET (gamma) and high-LET (fission neutron) radiation. Information obtained from animals irradiated with fission neutrons may also have general relevance to risk estimation for alpha particles from plutonium or other high-LET radiations.
PROJECT MILESTONES: (1) 12/30/76 Final report on shapes of dose-response curves for life shortening and selected tumor production from model experiments. (2) 9/30/78 Publication of final reports on tumor rates from exploratory studies of injury to immune, vascular, and hematopoietic systems. (3) 12/30/77 Interim report on predictive models for low-dose effects.
KEYWORDS: FISSION NEUTRONS;GAMMA RADIATION;BIOLOGICAL RADIATION EFFECTS;MICE;HEALTH HAZARDS;LIFE SPAN;NEOPLASMS;BIOLOGICAL MODELS;DOSE-RESPONSE RELATIONSHIPS;ANIMAL CELLS;RBE;CELL PROLIFERATION;RADIOISOTOPES;AIR POLLUTION;GAMMA RADIATION;DISEASES;IN VIVO

<080002>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals, Carcinogenesis. Modulation and Mechanisms
PROJECT NUMBER: 000102
PRINCIPAL INVESTIGATOR: Fry, R.J.M.
ADDRESS: Division of Biological and Medical Research, Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$475,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (20%);FOSSIL FUEL/Oil Shale (10%);GENERAL SCIENCE (70%)
ENERGY CYCLE: COMBUSTION OR END USE (30%)
POLLUTANTS: METALS/Cadmium;METALS/Beryllium;METALS/Mercury;METALS/Lead (20%);ORGANICS/Aromatic carcinogens (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To understand the mechanisms of tumorigenesis and tumorigenic enhancement in rat liver. (2) Using liver as the model system, to develop the means of detecting tumorigenic enhancers among energy-related pollutants and other environmental contaminants.
APPROACH: Comparisons of liver tumor incidences are made in rats sequentially exposed to a known carcinogen and a putative tumorigenic enhancer. Increases in tumor yield denote enhancers, which are then compared biochemically to uncover molecular indices of enhancement. Regulatory processes in normal liver are also studied as potential sites for the initial neoplastic transformation. Isozyme differences between normal liver, precancerous liver, and liver tumor are studied to detect essential molecular changes associated with neoplasia.
RESULTS: Basic understanding of tumorigenic mechanisms will be increased by molecular studies of enhancer effects, regulation of gene expression, and isozyme comparisons. This will facilitate the development of effective prophylactic and therapeutic anticancer methodology. A method for detecting tumorigenic enhancers will be developed. This will be useful for screening compounds, such as energy-related pollutants, for enhancing activity.
PROJECT MILESTONES: (1) 9/1/76 Initiate studies of cocarcinogen dosage effects on tumor enhancements. (2) 7/1/76 Begin studies of hormonal effects on regulation of liver enzymes in vivo. (3) 7/1/76 Initiate isozyme comparisons between normal and tumor tissue.
KEYWORDS: CANCER;CARCINOGENESIS;RATS;LIVER;ENERGY SOURCES;POLLUTION;CARCINOGENS;NEOPLASMS;MOLECULAR BIOLOGY;BIOCHEMISTRY;BIOLOGICAL EFFECTS;IN VIVO;TISSUES

<080003>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals--Radiation Pathology and Oncology
PROJECT NUMBER: 000103
PRINCIPAL INVESTIGATOR: Finkel, M.P.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$414,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION/Beta (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global;COASTS/Other coasts Global;HYDROGRAPHIC AREAS/Other hydrographic areas Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Provide basic information for evaluating the cancer risk to man from exposure to ionizing radiation. In addition to dose-response information, we must know when, where, and with what absorbed energy the cancer event occurs and whether immune processes are involved.
APPROACH: Mice received injections of a variety of radionuclides under a set of standard conditions to obtain comparative dose-response information on life span and tumor induction. Mice and dogs received Sr-90 under a variety of exposure situations to obtain information relating to dose, dose-rate, latent period, and animal sensitivity in the induction of bone cancer when the physical, biological and temporal parameters of dosage are altered. Bone cancer was induced in mice by other agents (X-ray, Y-90, bone-tumor viruses) and tissue culture techniques are being developed to provide information relevant to radiation oncogenesis.
RESULTS: (1) Ability to estimate the lowest tumor-inducing body-burden of Sr-90 in man on the basis of

information on Sr-90 toxicity in dog along with toxicity of Sr-90 and other radionuclides in mouse. (2) In the induction of bone cancer by radiation in mice, knowledge of (a) how soon after exposure induction occurs, (b) the cell in which the primary event occurs, (c) the amount of energy required, and (3) whether immunity suppresses tumor response.
JECT MILESTONES: (1) Completion of Sr-90 beagle experiment and completion of histopathology. 12/30/77 (2) Perfection of in vitro technique for growing radiation-transformed preosteoblasts from mouse bone marrow. 6/30/78
KEYWORDS: CANCER;IONIZING RADIATIONS;HEALTH HAZARDS;MAN;BIOLOGICAL RADIATION EFFECTS;DOSE-RESPONSE RELATIONSHIPS;MICE;DOGS;STRONTIUM 90;DOSE RATES;BONE TISSUES;NEOPLASMS;YTTRIUM 90;X RADIATION;VIRUSES;CARCINOGENESIS;RADIOINDUCTION;INGESTION;TOXICITY;ANIMALS

<080004>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals; Physiological and Immunclogical Measures in Aging Rodents
PROJECT NUMBER: 000104
PRINCIPAL INVESTIGATOR: Sacher, G.A.
ADDRESS: Division of Biological and Medical Research, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$288,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS: ORGANICS/Hydrocarbons (40%);RADIATION/Ionizing (40%);HEAT, THERMAL/Thermal (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This program is concerned with the effects of environmental pollutants on selected physiological processes including immune response. Specifically the objectives are (1) to determine how environmental pollutants (ionizing radiation, carcinogenic hydrocarbons) affect physiological regulation in rapidly and slowly aging rodents at low-levels of exposure, (2) to correlate physiological responses with disease and mortality and their relationship to excessive survival variability, and (3) to elucidate the functional development of sub-sets of immunologically competent cells and the influence of pollutants thereon.
APPROACH: Indices of physiological response, i.e., temperature, oxygen consumption, muscular activity, to thermal stress and exposure to environmental pollutants are being monitored continuously and the data subjected to time series analysis. This phase of the study utilizes the short-lived ''house'' mouse Mus musculus and the longer-lived Peromyscus leucopus; interesting facets of the latter are its better cellular repair and protection systems relative to Mus and the closer array of spontaneous tumor types to those in man. In the second facet of the program humoral and cell-mediated immunity and their response to carcinogenic pollutant exposure is being assayed in BCF/sub 1/ mice or cultured spleen cells by immunization with sheep red cells or mouse tumor cells. Fluorescent antibody techniques will be employed to assay development of immunocyte subsets.
RESULTS: The results of the low-level exposure study relate directly to the question of inconsistencies betwen low-dose effects and predictions based on high dose data. This program will provide the objective evidence to test the basic hypothesis that many paradoxes originate from non-specific compensatory responses of organisms to disturbance of their physiological equilibrium. Confirmation of the hypothesis will greatly improve the economy and accuracy of low-dose epidemiological studies. Results of the immunological study will establish the sequence of immunological responses during normal development of the immune system and under conditions of stress induced by environmental pollutants.
PROJECT MILESTONES: (1) Carry out joint epidemiological studies to assess effects of changes in energy levels of neuropsychological processes. 12/30/77. (2) Characterize the enhancing and suppessive factors on intracellular effects. 7/1/77. (3) Test of enhancement of the effect of carcinogens on the immune response. 12/30/77. (4) Determine the environmental conditions that increase or depress the energy and activity level of organism. 7/1/77.
KEYWORDS: ENERGY SOURCES;POLLUTION;IMMUNITY;ENVIRONMENTAL EFFECTS;SURVIVAL TIME;METABOLISM;MICE;NEOPLASMS;SPLEEN CELLS;IMMUNE REACTIONS;BIOLOGICAL EFFECTS;AGING;CARCINOGENS;IMMUNOLOGY;IN VIVO;GAMMA RADIATION;ANIMALS

<080005>
TITLE: Detection and Characterization of Damage in Physiological, Cellular and Molecular Systems--Biochemistry
PROJECT NUMBER: 000105
PRINCIPAL INVESTIGATOR: Thomson, J.F.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Isolation of subcellular fractions is an important analytical tool for the study of cellular physiology and biochemistry, particularly when supplemented by correlative morphologic examination. This study is directed in part toward the development and application of methods of density-gradient centrifugation that relate the concentration of cellular components to the size of the particulates with which they are associated, rather than to morphologic labels of doubtful meaning. It is useful to use enzymes or other cellular constituents known to be specifically associated with given organelles as biochemical markers
APPROACH: The procedures developed in this laboratory have been valuable in the comparison of tissues from normal animals and those treated in various ways. They have also been successfully adapted as preparative methods. The basic technique has been to layer a preparation (e.g., a tissue homogenate or a suspension of cells) over a density gradient; after centrifugation, successive fractions are collected and analyzed by

appropriate methods: enzyme assays, microscopic examination, cell counts, chemical composition, etc. Since the average particle size in each fraction can be estimated from a sedimentation equation derived from Stokes' law, the relationship between concentration and particle size can be estimated; we have written computer programs to facilitate the mathematical and statistical analyses of such data. Currently we are carrying out tissue fractionations in zonal centrifuges, which provide much finer resolution than can be obtained by other procedures that involve centrifugation.
RESULTS: Specific projects include (1) isolation and enzymatic characterization of peroxisomes from mouse and rat liver cells, (2) use of H/sub 2/O/D/sub 2/O gradients for subcellular fractionation, (3) age-dependent changes in mitochondrial sedimentability, (4) intracellular distribution of liposome-encapsulated actinomycin D in ascites tumor, liver, spleen, and bone marrow cells, and (5) enzyme activities of mitochondria isolated from hearts of mice exposed to neutron or gamma radiation.
PROJECT MILESTONES: (1) Examine the chemical composition and morphological appearance of liver mitochondria from mice. 9/30/77 (2) Complete measurement of sedimentation chemical composition and examine complement of liver organelles in animals 9/30/78
KEYWORDS: BIOCHEMISTRY;ANIMAL CELLS;PHYSIOLOGY;CENTRIFUGATION;ENZYMES;BIOASSAY;MICROSCOPY;MICE;RATS;LIVER;MITOCHONDRIA;AGE DEPENDENCE;ACTINOMYCIN;SPLEEN;BONE MARROW CELLS;HEART;NEUTRONS;GAMMA RADIATION;BIOLOGICAL RADIATION EFFECTS;ENZYMES;METABOLISM;TISSUES;ANIMALS

<080006>
TITLE: Detection and Characterization of Damage in Physiological; Cellular and Molecular Systems; Biophysics
PROJECT NUMBER: 000106
PRINCIPAL INVESTIGATOR: Danyluk, S.S.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$742,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Mercury;METALS/Cadmium;METALS/Beryllium (30%);ORGANICS/Benzopyrene (50%);RADIATION/Gamma;RADIATION/Neutrons (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: The principal objectives of this program are (1) to determine accurate three-dimensional structures and conformation for immunoglobulins, nucleic acids and drugs in the crystalline and solution states, (2) to relate the unique structural/conformational properties for these biomolecules to their biological function, and (3) develop an understanding of circadian phenomena in terms of moleuclar events. A knowledge of biomolecular chemical and structural properties is the essential starting point for definition of the nature of molecular, cellular, and physiological lesions produced by environmental pollutants.
APPROACH: A combined experimental-theroretical approach is being pursued. Structural/conformational data for biomolecules are being obtained by X-ray diffraction and magnetic resonance techniques. These are supplemented by protein sequencing, synthesis of selectively labeled (H-1, C-13) analogues, and theoretical calculations of biomolecular conformation. For the circadian studies the approach adopted involves measurement of critical enzyme and biogenic amine levels in cellular systems and deep body temperature telemetry in animal systems.
RESULTS: Results of this program will yield fundamental information needed to answer important questions regarding immuncglobulin structure and function; molecular mechanisms of replication and transcription, the interplay of forces determining the specificity of structural and conformational features of biological molecules, and the molecular basis for circadian periodicity in eukaryotes, including man. These results will have a major impact on our understanding of biological function in organisms subjected to environmental stress.
PROJECT MILESTONES: (1) Determination of the first complete 3-D structure for an immunoglobulin (IgG) by X-ray diffraction methods. 6/30/77 (2) The first complete description of conformational rules governing 3-D organization of nucleic acids. 12/31/77 (3) Elucidation of the conformational pathways for nucleotide coenzymes function in an enzyme-coenzyme-substrate system. 6/30/78 (4) Role of diet in resetting of the mammalian biological clock. 9/31/78 (5) Influence of drugs and enzymes on biogenic amine levels and the relationship to circadian rhythms. 7/31/77
KEYWORDS: CIRCADIAN RHYTHMS;IMMUNOGLOBULINS;BIOPHYSICS;NUCLEIC ACIDS;DRUGS;CHEMICAL PROPERTIES;DAILY VARIATIONS;MOLECULES;POLLUTION;BIOLOGICAL EFFECTS;X-RAY DIFFRACTION;AMINES;ENZYMES;MAGNETIC RESONANCE;BIOCHEMISTRY;IMMUNOLOGY

<080007>
TITLE: Genetic Effects--Mammalian Genetics--Genetic Effects of High LET Radiations
PROJECT NUMBER: 000107
PRINCIPAL INVESTIGATOR: Grahn, D.
ADDRESS: Division of Biological and Medical Research, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$124,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (40%)
POLLUTANTS: RADIATION/Alpha radiation;RADIATION/Neutrons;RADIATION/Gamma ray (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The nuclear fuel cycle for the LWR's and proposed LMFBR's involve large quantities of plutonium, small quantities of which might be released to the environment during fuel fabrication, conversion, reprocessing and waste handling, leading to its uptake and retention in the human population. The gonadal retention and distribution will be experimentally studied in animals while concurrent measures of short-term genetic damage will be carried out.

APPROACH: B6CF/sub 1/ hybrid young adult mice will be used and Pu citrate solutions will be injected intravenously at dose levels to yield final gonad burdens that produce about 1 rad/week of alpha irradiation to the total testes tissues. Microdistribution will be studied autoradiographically. Genetic damage will be measured by the dominant lethal mutation rate, frequency of abnormal sperm, changes in testes weight and sperm count, and frequency of translocations induced in spermatogonia. Concurrent single and weekly neutron and gamma ray exposures and continuous gamma irradiation will provide a data-base for full comparative analysis.
RESULTS: The final data will be in the form of a series of dose-response relationships that will permit comparison of LET factors, cell stage sensitivity differences, and dose-rate variables. Appropriate RBE values will be derived and the importance of the heterogeneity of tissue distribution in the gonad to the derived dose-response equations will be evaluated.
PROJECT MILESTONES: (1) First dose-response comparisons for long term exposure to gamma rays and plutonium. 7/1/77. (2) Development of matrix of response data for neutrons, gamma rays and plutonium alpha particles for dominant lethal mutation rate 1/1/78.
KEYWORDS: LET;NUCLEAR FUELS;FUEL CYCLE;REACTORS;PLUTONIUM;FUEL FABRICATION PLANTS;REPROCESSING;ENVIRONMENTAL EFFECTS;GONADS;GENETICS;MICE;TISSUE DISTRIBUTION;ALPHA PARTICLES;SPERMATOZOA;NEUTRONS;GAMMA RADIATION;RBE;BIOLOGICAL RADIATION EFFECTS;DOSE-RESPONSE RELATIONSHIPS;IN VIVO;MUTATIONS;PLUTONIUM;ANIMAL BREEDING;ANIMALS

<080008>
TITLE: Genetic Effects--Molecular and Radiation Genetics
PROJECT NUMBER: 000108
PRINCIPAL INVESTIGATOR: Kubitschek, H.E.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$257,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (30%);GENERAL SCIENCE (40%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS/Carcinogens and mutagens (50%);RADIATION/Radioisotopes;RADIATION/UV and X-radiation (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study the production and mechanisms of action of lethal, mutagenic and carcinogenic lesions produced in DNA by radioisotopes, chemical agents, and environmental pollutants. Mutagenesis by cellular repair mechanisms is being tested as a model system for carcinogenesis. I-125 is under examination as a possible antineoplastic agent.
APPROACH: Genetic lesions are studied at the chemical and molecular levels in bacteria and bacteriophage. Possible antineoplastic effects are studied in tissue culture cells and in mice.
RESULTS: Results expected are the correlation of specific lethal and mutagenic effects with particular molecular alterations in DNA, as well as with the involvement of particular error prone genetic repair systems; also expect to test feasibility of I-125 as an antineoplastic agent.
PROJECT MILESTONES: (1) Conclusive observation of UV-induction of multiple clustered mutations in bacterium E. coli 12/1/77. (2) Induction of multiple clustered mutations by other strong mutagens 9/30/78. (3) Demonstration of multiple mutations in the Ames' tester bacterial strains developed to test for cancerogenic mutagens 9/30/77. (4) Nature of the repair mechanism for /sup 125/I-induced DNA lesions 9/30/78. (5) Quantitative measurement of the efficacy of /sup 125/I-decay in killing tumor cells after ingestion of liposomes containing this isotope 7/1/77.
KEYWORDS: GENETICS;DNA;MUTATIONS;DRUGS;POLLUTION;RADIOISOTOPES;MUTAGENESIS;CARCINOGENESIS;IODINE 125;BACTERIA;BACTERIOPHAGES;MICE;ANIMAL CELLS;BIOLOGICAL REPAIR;BIOLOGICAL EFFECTS;BIOLOGICAL RADIATION EFFECTS;CARCINOGENS

<080009>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals, Radiation Toxicity in Dogs
PROJECT NUMBER: 000109
PRINCIPAL INVESTIGATOR: Fritz, J.
ADDRESS: Argonne National Laboratory, Building 202, 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$1,200,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the mortality rates, and clinical, biochemical, and pathologic responses of beagle dogs subjected to continuous irradiation of the whole body at one of a number of daily exposure rates that allow for survival times approaching those of unirradiated controls. The results are used in interspecies comparisons of responses aimed at developing rational models of mechanisms of radiation-induced injury that will allow for extrapolations to effects to be expected in exposed populations of humans.
ROACH: Dogs are caged in special facilities containing Co-60 gamma-ray sources in such a manner that they are irradiated continuously, at one of 7 exposure rates ranging from 0.4 to 35 R/day, for 22 hours each day. Young adult beagles of both sexes are irradiated either (a) for duration of life, or (b) until they have accumulated total exposures ranging from 600-4000 R delivered at one of the available exposure rates ranging from 5-35 R/day. Pregnant beagles are similarly irradiated from conception to parturition to determine the effects on the developing fetus, and especially on the reproductive capacities of dogs irradiated while in utero.
RESULTS: The data will define the relative importance of total dose and dose rate to the radiation induced

responses of the dog. Causes of death are expected to be highly correlated with daily dose rate, and these relationships will be identified. The most sensitive indicator of radiation-induced damage concerns interference with normal reproduction. The daily dose rate that allows for continued reproduction, and perpetuation of the species, will be determined.
PROJECT MILESTONES: (1) Complete duration of life exposure to dogs at 5-35 R/day 12/30/76. (2) Completed new gamma-ray exposure facility and begin irradiation of dogs at rates of 0.4-2.5 R/day 3/30/76.
KEYWORDS: CANCER;COBALT 60;GAMMA RADIATION;EXTERNAL IRRADIATION;CHRONIC IRRADIATION;LOW DOSE IRRADIATION;WHOLE-BODY IRRADIATION;BEAGLES;DELAYED RADIATION EFFECTS;REPRODUCTION;MORTALITY;DOSE RATES;SURVIVAL TIME;IN VIVO;TOXICITY;ANIMALS

<080010>
TITLE: Combating Detrimental Effects, Therapy of Poisoning by Radioactive and Nonradioactive Metals
PROJECT NUMBER: 000110
PRINCIPAL INVESTIGATOR: Lindenbaum, A.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$81,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/Fission Breeders (60%);GENERAL SCIENCE (20%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (40%)
POLLUTANTS: METALS/Trace (10%);PARTICULATES/Heavy metal compounds (10%);RADIATION/Actinide metals (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Decorporation of toxic metals, with major emphasis on plutonium-239. This work includes: (1) relationships between physicochemical properties of metal compounds and their deposition sites, duration of retention, and pathological effects; (2) utilization of such information to develop decorporation procedures; (3) development of appropriate methodology to facilitate these objectives. Both in vitro studies of mammalian organs and in vivo studies are carried out in rodents and dogs. Experiments are designed to allow extrapolation of results toward man. Most experiments are short-term (less than 6 months) and utilize sub-microgram quantities of metals.
APPROACH: Knowledge of specific deposition sites in tissues of a hazardous metal like plutonium allows selection of appropriate agents and procedures for decorporation. Potentially useful therapeutic agents are tested in mice or rats. If successful in the rodent, critical metal distribution or decorporation experiments are repeated with dogs. If therapeutic promise is confirmed for both rodent (mainly mice) and dog the substances and/or procedures are then evaluated for clinical use in human patients. The main target organs are the skeleton and liver.
RESULTS: Studies in experimental animals are designed to apply to man. The specific population aimed at is the production worker in a nuclear fuel fabrication or reprocessing facility who may become accidentally contaminated with actinides or lanthanides. However, the procedures developed could be used for any member of the human population similarly contaminated.
PROJECT MILESTONES: (1) Completion of the radioisographic studies outlining mineral distribution of plutonium isotopes in animal studies 12/30/77. (2) Demonstration of usefulness of pyran copolymer analogs for decorporation of Pu 12/30/76.
KEYWORDS: AIR POLLUTION;LAND POLLUTION;METALS;ACTINIDE COMPOUNDS;HEALTH HAZARDS;BIOLOGICAL REPAIR;BIOLOGICAL EFFECTS;RATS;DOGS;MAN;PLUTONIUM ISOTOPES;METABOLISM;TOXICITY;PATHOLOGICAL CHANGES;THERAPY;PYRANS;BIOCHEMICAL REACTION KINETICS;ANIMALS;INGESTION

<080012>
TITLE: Effects of Energy-Related Pollutants on Humans Exposed to Radionuclide Intake
PROJECT NUMBER: 000302
PRINCIPAL INVESTIGATOR: Stehney, A.F.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$2,450,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
POLLUTANTS: RADIATION/Internal emitters (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the long-term effects of radium and other internal emitters in humans.
APPROACH: Epidemiological study of human beings who have been occupationally or iatrogenically exposed to intake of radium. Medical and dosimetric data are obtained by the study of living persons and of autopsy material. The principal end-points are neoplasms and pathologic changes in bone. Whole body counting (in vivo), radiochemistry and microscopic measurements are employed.
RESULTS: To identify diseases associated with internally deposited radium in humans and to determine quantitative relationships between dose and effect.
PROJECT MILESTONES: (1) Quantitative evaluation of the incidence of bone sarcomas and head carcinomas as a function of dose for radium cases (Jan. 1977). (2) Completion of a pilot study of the birth characteristics of offspring of female radium-dial workers (July 1977). (3) Completion of the first comprehensive study of mortality and morbidity of radium-dial workers (Jan. 1978). (4) Completion of pilot studies of mortality and morbidity of 4500 thorium industry workers (July 1979).
KEYWORDS: RADIUM;TOXICITY;MAN;EPIDEMIOLOGY;DOSIMETRY;NEOPLASMS;RADIOINDUCTION;SKELETON;PATHOLOGICAL CHANGES;WHOLE-BODY COUNTING;METABOLISM;RADIOISOTOPES;MAN

<080013>
TITLE: Characteristics, Transport and Conversion of Energy-Related Pollutants in the Environment: Great Lakes, Fate of Pollutants Related to Energy Conversion
JECT NUMBER: 000501
NCIPAL INVESTIGATOR: Edgington, D.N.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Forster, William
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W-31-109-Eng-38 Suppl. 18
77 FUNDING: Energy Research and Development Administration FY77:$420,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (25%)
POLLUTANTS: METALS/All (50%);SPECIFIED OTHER POLLUTANTS/Plutonium (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes
PROJECT DESCRIPTION: The general objective is to provide the knowledge needed to assess the geochemical behavior of toxic and radioactive materials related to energy production, conversion, etc. in aquatic ecosystems such as the Great Lakes. Specific nuclear and non-nuclear objectives include source terms, sediment-water interactions, chemical speciation, potential long-term accumulation in water, and eventual removal or fate.
APPROACH: The two sub-programs are highly interdependent in that results from either one are essential for a total understanding of the geochemical processes occurring in the Great Lakes. Most of the field sampling work will be conducted in Lake Michigan; in order to verify hypotheses and models, studies will be conducted in the other lakes as necessary.
RESULTS: These studies will provide an essential experimental and theoretical base for the meaningful assessment of the environmental impact of energy-related activities on the Great Lakes. The results of this project will be closely coordinated with biological effects and transport studies.
PROJECT MILESTONES: (1) Report on the seasonal variability in plutonium concentration in Lake Michigan water and its relation to turbulent sediment resuspension and ion exchange processes in the lake January 1977. (2) Progress report on speciation of selected potentially toxic trace elements in Lake Michigan and their biological availability September 1977. (3) An Annual Report will be issued each year containing a summary to date of the work of this project.
KEYWORDS: GREAT LAKES;POLLUTION;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;BIOGEOCHEMISTRY;HYDRODYNAMICS;HUMAN POPULATIONS;LAKE MICHIGAN;FUNCTIONAL MODELS;WIND;VELOCITY;FOSSIL FUELS;FOOD CHAINS;AQUATIC ECOSYSTEMS;TOXICITY;TRACE AMOUNTS;METEOROLOGY;WATER;ENVIRONMENTAL TRANSPORT;INVERTEBRATES;EMISSION

<080014>
TITLE: Environmental Effects of Energy-Related Processes and Pollutants on the Environment: Great Lakes, Effects of Pollutants on Biota
PROJECT NUMBER: 000502
PRINCIPAL INVESTIGATOR: Wahlgren, M.A.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Sanders, George W.
TELEPHONE: F233-5548
TYPE OF FUNDING: Contract No.-W-31-109-Eng-38 Suppl. 18;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$325,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/Cadmium;METALS/Arsenic (60%);ORGANICS/Chlorinated hydrocarbons (10%);HEAT, THERMAL/Discharge effects (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The general objective is to provide the knowledge required to assess the ecological effects of potentially toxic materials related to energy production and conversion on the Great Lakes ecosystems. Specific problems to be evaluated include: effects of arsenic and cadmium on populations and communities; effects on trophic relationships; and the role of functional groups in the transfer of toxic materials within the system and to man. Communities of interest include plankton, benthos and fish.
APPROACH: Each part of the program addresses potentially significant impacts on a major aquatic community and the functional roles of these communities in the transport of energy-related pollutants. The approach is to unify sub-programs by maximizing coordinated studies and minimizing the number of stress factors to be studied at one time. Complementary lab and field studies will evaluate potential effects and determine actual effects based on existing concentrations (dose-response relationships).
RESULTS: The program will identify serious existing and potential pollutants resulting from or interacting with energy-related effluents and develop predictive capabilities useful in assessing the environmental effects of energy technologies.
PROJECT MILESTONES: (1) September, 1977, 1978 Progress reports and publications on biological activity and effects of selected pollutants in Great Lakes biota. (2) Development of appropriate methodologies to determine physiological and behavioral effects and biological cycling of pollutants in biota.
KEYWORDS: GREAT LAKES;RADIOACTIVE WASTES;POLLUTION;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;NUCLEAR ENERGY;BIOGEOCHEMISTRY;HYDRODYNAMICS;LAKE MICHIGAN;FUNCTIONAL MODELS;WATER QUALITY;MATHEMATICAL MODELS;RADIOISOTOPES;HUMAN POPULATIONS;ENVIRONMENTAL TRANSPORT;INVERTEBRATES;METEOROLOGY;PLUTONIUM

<080015>
TITLE: Carbon-14 Assays in the Stratosphere and Krypton-85 Monitoring at Savannah River
JECT NUMBER: ERDA 510
NCIPAL INVESTIGATOR: Gray, J. Jr.
ADDRESS: 9700 S. Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert W.
TELEPHONE: F233-3764

TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: C-14 assays provide a data base used by NOAA meteorologists to study and model the carbon dioxide cycle in the atmosphere. The large stratospheric injections of C-14 resulting from the detonation of nuclear devices have provided an opportunity to trace the circulation, mixing and diffusion of CO/sub 2/. Previous experiments established that >99% of C-14 is present as CO/sub 2/ and, thus, excess CO-14/sub 2/ (measured concentration minus pre-bomb background) can be used as a quantitative tracer of CO/sub 2/ in the atmosphere. The purpose of the Kr-85 assays at the Savannah River site is to obtain a data base for use by Savannah River and NOAA meteorologists to develop models of air mass movements in the area. When irradiated fuel is processed, the fission product krypton (Kr-85) is released to the atmosphere, providing an ideal tracer.
APPROACH: A light-weight CO/sub 2/ collection apparatus employing molecular-sieve material as the adsorbent is used for sampling at a number of altitudes and latitudes. The sieve material is shipped to ANL in stainless steel canisters where the CO/sub 2/ is removed, purified and assayed for C-14 concentration. Krypton samples are collected at ground level using cryogenic collection apparatus. Sample canisters are shipped to ANL where the krypton is recovered, purified and assayed. The canister is returned to the field for reuse. There are thirteen collection units deployed around the site at distances ranging from 5 to 100 miles.
RESULTS: It is expected that the /sup 14/C assay will continue at the current levels of about three per month in FY 1977 and FY 1978. The /sup 85/Kr program is presently scheduled for completion at the end of FY 1977. If, because of the success of this program it is decided to continue the monitoring through FY 1978, we will continue to provide the analytical capability. However, if this program is not extended, then it is proposed that the previous research program to study the properties of molecular-sieve materials be re-established and expanded in FY 1978. Since the molecular-sieve and cryogenic systems collect many chemical species of great interest to meteorologists, environmentalists and atmospheric chemists, it is proposed that the product canisters from both systems be carefully evaluated for their potential for furnishing many more diverse and valuable data relating to stratospheric trace gases in addition to the /sup 14/CO/sub 2/ information.
PROJECT MILESTONES: Annual reports on C-14 assays are submitted to NOAA. Monthly reports on Kr-85 assays are sent tc Savannah River and NOAA.
KEYWORDS: CARBON DIOXIDE;DIFFUSION;STRATOSPHERE;CARBON 14;TRACER TECHNIQUES;SAVANNAH RIVER PLANT;EARTH ATMOSPHERE;KRYPTON 85;METEOROLOGY;PLUMES;EARTH ATMOSPHERE;EMISSION

<080016>
TITLE: Fundamental Environmental Processes Related to Energy, MAP3S Boundary Layer Investigations
PROJECT NUMBER: 000543
PRINCIPAL INVESTIGATOR: Frenzen, P.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$340,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS/Atmospheric (40%);PARTICULATES/Atmospheric (40%);HEAT, THERMAL/In and to the air (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The Multi-state Atmospheric Power Production Pollution Study (MAP/sup 3/S) of ERDA/DBER has the goal of developing an improved capability for the regional assessment of longer-term, average effects of pollutants emitted by conversion and combustion of fossil fuels. In order to achieve this goal, advanced numerical models involving improved parameterizations of atmospheric transport and removal processes will be developed.
APPROACH: A series of investigations of the structure and behavior of the Planetary Boundary Layer employs advanced remote-probing techniques and high-resolution sounding methods. Supporting micrometeorological studies evaluate the relevant surface fluxes required for parameterization of the efficiency of mixing in the atmosphere, and of the rate of removal of pollutants at the surface. Improvements are incorporated in numerical models, accordingly.
RESULTS: Improved numerical models capable of assessing those effects on the atmospheric environment that are caused by the transport, deposition and dispersion of pollutant materials carried over mesoscale and regional distances.
PROJECT MILESTONES: (1) Accomplishment of an extended 1976 field program, by 1 December 1976. (2) Completion of tracer feasibility tests by 1 March 1977. (3) Development of a preliminary grid model incorporating improved descriptions of atmospheric transport, transformation, and removal, by 1 June 1977. (4) Completion of the 1977 field program by 1 November 1977.
KEYWORDS: EARTH ATMOSPHERE;BOUNDARY LAYERS;THERMAL POWER PLANTS;AIR POLLUTION;MATHEMATICAL MODELS;DIFFUSION;AEROSOLS;METEOROLOGY;PLUMES;SULFUR COMPOUNDS;ENVIRONMENTAL TRANSPORT

<080017>
TITLE: Effects of Sulfur Oxides on Crop Plants
PROJECT NUMBER: 000601
PRINCIPAL INVESTIGATOR: Miller, J.E.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Energy Research and Development Administration FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
RGY CYCLE: COMBUSTION OR END USE (100%)
LUTANTS: NOXIOUS GAS/Sulphur dioxide (100%)
___RACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Three areas of study concerning sulfur oxide effects on crops are (1) interaction between sulfur oxides and other environmental parameters, (2) varietal differences in sulfur oxide resistance to damage, and (3) estimation of sulfur oxide effects under actual field conditions. Overall objective is to determine subtle effects of ambient low-level concentrations and expected increases in sulfur oxides due to combustion and conversion of fossil fuels. A combined field-controlled environment experimental approach is being used. Significant results obtained in growth chamber experiments will be tested under actual field conditions.
APPROACH: A combination of controlled experiments (growth chambers) and in situ (field) studies. Parameters (effects) of interest are photosynthesis and growth, uptake and biotransformation of pollutants, and varietal sensitivity.
RESULTS: (1) Description of chronic effects, dose-response relationships and mechanisms of toxicity of sulfur oxides on important crop plants. (2) Predictive capability, given increases in sulfur oxide emissions and ambient air concentrations.
PROJECT MILESTONES: (1) Construction and testing of zonal fumigation system and programmable controlled environment chambers. (2) Uptake and effects of SO2 on field-grown soybeans. (3) Accumulation and physiological effects of SO2 on chamber-grown plants. (4) Interaction of soil nutrients, climate,and incidence of disease with exposure to SO2.
KEYWORDS: SULFUR OXIDES;AIR POLLUTION;ENVIRONMENTAL EFFECTS;TERRESTRIAL ECOSYSTEMS;SOYBEANS;PLANT GROWTH;TOXICITY;EARTH ATMOSPHERE;SULFUR COMPOUNDS;SOILS;PHOTOSYNTHESIS;PLANT DISEASES;UPTAKE;BIOLOGICAL ACCUMULATION;GENETIC VARIABILITY;COMBUSTION PRODUCTS;FOSSIL FUELS

<080018>
TITLE: Fish Impingement at Power Plant Water Intakes
PROJECT NUMBER: 000674
PRINCIPAL INVESTIGATOR: Spigarelli, S.A.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-W-31-109-Eng-38 Suppl. 18
77 FUNDING: Energy Research and Development Administration FY77:$255,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Physical impacts of plant structure (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) To determine the relationships between plant design, operation and environmental factors most influential in fish impingement. (2) To develop, test, and verify models for predicting impingement at water intakes. (3) To assess the significance and acceptability of impingement losses in a regional or ecosystem context.
APPROACH: Anticipated Program for FY 1977. During FY 1977, the information developed during the last two years will be used to develop perspectives regarding significance and acceptability of the fish impingement losses on a regional basis. From available data, fish losses at water intakes per unit volume of water screened will be estimated and losses for the whole lake on the basis of total water withdrawn from the lake will be projected. Significance and/or acceptability of these losses for two or three important species will be evaluated in the context of Lake Michigan fish, sport and commercial fisheries, and socio-economic applications. The various parts of the program follow.
RESULTS: Final report of the project will contain a comprehensive discussion of the fish impingement problem in a generic and regional context, an assessment of the significance of the problem on a lake wide basis, and guidelines for siting design and operation of intake structures on the lake.
PROJECT MILESTONES: Analysis of available data and identification of important variables-September, 1976. Assessment of impacts-September, 1977.
KEYWORDS: GREAT LAKES;THERMAL POLLUTION;WATER POLLUTION;ENVIRONMENTAL EFFECTS;NUCLEAR ENERGY;NUCLEAR POWER PLANTS;FOSSIL-FUEL POWER PLANTS;LAND RECLAMATION;FISHES;TEMPERATURE EFFECTS;PHYSIOLOGY;IMPINGEMENT;AQUATIC ECOSYSTEMS;THERMAL EFFLUENTS;METEOROLOGY;PLUMES;COOLING SYSTEMS

<080019>
TITLE: Radiological and Chemical Physics--Molecular Radiation Physics
PROJECT NUMBER: 000701
PRINCIPAL INVESTIGATOR: Inokuti, M.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$340,000
TECHNOLOGY: NUCLEAR/General (50%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (35%);NUCLEAR/Fusion Magnetic;NUCLEAR/Fusion Laser (10%);GENERAL SCIENCE (5%)
RGY CYCLE: TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (10%);WASTE MANAGEMENT (10%)
LUTANTS:
RADIATION/Ultraviolet;RADIATION/X-rays;RADIATION/Gamma-rays;RADIATION/Electrons;RADIATION/Protons;RADIATIO /And alpha particles (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This activity is primarily aimed at extending our knowledge of elementary, molecular processes which take place at the earliest stages of radiation actions on any molecular substance

including the biological cell and which specifically involve electronic excitation and ionization. Elucidation of those processes is an essential prerequisite to sound and detailed modeling of subsequent chemical reactions and of biological changes brought forth by ionizing radiations in general. A secondary objective is to contribute to development of advanced instrumentation for radiation dosimetry.
APPROACH: Methods of research include both laboratory experiments and theoretical-physics techniques.
RESULTS: The project will generate comprehensive data on the excitation and ionization processes of diverse molecules by energetic agencies (including photons, electrons, and other charged particles), and on the properties of initial products such as excited species, radicals, ions, and secondary electrons. The resulting data will be applied to interpretation and prediction of various phenomena in radiation chemistry and biology.
PROJECT MILESTONES: By the end of each calendar year, an Annual Report will be issued to give a comprehensive account of the progress made in the concluded fiscal year, and about a dozen major journal articles will have been published. By the end of September 1977, application of the data to interpretation and prediction of various phenomena in radiaion chemistry and biology will be stepped up markedly.
KEYWORDS: PHOTONS;ELECTRONS;CHARGED PARTICLES;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL MATERIALS;MOLECULES;BIOPHYSICS;RADICALS;IONIZATION;EXCITATION;GAMMA RADIATION;ULTRAVIOLET RADIATION;X RADIATION

<080021>
TITLE: Assessment of Health Effects of Energy Systems, Analysis and Evaluation of the Biomedical Costs of Energy Production
PROJECT NUMBER: 000811
PRINCIPAL INVESTIGATOR: Grahn, D.
ADDRESS: Division of Biological and Medical Research Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$140,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Sulfates;NOXIOUS GAS/Polycyclic hydrocarbons (20%);METALS/Trace elements: cadmium;METALS/Beryllium;METALS/Mercury;METALS/Arsenic (20%);PARTICULATES/Fly ash;PARTICULATES/Metals (20%);ORGANICS/Benzpyrene;ORGANICS/Other polycyclics (20%);RADIATION/Gamma;RADIATION/Beta;RADIATION/Alpha radiations (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Causes of death in man are sensitive to socio-economic, cultural, occupational and general environmental pollutant variables. This project is therefore designed to identify the contribution of each factor to the age and cause of death, to quantify its effect and to develop predictive models for impact analysis of energy facility sites and regions of resource development. The models should permit reevaluation of other cause-effect studies of air pollution and human health and the development of a rational cost-benefit analysis of health effects vs. effluent control technology.
APPROACH: The study will utilize existing data bases such as the U.S. vital statistics, census data, commercial and industrial activity data. Standard methods of demographic and life-table analysis will be employed to isolate specific relationships between health effects and socio-economic, etc., factors. The methods of multiple regression and factor analysis will also be employed. Wherever possible we will use data-bases existing in our own and other ERDA facilities.
RESULTS: The predictive models should permit the description of the health status of any population, given a set of economic, social, occupational, cultural and demographic conditions. Variations in health status that might accompany local or regional developments in energy resource utilization, energy facility, siting effluent or pollution level changes, or the myriad of population character changes that occur as economic bases change, can be predetermined so that local and regional governments can make preparations.
PROJECT MILESTONES: (1) Establish data bases and develop first relationships among factors for a test-set of 15 energy facility sites September 30, 1977. (2) Development of first testable model describing inter-relations of health status and socio-economic and other variables September 30, 1978. (3) Development of mortality models and incorporation into the analysis September 30, 1979.
KEYWORDS: ENERGY;HEALTH HAZARDS;AIR POLLUTION;SOCIO-ECONOMIC FACTORS;MAN;BIOLOGICAL MODELS;POLLUTION REGULATIONS;AIR POLLUTION ABATEMENT;COST BENEFIT ANALYSIS;DATA ACQUISITION SYSTEMS;MATHEMATICAL MODELS;SITE SELECTION;PLANNING;FORECASTING;CHEMICAL EFFLUENTS;RADIOACTIVE EFFLUENTS;EPIDEMIOLOGY;POPULATION DYNAMICS

<080022>
TITLE: Social Costs of Energy Supply Systems
PROJECT NUMBER: 000812
PRINCIPAL INVESTIGATOR: Hub, K.A.
ADDRESS: 9700 South Cass Ave, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.
TELEPHONE: F233-3631
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (60%);TRANSPORTATION (20%);STORAGE (10%);PROCESSING, CONVERSION (10%)
POLLUTANTS: NOXIOUS GAS (15%);METALS (15%);PARTICULATES (15%);ORGANICS (15%);NOISE, VIBRATION (15%);HEAT, THERMAL (15%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To assess the social costs of energy supply systems; gas, oil, and electrical supply systems are included.
APPROACH: The study uses a unified approach whereby the energy systems are characterized, impacts defined, and costs estimated; this is carried out uniformly for alternatives studied. Information is gathered from existing studies and reports in the public literature.
RESULTS: Reports showing the costs (broken down) for alternatives (gas supply systems, first) on a regional basis.
PROJECT MILESTONES: Report, assessment of social costs for gas supply systems 9/30/77.
KEYWORDS: ENERGY;SOCIOLOGY;COST BENEFIT ANALYSIS;NATURAL GAS INDUSTRY;PETROLEUM INDUSTRY;ELECTRIC POWER;POWER GENERATION;DATA ACQUISITION

<080023>
TITLE: Land and Fresh Water Environmental Sciences, National Environmental Research Park
PROJECT NUMBER: 000909
PRINCIPAL INVESTIGATOR: Sprugel, D.G.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterburg, Charles L.
TELEPHONE: F233-4208
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this program is to develop a National Environmental Research Park in the midwest region to provide facilities to enable environmental research to be carried out in order to achieve national environmental goals. These lands will be used for both baseline studies and environmental manipulation to permit comparisons of stressed and unstressed ecosystems. Since the Great Lakes are an important resource, these fresh water impoundments will also be included.
APPROACH: Since ANL has only small land holdings of at best limited ecological interest, the ANL/NERP will be an ''archipelago'' of several discrete areas of facilities which, taken together, will represent each of the important ecosystems and energy-effluent impacted environments in the midwest. Since this region borders on the upper Great Lakes and includes many of their watersheds, active consideration is being given to including these critically important freshwater impoundments in the NERP.
RESULTS: A proposal to set up and manage a midwestern National Environmental Research Park.
PROJECT MILESTONES: (1) A preliminary assessment of State and Federal lands available for inclusion in the NERP will be completed (July 1976). (2) An Annual Report will be prepared each year on the activities of the NERP.
KEYWORDS: RESEARCH PARKS;ENVIRONMENT;ECOSYSTEMS;RESEARCH PROGRAMS;BIOLOGICAL STRESS

<080024>
TITLE: Follow Up Assessment of Previously Mined Areas in Northern Great Plains, Southwest, and Midwest Coal Fields
PROJECT NUMBER: 004003
PRINCIPAL INVESTIGATOR: Buffington
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: COAL INDUSTRY;COAL MINES;COAL RESERVES;ECONOMICS

<080025>
TITLE: Land and Fresh Water Environmental Sciences, Behavior of Transuranic Elements in Natural Waters
PROJECT NUMBER: 001293
PRINCIPAL INVESTIGATOR: Alberts, J.J.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$108,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Transuranic elements (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Other hydrographic areas Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this program is to define the physiochemical properties of transuranium elements in natural waters, so that a reliable prediction of their fate and transport may be made if further environmental inputs occur.
APPROACH: Combinations of ultrafiltration and ion-exchange technique will be used to determine the chemical speciation of the transuranic elements in the water column. The nature of the complex formation and distribution coefficients relative to various components of the natural system will be defined using tracers. Differential extraction technique will be used to define association of these elements with the different solids in particulates and sediments.
RESULTS: It is anticipated that as a result of this research it will be possible to better predict the chemical form, association, transport and fate of transuranic elements released to the environment.
PROJECT MILESTONES: The determination of the physicochemical speciation of transuranic elements in surface

waters characteristic of the major climatic zones and extreme limnological character will be completed by September 1978. The elucidation of the major solid phases which control the equilibrium concentration of transuranic elements in the Lake Michigan water columns and rates of remobilization back to the water from the sediments will also be completed by September 1978.
KEYWORDS: PLUTONIUM;BIOGEOCHEMISTRY;GREAT LAKES;RADIOACTIVITY;PHYSICAL PROPERTIES;AMERICIUM;RADIONUCLIDE MIGRATION;WATER;TRANSURANIUM ELEMENTS;CHEMICAL PROPERTIES

<080026>
TITLE: Fundamental Environmental Processes Related to Energy, Coastal and Off-Shore Siting
PROJECT NUMBER: 001294
PRINCIPAL INVESTIGATOR: Frenzen, P.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.
TELEPHONE: F233-3763
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS/Atmospheric (30%);PARTICULATES/Atmospheric (30%);HEAT, THERMAL/In and to the air (40%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To provide the basic information required for the assessment of the impact upon coastal inhabitants of releases to the atmosphere of pollutants from nuclear and fossil fuel power plants located on coastal and off-shore sites, and to develop improved procedures for calculating atmospheric dispersion rates appropriate to marine locations.
APPROACH: Experimental investigations of dispersion, using zero-lift balloons, are conducted over Lake Michigan and over Long Island Sound. The dispersion experiments are supported by measurements of atmospheric turbulence and statistical studies of the properties of the lower atmosphere.
RESULTS: Improved methods, of utility similar to those already available for application over land sites, for calculating the effective dosage to inhabitants of near-shore regions resulting from pollutants released into the atmosphere from power plants located on coastal and off-shore sites.
PROJECT MILESTONES: (1) Publication of improved nomograms for estimating plume dispersion by 1 July 1977. (2) Completion of 1976 Annual Report by 1 July 1977. (3) Completion of building-wake modeling studies by 1 March 1977. (4) Completion of prototype wake-effect studies by 1 November 1977. (5) Publication of a relevant topical report by 1 March 1978.
KEYWORDS: NUCLEAR POWER PLANTS;FOSSIL-FUEL POWER PLANTS;OFFSHORE SITES;REACTOR SITES;COASTAL REGIONS;AIR POLLUTION;ENVIRONMENTAL EFFECTS;BALLOONS;LAKE MICHIGAN;TURBULENCE;STATISTICS;RADIATION DOSES;HUMAN POPULATIONS;RADIOACTIVE AEROSOLS;METEOROLOGY;PLUMES;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS

<080027>
TITLE: Detection and Characterization of Damage in Physiological, Cellular and Molecular Systems, Mammalian Cell Biology
PROJECT NUMBER: 001297
PRINCIPAL INVESTIGATOR: Elkind, M.M.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: FOSSIL FUEL/General (35%);NUCLEAR/General (65%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (30%)
POLLUTANTS: METALS/Trace (10%);ORGANICS/Hydrocarbons (40%);RADIATION/X-ray;RADIATION/Gamma;RADIATION/Neutron (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (70%);DEVELOPMENT/Laboratory scale (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Other coasts Global;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Cell survival is required for the expression of teratogenic, mutagenic, and oncogenic changes. Cell survival is also critical to the treatment of cancer with radiation and drugs. This project is aimed at elucidating the mechanisms of cell killing.
APPROACH: Mammalian cells cultivated in vitro will be studied as well as the DNA obtained from them. Damage and repair processes will be measured in respect to: metabolic activity, DNA size, cell growth, and cell survival. Acute and intermittent treatment with carcinogens, nonionizing and ionizing radiations will be used.
RESULTS: It is expected from this work that quantitative and qualitative comparisons can be made among various kinds of chemical and physical cytotoxic agents. Further, indications of interactions between one agent and another (e.g., radiation and chemical pollutants) can also be determined.
PROJECT MILESTONES: (1) Selection of cells having contrasting properties and having sensitivity and resistance to radiation and hyperthermia 12/30/77. (2) Identification of pre- and post-replication repair mechanisms in DNA damage 9/30/78.
KEYWORDS: ANIMAL CELLS;SURVIVAL TIME;MUTAGENESIS;TERATOGENESIS;CARCINOGENESIS;NEOPLASMS;BIOLOGICAL RADIATION EFFECTS;DRUGS;CELL KILLING;DNA;BIOLOGICAL REPAIR;CARCINOGENS;IONIZING RADIATIONS;METABOLISM;BIOLOGICAL EFFECTS;RADIOTHERAPY;IN VITRO

<080028>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals--Development of In Vitro Assay Systems for Oncogenesis
OJECT NUMBER: 001298
INCIPAL INVESTIGATOR: Elkind, M.M.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (20%);GENERAL SCIENCE (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (30%)
POLLUTANTS: ORGANICS/Hydrocarbons (60%);RADIATION/Gamma;RADIATION/Neutron and ultraviolet (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: In vitro mammalian cell systems will be developed for the screening of oncogenic agents and for the study of the molecular mechanisms by which they act so that a rational basis can be made for extrapolation to man.
APPROACH: In vitro cell transformation will be used. Changes in growth morphology, anchorage dependence, or media requirements will be used as indicators of transformation. Tests for neoplastic change will be assayed in appropriate hosts.
RESULTS: Using different rodent cell systems, generalities will be sought of the effectiveness of different carcinogens including ionizing and nonionizing radiation. Cells from mammals closer to man will also be placed in culture, e.g., dog cells, to see if results with in vitro systems parallel those obtained in vivo.
PROJECT MILESTONES: A quantitative comparison of the relative effectiveness of different oncogenic agents in mammalian human cells in culture 9/30/78.
KEYWORDS: ENERGY SOURCES;ENVIRONMENTAL EFFECTS;CARCINOGENESIS;MAMMALS;ANIMAL CELLS;IN VITRO;MORPHOLOGICAL CHANGES;RODENTS;CARCINOGENS;IONIZING RADIATIONS;BIOLOGICAL EFFECTS;BIOLOGICAL RADIATION EFFECTS;BIOASSAY;GAMMA RADIATION;ULTRAVIOLET RADIATION;HYDROCARBONS

<080029>
TITLE: Characteristics, Transport and Conversion of Energy-Related Pollutants in the Environment--Plutonium Behavior in the Miami River Watershed
PROJECT NUMBER: 001344
PRINCIPAL INVESTIGATOR: Marshall, J.S.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$310,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Site specific S.W. Ohio;HYDROGRAPHIC AREAS/Other hydrographic areas Miami River
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to assess the behavior and mobility of plutonium in a watershed that has experienced plutonium deposition over a period of years from a processing facility sited close to the Miami River.
APPROACH: This is a field-based aquatic and terrestrial program. Samples of water, soils, sediments and biota will be collected as required and analyzed for their Pu-238, Pu-239 content and for other important parameters necessary for the interpretation of the data.
RESULTS: The program will determine the sources and sinks of plutonium in the watershed, examine mechanisms of resuspension and mobility in water and soil, and assess the role of biological uptake and cycling in transport to man via the food chain.
PROJECT MILESTONES: (1) The characterization of the distribution of plutonium in soils will be completed by October 1977. (2) The distribution and physicochemical speciation of plutonium in canals, ponds, and river water will be determined by October 1977. (3) Discrimination factors for plutonium in plants and tissue distribution of plutonium in fish will be completed by October 1978.
KEYWORDS: PLUTONIUM 238;WATERSHEDS;DEPOSITION;PLUTONIUM 239;WATER;SOILS;SEDIMENTS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;RADIONUCLIDE MIGRATION;CONTAMINATION;FOOD CHAINS;DISTRIBUTION;RADIOACTIVE EFFLUENTS

<080030>
TITLE: Assessment of Environmental Conditions of the Great Lakes in Relation to Power Production
PROJECT NUMBER: 001345
PRINCIPAL INVESTIGATOR: Gustafson, P.F.;McGregor, D.L.
ADDRESS: Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$140,000; Nuclear Regulatory Commission
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);CONSERVATION/General (25%);GENERAL SCIENCE (25%)
ENERGY CYCLE: EXTRACTION (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (40%);ELECTRICAL TRANSMISSION (15%);WASTE MANAGEMENT (15%)

POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/O/sub 3/ (15%);METALS/Sodium;METALS/Potassium;METALS/Calcium;METALS/Magnesium;METALS/Heavy metals;METALS/Mercury (20%);PARTICULATES/Cadmium;PARTICULATES/Molybdenum;PARTICULATES/Vanadium;PARTICULATES/Lead;PARTICULATES/Mercury;PARTICULATES/Zinc;PARTICULATES/Chlorinated hydrocarbons;PARTICULATES/Phenols (20%);HEAT, THERMAL/Thermal discharge (20%);VISUAL AESTHETICS (5%);SPECIFIED OTHER POLLUTANTS/PO/sub 4/, nitrogen, SiO/sub 2/, O/sub 2/, CO/sub 2/, chlorine (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;COASTS/Other coasts Great Lakes;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the research project titled Assessment of Environmental Conditions of the Great Lakes in Relation to Power Production are to: (1) develop, synthesize and integrate information for baseline characterization of regional environmental resources within each of the Great Lakes watersheds; (2) assess the current and projectedimpacts of regional power developments on these resources; and (3) evaluate control technology and resource management options for mitigating adverse impacts associated with power supply and conservation technology developments in each region.
APPROACH: Sources of power related effluents, and physical, chemical and biological processes that influence the transport of pollutants are assessed in the first stage characterization of environmental resources whereas second stage efforts focus on the assessment of regional impacts of power production. Direct and indirect impacts of electric power generation on major biotic communities and physical natural resources are evaluated and cumulative environmental impacts of regional power generation are compared with other human-induced or natural influences in each study region.
RESULTS: Current studies on the Lake Michigan watershed are strongly multi-disciplinary and interinstitutional in scope and will result in approximately 20 published reports treating the regions environmental resources, potential environmental constraints to power development and means to reduce adverse consequences of power production.
PROJECT MILESTONES: (A) Baseline Characterization of Environmental Resources for the Lake Michigan Region Environmental Status of the Lake Michigan Region, Volumes 1-19, 30 Sept. 1976. (B) Regional Assessment of Environmental Impacts Associated with power development and evaluation of control technology, Draft Document, 30 June 1977.
KEYWORDS: GREAT LAKES;ENERGY SOURCES;WATERSHEDS;THERMAL EFFLUENTS;CHEMICAL EFFLUENTS;POLLUTION;ELECTRIC POWER;ENVIRONMENTAL EFFECTS;COMMUNITIES;POWER GENERATION;BASELINE ECOLOGY;EARTH ATMOSPHERE;ENVIRONMENTAL TRANSPORT;TERRESTRIAL ECOSYSTEMS;SOILS;WATER;POWER PLANTS;SITE SELECTION;BIOLOGICAL EFFECTS;POLLUTION CONTROL EQUIPMENT

<080031>
TITLE: Energy-Related Regional Studies Program
PROJECT NUMBER: 001351
PRINCIPAL INVESTIGATOR: Hoover, J.L.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environment and Safety
MONITOR: Belter, Walt
TELEPHONE: F233-4556
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$1,100,000
TECHNOLOGY: FOSSIL FUEL/General (9%);FOSSIL FUEL/Coal (72%);FOSSIL FUEL/Oil and Gas (5%);GENERAL SCIENCE (14%)
ENERGY CYCLE: EXTRACTION (15%);COMBUSTION IN SITU (3%);TRANSPORTATION (6%);PROCESSING, CONVERSION (25%);ELECTRICITY GENERATION (19%);ELECTRICAL TRANSMISSION (2%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/CS/sub 2/;NOXIOUS GAS/COS;NOXIOUS GAS/SO/sub 4/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/CO;NOXIOUS GAS/CO/sub 2/;NOXIOUS GAS/NH/sub 3/;NOXIOUS GAS/HCN;NOXIOUS GAS/RSH (17%);METALS/Mercury;METALS/Beryllium;METALS/Cadmium;METALS/Vanadium;METALS/Arsenic;METALS/Lead;METALS/Selnium (11%);PARTICULATES/TSP;PARTICULATES/Fine particle fugitive dust (8%);ORGANICS/Phenols;ORGANICS/Cresols;ORGANICS/BTX;ORGANICS/Oils;ORGANICS/Tars (12%);NOISE, VIBRATION/Blasting (2%);HEAT, THERMAL/Water;HEAT, THERMAL/Weather mod. (5%);VISUAL AESTHETICS/Visibility;VISUAL AESTHETICS/Trans. lines (2%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The Regional Studies Program will provide integrated and comprehensive assessments of the health, environmental, socioeconomic and resource impacts associated with alternative energy systems. The National Coal Assessment (NCA) will evaluate the consequences of increased national levels of coal utilization. The framework for comparative assessments will enable the bringing together of the results of fuel cycle assessments being conducted by AES.
APPROACH: Major emphasis will be placed on the conduct of the NCA in concert with the other ERDA labcratories. The NCA will focus on the deployment of technologies in the entire coal fuel cycle and the factors which may limit coal utilization. The NCA will evaluate impacts on a local, state, regional and national scale. Both quantitative and qualitative analyses will be prepared and existing models and data will be adapted and used. The comparative framework development will lead to a mechanism for consistent and comprehensive comparisons of alternative fuel cycles and energy systems.
RESULTS: The NCA will generate outputs that can be used by ERDA and other federal agencies, Congress, and the states. A set of source documents will be prepared to aid other interested groups that are conducting analyses. A series of reports and interim assessments will be developed throughout the program's two year duration so that the NCA can provide input into key decisions that must be made during this period. The framework for energy system comparisons will be directed to AES as an aid in program planning and technology overview.
PROJECT MILESTONES: (1) Initiate Multi-laboratory National Coal Assessment 6/76. (2) Interim National Assessment 10/77. (3) Complete Comparative Assessment Framework 10/77. (4) Complete National Code Assessment 10/78. (5) Complete Example Interfuel Comparison 10/78.
KEYWORDS: COAL;ENVIRONMENTAL EFFECTS;FUEL CYCLE;ECONOMICS;PUBLIC HEALTH;COST BENEFIT ANALYSIS;ENERGY SOURCES;REGIONAL ANALYSIS;ANL;SOCIO-ECONOMIC FACTORS;SOCIOLOGY;SYNTHETIC FUELS;MAN;COAL INDUSTRY;HEALTH HAZARDS;TECHNOLOGY ASSESSMENT

<080032>
TITLE: Environmental Effects of Energy-Related Processes and Pollutants on the Environment: Cooling-Pond Thermal Transfer Studies
)JECT NUMBER: 001450
:NCIPAL INVESTIGATOR: Hicks, B.B.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3600
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS: HEAT, THERMAL/To the air (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To study and parameterize the fundamental mechanisms that control the exchange of heat, moisture, and momentum between heated water surfaces and the atmosphere, in order to permit the improvement of schemes for predicting the extent and severity of possible adverse environmental effects downwind of both single and multiple cooling pond systems. Furthermore, to develop improved numerical simulations of cooling pond systems, capable of assisting in the design of power plants, and to develop methods for assessing the thermal performance of existing installations.
APPROACH: Micrometeorlogical methods of direct flux evaluaion are applied over an industrial cooling pond; the data derived allow determination of transfer coefficients appropriate in the special, demanding atmospheric conditions that prevail over heated water surfaces. Remote probing methods and simple predictive models are developed and evaluated.
RESULTS: Improved methods for parameterizing thermal exchange from heated water surfaces, and correspondingly improved numerical models capable of predicting the performance characteristics of proposed cooling pond installations. Eventually, the development of models for estimating the local environmental impact of particular cooling pond installations.
PROJECT MILESTONES: (1) Publication of a technical report describing improved parameterization procedures, by 1 December 1976. (2) Completion of analyses of data concerning the generation of cool skins over water surfaces, by 1 March 1977. (3) Conclusion of preliminary investigations of methods for observing the moist thermal plume downwind of a large cooling pond by 1 August 1977.
KEYWORDS: AIR;WATER;SURFACES;HEAT TRANSFER;ENVIRONMENTAL EFFECTS;COOLING PONDS;DATA;MATHEMATICAL MODELS;EARTH ATMOSPHERE;ENVIRONMENTAL TRANSPORT;WEATHER;FOG;CONTROL;FORECASTING

<080033>
TITLE: Molecular and Cellular Radiobiology
PROJECT NUMBER: 001451
PRINCIPAL INVESTIGATOR: Elkind, M.M.
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: RADIOBIOLOGY;MOLECULAR BIOLOGY;ANIMAL CELLS;PLANT CELLS;BIOLOGICAL RADIATION EFFECTS;CYTOLOGY

<080037>
TITLE: Liposome Encapsulation
PROJECT NUMBER: 001539
PRINCIPAL INVESTIGATOR: Rahman
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$91,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<080038>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals, Skin and Pulmonary Carcinogenesis
PROJECT NUMBER: 001540
PRINCIPAL INVESTIGATOR: Fry, R.J.M.
ADDRESS: Division of Biological and Medical Research, Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);CONSERVATION/General (20%);GENERAL SCIENCE (40%
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS/Aromatic carcinogens (50%);RADIATION/Ultraviolet (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
~SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
OJECT DESCRIPTION: A. Skin tumorigenesis studies. The long-term objectives are concerned with (1) the identification of molecular lesions which result in transformation or initiation; (2) molecular lesions and systemic factors which influence promotion or expression of tumors; (3) the role of repair mechanisms in tumorigenesis; (4) the interaction of chemical agents and UV light. B. Lung tumorigenesis studies. (1) Determine the influences of cell proliferation and viral respiratory infection on the natural incidence of lung tumors. (2) Examine the use of tracheal and bronchial transplants.
APPROACH: A. Skin tumorigenesis. The test system uses (a) skin of two strains of mice that differ in

susceptibility to the induction of skin carcinomas, and (b) yeast for parallel mutation studies. The mice are exposed to UV light of different spectra furocoumarins and benzo(a)pyrene singly or in combination. The standard exposure regimen for UV light is 3/week for 24 weeks. For the study of tumor promotion regimens varying from 1-24 weeks are used. Biological end points: (1) molecular lesions; (2) repair of lesions; (3) metabolism of carcinogens; (4) mutation; (5) tumor incidence. B. Lung tumorigenesis. Test system: Lungs of mice of two strains and their hybrid which differ in the natural incidence of tumors. Exposure conditions: Sendai virus to young mice with defined flora. Biological end points: lung tumor prevalence rates.

RESULTS: A. Skin tumorigenesis. (1) Establish whether the genetic factors that determine susceptibility for skin tumorigenesis also affect sarcomagenesis. (2) Establish the UV spectral dependence for initiation and promotion. (3) Elucidate the role of cell proliferation, repair capability, and hydroxylation activity in the susceptibility to tumor induction. B. Lung tumorigenesis. (1) Establish whether the risk of lung tumor induction is dependent or independent on the natural incidence. (2) Establish the suitability of (a) in vivo and (b) in vitro mouse lung as a suitable screening test system. (3) Establish the role of respiratory viral infection in lung tumorigenesis.

PROJECT MILESTONES: (1) Establish whether susceptibility to tumorigenesis in skin is cell type specific. 12/30/76 (2) Establish the relationship between inducement of ornithine decarboxylase and susceptibility to tumorigenesis. 12/30/77 (3) Establish the fractionation dependency for initiation and promotion of tumors by exposure to UV light and psoralen. 12/30/77

KEYWORDS: CANCER;SKIN;LUNGS;CARCINOGENESIS;NEOPLASMS;CELL PROLIFERATION;DRUGS;ULTRAVIOLET RADIATION;BIOLOGICAL REPAIR;VIRUSES;TRACHEA;BRONCHI;TRANSPLANTS;MICE;MUTATIONS;BIOLOGICAL EFFECTS;BIOLOGICAL RADIATION EFFECTS;RADIOINDUCTION;ENZYMES;IN VIVO

<0080039>

TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals, Environmental Interactions with the Aging Process

PROJECT NUMBER: 001541

PRINCIPAL INVESTIGATOR: Sacher, G.A.

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AFFILIATION: Argonne National Lab., Ill. (USA)

MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)

DIVISION: Division of Biomedical and Environmental Research

MONITOR: Carter, Charles E.

TELEPHONE: F233-5468

TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Energy Research and Development Administration FY77:$63,000

TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)

POLLUTANTS: ORGANICS/Hydrocarbons (60%);RADIATION/Gamma rays (20%);HEAT, THERMAL/Thermal stress (20%)

CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (90%);ANALYTICAL (10%)

REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global;COASTS/Other coasts Global;HYDROGRAPHIC AREAS/Other hydrographic areas Global

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: This project examines the genetic factors in sensitivity to the late effects of energy pollutants at two levels: (1) genetic components of tumor induction and life shortening in inbred and hybrid mice exposed to gamma rays and polycyclic hydrocarbons; and (2) differences in carcinogenic effects and life shortening produced by gamma rays and polycyclic hydrocarbons administered to a short-lived and long-lived rodent species. The estimates of genetic variance for the various pollutants will assist in the development of an optimum experiment design for evaluating the long-term hazards of chemical pollutants. The Mus-Peromyscus comparison is important because the longer-lived Peromyscus has greater capacity to repair DNA damage and lower rates of somatic mutation and viral transformation. The correlation of these and other in vitro characteristics with in vivo sensitivity will be made possible in this project.

APPROACH: The mouse genetics study uses five inbred mouse strains that have different life-spans and radiosensitivities. All 25 matings are made, and the progeny are used for the tests. This diallel design allows the extraction of a member of genetic variance component, additive, non-additive, and interactive. The same design and set of genotypes have already been measured for a number of traits, including survival in a conventional environment, survival under continuous irradiations; and measurements of body and organ dimensions. Genetic relations among these characteristics have been identified thereby. We plan to use it to test sensitivity to several energy by-products and to measure various mechanisms of cellular injury and repair, because the information yield increases with the number of different characteristics measured. The rodent species Peromyscus leucopus is a small mouse-like rodent that has a life expectation of 4+ years (vs. 2 years for the mouse) and a maximum span of 8 years. It has a different spectrum of tumors, some of them histologically similar to human neoplasms. It has already been shown by in vitro testing to have a higher rate of DNA repair and a lower rate of point mutation and viral transformation than the mouse. Comparison of these two species will yield more information about mechanisms of injury and repair than testing mice alone. Our capabilities include a cold room for imposing long-term metabolic loads, and much experience in lifetime epidemiological studies on rodents.

RESULTS: One basic purpose of this project is to develop experiment designs that yield more information about the genetic basis of sensitivity to environmental insults. Genetic variance in sensitivity to ionizing radiations has already been demonstrated, but the genetic factor in late effects of chemical pollutants will be even greater because of the larger role of enzymatic mechanisms. Another goal is to produce differences in late effects between populations and species that can be used in the search for correlative, and possibly causal, differences in capacities for cellular damage and repair. We already have found some support for the hypothesis that Peromyscus differ from mice in ways that are a step in the direction toward man. Study of these two systems will, therefore, greatly strengthen the validity and confidence of our prediction of hazards for man.

PROJECT MILESTONES: (1) Completion (3 years) and analysis (1 year) of diallel study of survival and pathology of mice kept in conventional environments. Partial 12/30/77; complete 12/30/80. (2) Completion of first generation of diallel studies on survival in cold environment and under chronic exposure to polycyclic hydrocarbon. 12/30/78. (3) Complete study on survival and pathology in Mus-Peromyscus pair exposed to cold environment, and interaction of cold with a polycyclic hydrocarbon. 12/30/78.

KEYWORDS: MICE;GAMMA RADIATION;ENERGY SOURCES;POLLUTION;HYDROCARBONS;LIFE SPAN;DNA;BIOLOGICAL REPAIR;BIOLOGICAL RADIATION EFFECTS;GENETICS;GENOTYPE;ENVIRONMENTAL EFFECTS;AGING;CARCINOGENS;GENETICS;IN VIVO;ANIMALS

<080040>
TITLE: Genetic Effects, Molecular Genetics and Environmental Mutagens
PROJECT NUMBER: 001543
PRINCIPAL INVESTIGATOR: Matsushita, T.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$296,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS/Photosensitizers (50%);RADIATION/UV visible (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Control mechanisms for chromosome replication are studied in Bacillus subtilis, specifically the biochemical events involved in the initiation and termination of replication. We have also begun a study of immunoglobulin gene and biochemical genetic mutations in mouse myeloma cells. Mechanisms of action of UV and visible radiation in the production of mutagenic and lethal lesions, as well as the effects produced by added chromophores such as the psoralens and acridines are elucidated.
APPROACH: Cell membrane-bound segments of B. subtilis DNA are studied using transformation and density gradient techniques. In vitro mutagenesis using environmental and other mutagens are utilized in mouse myeloma cells. DNA lesions are studied using chromatographic and sucrose gradient techniques. A large monochromator has made possible the high irradiances required for the near UV and visible radiation studies. Mutagenesis in bacteria is studied primarily in continuous cultures (chemostat and turbidostat) in strains of bacteria with appropriate repair properties. The use of continuous culture techniques permits the study of mutation induction at very low levels of mutagen in the absence of detectable lethality.
RESULTS: (1) Control of replication: Lipid synthesis requirements; temperature-sensitive termination mutants. (2) Mouse myeloma: Levels of excision and postreplication repair; eukaryotic cell mutants. (3) UV and visible radiation: Mechanism of action of wavelengths longer than 300 nm; synergistic effects between near UV and other radiations; effects of selected photosensitizers including 8-methoxypsoralen, methylene blue and acridine orange.
PROJECT MILESTONES: (1) Control of replication: To demonstrate initiation and termination mechanisms for cellular control of bacterial DNA replication. 9/30/78 (2) Mouse myeloma: Isolation of molecular genetic mutants in eukaryotic cells. 9/30/78 (3) UV and visible radiation: Demonstration of the role of dimers and single-strand breaks in near UV lethality. 9/30/77 (4) The role of recombination repair in near UV and photosensitized lethality and mutagenesis. 9/30/78
KEYWORDS: GENETICS;MUTAGENS;BACILLUS SUBTILIS;ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;VISIBLE RADIATION;IMMUNOGLOBULINS;MUTATIONS;DNA;TUMOR CELLS;MUTAGENESIS;RADIOINDUCTION;CARCINOGENS

<080041>
TITLE: Levels of Activity and Doses from Ingestion of Great Lakes Water
PROJECT NUMBER: 002841
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/Fission (100%)
KEYWORDS: GREAT LAKES;SURFACE WATERS;RADIOACTIVITY;FALLOUT DEPOSITS;HUMAN POPULATIONS;INGESTION;DRINKING WATER;RADIATION DOSES;INTERNAL IRRADIATION

<080042>
TITLE: Physics and Chemistry of Pollutant Interactions in the Environment, Molecular Physics and Chemistry Basic to Environmental Research
PROJECT NUMBER: 001759
PRINCIPAL INVESTIGATOR: Inokuti, M.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: FOSSIL FUEL/General (35%);GEOTHERMAL/General (10%);SOLAR/General (25%);CONSERVATION/General (10%);GENERAL SCIENCE (20%)
ENERGY CYCLE: COMBUSTION IN SITU (5%);TRANSPORTATION (5%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (10%);WASTE MANAGEMENT (20%)
POLLUTANTS: NOXIOUS GAS/Nitrogen and sulfur compounds (60%);METALS/Heavy metals such as mercury and barium (10%);ORGANICS/Hydrocarbons;ORGANICS/Ketones and aldehydes (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Determine the mechanism of transformation of SO/sub 2/ to SO/sub 4//sup =/ in the atmosphere.
APPROACH: Laboratory studies and field sampling experiments in which the oxygen isotope rates in SO/sub 2/, SO/sub 4//sup =/, H/sub 2/O vapor, and O/sub 2/ will be measured. The isotopic composition of SO produced in controlled laboratory experiments will be compared to that in the atmosphere.
RESULTS: It is expected that the isotopic composition of atmospheric sulfate will indicate the major mechanism of formation.
PROJECT MILESTONES: Basic research program.
KEYWORDS: SPECTROSCOPY;AIR POLLUTION;DATA;CHEMICAL REACTION KINETICS;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;MONITORING;CHEMICAL EFFLUENTS;SULFUR COMPOUNDS;NITROGEN COMPOUNDS;ULTRAVIOLET RADIATION;SULFUR DIOXIDE;SULFATES;PHOTOCHEMICAL OXIDANTS

<080043>
TITLE: Development of Improved Monitoring Equipment for On-Line Detection and Characterization of Airborne Plutonium Aerosols
PROJECT NUMBER: 001762
PRINCIPAL INVESTIGATOR: Yule, T.J.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: NUCLEAR/General (75%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (25%)
ENERGY CYCLE: TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (70%);COMBUSTION OR END USE (10%)
POLLUTANTS: RADIATION/Plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (30%);FULL SCALE DEMONSTRATION (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development of improved monitoring equipment for the on-line detection and characterization of airborne plutonium aerosols which may be released during the nuclear fuel cycle.
APPROACH: Improved sensitivity and reliability over presently available monitors will be achieved by improving the discrimination against natural background activity by utilizing improved mechanical and electronic separation schemes. Prototypical monitors will be constructed and tested under laboratory and field conditions. New techniques will be developed and existing techniques evaluated for determining the activity and aerodynamic particle-size distributions of plutonium aerosols.
RESULTS: Development of on-line airborne plutonium monitors which will be able to rapidly and reliably detect small concentrations of airborne plutonium. Development of techniques to determine the characteristics of a plutonium aerosol.
PROJECT MILESTONES: (1) Establish the basis for design of an on-line airborne plutonium monitor Sept. 30, 1977. (2) Fabricate and test airborne plutonium monitor prototype suitable for commercial development Sept. 30, 1979.
KEYWORDS: RADIOACTIVE AEROSOLS;LUNGS;PLUTONIUM;AIR POLLUTION MONITORS;RADIATION DETECTORS;AIR POLLUTION;PLUTONIUM ISOTOPES;NUCLEAR FUELS;FUEL CYCLE;RADIATION MONITORING;PARTICLE SIZE;BACKGROUND RADIATION;MEASURING INSTRUMENTS;PARTICLE KINEMATICS;RADIOECOLOGICAL CONCENTRATION;SPECIFICATIONS

<080044>
TITLE: Environmental Data Integration, Information System for Surface Mining Utilizing Data Gathered on State Extraction/Reclamation Permits
PROJECT NUMBER: 2158
PRINCIPAL INVESTIGATOR: Perry, A.O.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Albert, Ted M.
TELEPHONE: F233-3311
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$131,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: VISUAL AESTHETICS/Land reclamation (90%);SPECIFIED OTHER POLLUTANTS/Water quality (10%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this project is to collect and store in retrievable form data related surface mining of coal and reclamation of mined lands. At present, such data is scattered through the files of various state agencies, mostly in the form of raw data. The envisioned data base would permit rapid, easy access to such data and would allow for the calculation of useful statistical measures related to the environmental impacts of mining.
APPROACH: Argonne is contacting the pertinent state agencies in order to obtain their cooperation and to determine the nature and scope of the data collection problem. Preliminary study indicates project is feasible. After scope of data bank is determined, coding sheets will be prepared. Data collection should begin by mid-summer. Simultaneously, data management program will be developed by Argonne staff. 1977 Coding sheets are in preparation and are completed for two states. Collection of data has begun for Indiana.
RESULTS: The end product of this project will be a data management system capable of storing pertinent data related to the environmental impacts of surface mining of coal. The system will be designed to be open-ended so that data files can be updated periodically and new data files can be updated periodically and new data files can be added as new data becomes available. This system should be of much assistance both to ERDA and to the cooperating state agencies.
PROJECT MILESTONES: (1) Preliminary feasibility study and report to be completed by 1/1/76. (2) Field trips to visit pertinent personnel in Washington, DC, Columbus, OH, and Frankfort, KY completed 5/25/76. (3) Pre-planning documents completed 5/25/76.
KEYWORDS: MINING;DATA ACQUISITION;COAL MINES;DATA ACQUISITION SYSTEMS;STATISTICS;INFORMATION SYSTEMS;COMPUTER CODES;COAL MINING;WATER;LAND RECLAMATION

<080046>
TITLE: Combating Detrimental Effects, Therapy of Poisoning by Radioactive and Nonradioactive Metals
PROJECT NUMBER: 002169
PRINCIPAL INVESTIGATOR: Lidenbaum, A.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Energy Research and Development Administration FY77:$210,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (60%);GENERAL SCIENCE (20%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (40%)
LLUTANTS: METALS/Trace (10%);PARTICULATES/Heavy metal compounds (10%);RADIATION/Actinide metals (80%)
ARACTER OF STUDY: RESEARCH/Laboratory (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Decorporation of toxic metals, with major emphasis on plutonium-239. This work includes: (1) relationships between physicochemical properties of metal compounds and their deposition sites, duration of retention, and pathological effects; (2) utilization of such information to develop decorporation procedures; (3) development of appropriate methodology to facilitate these objectives. Both in vitro studies of mammalian organs and in vivo studies are carried out in rodents and dogs. Experiments are designed to allow extrapolation of results toward man. Most experiments are short-term (less than 6 months) and utilize sub-microgram quantities of metals.
APPROACH: Knowledge of specific deposition sites in tissues of a hazardous metal like plutonium allows selection of appropriate agents and procedures for decorporation. Potentially useful therapeutic agents are tested in mice or rats. If successful in the rodent, critical metal distribution or decorporation experiments are repeated with dogs. If therapeutic promise is confirmed for both rodent (mainly mice) and dog the substances and/or procedures are then evaluated for clinical use in human patients. The main target organs are the skeleton and liver.
RESULTS: Studies in experimental animals are designed to apply to man. The specific population aimed at is the production worker in a nuclear fuel fabrication or reprocessing facility who may become accidentally contaminated with actinides or lanthanides. However, the procedures developed could be used for any member of the human population similarly contaminated.
PROJECT MILESTONES: (1) Completion of the radioisographic studies outlining mineral distribution of plutonium isotopes in animal studies 12/30/77. (2) Demonstration of usefulness of pyran copolymer analogs for decorporation of Pu 12/30/76.
KEYWORDS: BIOLOGICAL REPAIR;METALS;RADIOACTIVITY;THERAPY;ACTINIDE COMPOUNDS;AIR POLLUTION;LAND POLLUTION;TOXICITY;ENERGY CONVERSION;ELECTRIC POWER;HEALTH HAZARDS;PLUTONIUM 239;IN VITRO;IN VIVO;RATS;DOGS;MAN;RADIONUCLIDE KINETICS;INGESTION;METABOLISM;ANIMALS

<080048>
TITLE: Influence of Ground Disturbance and Exposure of Minerals on Their Susceptibility to Transport Through the Soil
PROJECT NUMBER: 004005
PRINCIPAL INVESTIGATOR: Carter
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$44,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: SOILS;MINERAL CYCLING;TERRESTRIAL ECOSYSTEMS;MINERALS;ECOLOGICAL CONCENTRATION;EXCAVATION;ENVIRONMENTAL TRANSPORT

<080049>
TITLE: Land Reclamation Program
PROJECT NUMBER: 2199
PRINCIPAL INVESTIGATOR: Carter, R.P.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: C(301)353-5078
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$239,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (20%);ORGANICS (30%);VISUAL AESTHETICS (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The Land Reclamation Program addresses coordinated applied and basic research into the physical and ecological problems of land reclamation and rehabilitating mined coal land to productive end uses. The purpose of the new program is to conduct research and development projects focused on near- and long-term reclamation problems in all major U.S. coal resource regions, including Alaska, and to coordinate, evaluate, and disseminate the results of related studies conducted at other research institutions. The activities of the Land Reclamation Laboratory program will involve close cooperation with industry and focus on establishing a comprehensive field and laboratory effort. Research demonstration sites are established throughout the U.S. Regional and site-specific problems are addressed. The research is implemented through close cooperation with related efforts at academic institutions and other agencies. The major effort focuses on the complete coal extraction/reclamation cycle where necessary to develop solutions to ameliorating the environmental impacts of coal development.
APPROACH: The activities of the Land Reclamation Laboratory are divided into four key areas: (I) Program Development and Coordination: (A) Identification of key problems and issues; (B) Current research; and (C) Technology transfer. (II) Field and Laboratory Research in Problem Areas: (A) Geophysical and geochemical studies; and (B) Ecosystems studies. (III) Model Development and Generic Statements. (IV) Data System Development.
RESULTS: A cooperative project with the State of Illinois was completed; the effort demonstrated successful rehabilitation of deep-mine refuse. Striking improvements in aesthetics, water quality and biological productivity are evident. Two meetings were cosponsored by ERDA and DOI (BOM) to exchange information among 11 agencies on environmental research related to coal extraction. The interagency meetings have improved coordination with reduced duplication of research related to environmental effects of coal extraction. A land reclamation bibliography for Eastern United States has been developed, assembled and coded for retrieval by computer processing; the computer file of bibliographic citations has been published. It was determined that water quality and biotic parameters of the Tongue River (Wyoming) are unaffected by effluents of an active surface mine. Root development in soil/spoil layers is restricted to topsoil; roots do not penetrate the acid spoil. This observation confirms the need for careful replacement

of topsoil as specified by the Surface Mining Control and Reclamation Law.
PROJECT MILESTONES: (1) Optimization of surface mining techniques that minimize erosion and impact on water quality (Big Horn Mine/Tongue River). Complete development of predictive model 6/78. (2) Adaptation, plant breeding, and efficient water use by native species in arid environments (Jim Bridger Mine/Navajo Mine). Interim report on recommendations of reclamation techniques that minimize erosion 10/78. (3) Initiate feasibility study on water harvesting in arid western regions 10/77. (4) Monitor water quality/ecology of reclaimed deep-mine refuse (Macoupin County, IL). Interim status report. 6/78. (5) Evaluate alternate soil strata to optimize plant productivity (Midwestern Mine). Finalize experimental design 3/78. Initiate field experiments 5/78. (6) Feasibility evaluate of integrated pre-mine planning, reclamation strategies and alternate land use (Eastern Mine). Select site 6/78. Develop integrated plan with mine operator 8/78. Implement plan 1/79. (7) Complete computerized bibliographic file of environmental research related to coal extraction. Bibliographic report of reclamation research in Eastern United States 10/77. Bibliographic report of reclamation in Western United States 6/78.
KEYWORDS: LAND RECLAMATION;COAL INDUSTRY;LAND POLLUTION ABATEMENT;ENVIRONMENTAL EFFECTS;SURFACE MINING;WATER POLLUTION ABATEMENT;REGIONAL ANALYSIS;TECHNOLOGY TRANSFER;TERRESTRIAL ECOSYSTEMS;TECHNOLOGY ASSESSMENT;DATA ACQUISITION;GEOCHEMICAL SURVEYS;GEOLOGICAL SURVEYS;SOILS;GEOCHEMISTRY;EXTRACTION

<080050>
TITLE: Indian Training Program in Energy Extraction
PROJECT NUMBER: 002570
PRINCIPAL INVESTIGATOR: Gustafson, P.F.
ADDRESS: Division of Environmental Impact Studies, 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dobbman, Roger C.
TELEPHONE: C(301)353-5078
TYPE OF FUNDING: Agency in-house effort;Interagency agreement-DOE
77 FUNDING: Energy Research and Development Administration FY77:$179,000
TECHNOLOGY: POSSIL FUEL/General (20%);FOSSIL FUEL/Coal (30%);CONSERVATION/General (30%);GENERAL SCIENCE (20%)
ENERGY CYCLE: EXTRACTION (30%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/NOx (10%);METALS/Hg;METALS/Zn;METALS/Pb;METALS/Cd;METALS/Sb (10%);PARTICULATES/Sulfides;PARTICULATES/Nitrates;PARTICULATES/Fly ash (20%);ORGANICS/Phenols;ORGANICS/PCB's (10%);RADIATION/Thorium;RADIATION/Uranium;RADIATION/Plutonium (10%);NOISE, VIBRATION/Strip mining (10%);HEAT, THERMAL/Power plants (10%);VISUAL AESTHETICS/Mined land disruption (10%);SPECIFIED OTHER POLLUTANTS/Ground and surface water (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT (10%);FULL SCALE DEMONSTRATION (30%);PRODUCTION (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This training program was developed for Native Americans to provide the knowledge and understanding necessary for working on energy development, environmental and reclamation problems on tribal lands. Special attention is given to energy extraction and development with field trips to coal mines on or adjacent to Reservation lands to observe mining, environmental impacts, and application of various reclamation technologies.
APPROACH: The program consists of a basic and practical six-week educational and training program in energy, resources, conservation, environment, assessment, monitoring, and rehabilitation of disturbed land. The Native Americans are presented lectures, laboratory, and field instruction in: geology, energy resources and development, hydrology, soil science, aquatic chemistry and biota, meteorology, range and watershed management, wildlife ecology, data gathering, and interpretation, and human factors as related to energy develcpment.
RESULTS: It is expected that the program will provide tribal organizations with individuals having the knowledge and basic skills for making decisions affecting tribal energy, resources, environmental and rehabilitation. These individuals can serve in the various Tribal Energy Offices that each tribe has or plans to establish.
KEYWORDS: AMERICAN INDIANS;EDUCATION;ENERGY SOURCES;ENERGY CONSERVATION;ENVIRONMENTAL EFFECTS;MONITORING;WATER POLLUTION;AIR POLLUTION;LAND RECLAMATION;COAL MINING;TERRESTRIAL ECOSYSTEMS;DECISION MAKING

<080051>
TITLE: Determine the Load and Dynamics of Particulate Pollutants Resulting from Mining Operations and Powerplant Construction
PROJECT NUMBER: 004006
PRINCIPAL INVESTIGATOR: Carter
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: POSSIL FUEL/Coal (100%)
KEYWORDS: AIR POLLUTION;MINING;CONSTRUCTION;EXCAVATION;ENVIRONMENTAL EFFECTS;AEROSOLS;DUSTS

<080052>
TITLE: Determine Effects of Mining and Related Activities on Water Quality Aquatic Ecosystems
PROJECT NUMBER: 004007
PRINCIPAL INVESTIGATOR: Buffington
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: POSSIL FUEL/Coal (100%)
KEYWORDS: AQUATIC ECOSYSTEMS;WATER QUALITY;MINING;ENVIRONMENTAL EFFECTS

<080053>
TITLE: Modeling Pre- and Post-Mining Biological Fate and Effects Data from Northern Great Plains, Southwest and Midwest Coal Field
)JECT NUMBER: 004008
[NCIPAL INVESTIGATOR: Buffington
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$88,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: COAL MINING;ENVIRONMENTAL EFFECTS;TIME DEPENDENCE;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;MATHEMATICAL MODELS

<080055>
TITLE: Office of Environmental Policy, Argonne National Laboratory
PROJECT NUMBER: 002230
PRINCIPAL INVESTIGATOR: Leppert, G.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Holt, Dick
TELEPHONE: F233-4570
TYPE OF FUNDING: Contract No.-W-31-109-ENG-38
77 FUNDING: Energy Research and Development Administration FY77:$322,000
TECHNOLOGY: FOSSIL FUEL/General (70%);CONSERVATION/General (30%)
POLLUTANTS: NOXIOUS GAS (70%);PARTICULATES (30%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide ERDA with analyses of the relationships among technical, environmental, health, economic and societal factors as they affect environmental regulation, energy and environmental RD and D policy on the commercialization of developed energy systems.
APPROACH: Conduct specific studies on the implications of the Clean Air Act amendment on energy development and conservation technologies emphasizing sections on prevention of significant deterioration and non-attainment; surface mining issues affecting coal gasification, implications of atmospheric carbon dioxide accumulation, and deployment of decentralized energy supply systems.
RESULTS: (1) Periodic reports on topical issues. (2) Monthly progress reports.
KEYWORDS: ENERGY SOURCES;DECISION MAKING;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;COST BENEFIT ANALYSIS;CLEAN AIR ACT;SURFACE MINING;COAL MINING;COAL GASIFICATION;CARBON DIOXIDE;SURFACE AIR;AIR POLLUTION;AIR QUALITY;LEGAL ASPECTS;AIR;ECONOMICS;SOCIOLOGY;COAL;GASIFICATION;ENERGY POLICY

<080056>
TITLE: Assessment and Application of Endochronic Plasticity for the Dynamic Analysis of Energy Materials Shipping Containers
PROJECT NUMBER: 800193
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: NUCLEAR/Fission (100%)
KEYWORDS: CASKS;CONTAINERS;TRANSPORT;PLASTICITY;SAFETY ENGINEERING

<080057>
TITLE: IAEA Course on Nuclear Power
PROJECT NUMBER: 001674
PRINCIPAL INVESTIGATOR: none
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<080060>
TITLE: Molecular Perturbations in Man Caused by Energy-Related Pollutants
PROJECT NUMBER: 002454
PRINCIPAL INVESTIGATOR: Anderson, N.G.
ADDRESS: Div. of Biological-Medical Research, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION IN SITU (30%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (30%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (30%);METALS (30%);ORGANICS (40%)

CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Develop integrated set of biophysical and engineering technologies to permit rapid separation and identification of sets of proteins present in human tissues, plasma and urine. Apply such measurements to detect perturbations caused by exposure to pollutants and are indicators of onset and development of disease.
APPROACH: Concentrate urinary proteins by hollow fiber dialysis. Separate and identify proteins by isoelectric focussing centrifugation. Continue to automate these methods for rapid analysis of samples from mass screening of human populations.
RESULTS: Development of a spectrum of new diagnostic methods for detection of mutations, and detection and characterizing a wide variety of injuries to human cells and tissues, for detecting and typing developing human cancers.
PROJECT MILESTONES: (1) Develop methods for concentrating urine 30-12-77. (2) Automation of protein isolation 30-12-77. (3) Develop rapid automatic gel analyzer 1-6-78. (4) Initiate sample bank (urine proteins) 30-9-77.
KEYWORDS: ENERGY SOURCES;POLLUTION;PROTEINS;MAN;TISSUES;SEPARATION PROCESSES;CHEMICAL ANALYSIS;BLOOD PLASMA;URINE;CENTRIFUGATION;AUTOMATION;HUMAN POPULATIONS;DIAGNOSTIC TECHNIQUES;MUTATIONS;BIOLOGICAL EFFECTS;ENVIRONMENTAL EFFECTS;EPIDEMIOLOGY;GENETICS;ANIMAL CELLS;NEOPLASMS

<080064>
TITLE: Analytical Instrument Development for Organic Environmental Contaminants
PROJECT NUMBER: 2769
PRINCIPAL INVESTIGATOR: Cunningham, P.T.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No.-W-31-109-ENG-38;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development of rapid, cost-effective procedures for the analysis of organic materials.
APPROACH: Development of a completely automated gas chromatograph-mass spectrometer and data system, utilizing time-of-flight mass spectrometer.
RESULTS: An advanced GC/MS/DS system.
PROJECT MILESTONES: Assemble GC/FOF MS system: install data system; modify MS inlet system.
KEYWORDS: AIR POLLUTION MONITORS;WATER POLLUTION MONITORS;PERFORMANCE TESTING;ORGANIC COMPOUNDS;MONITORING;MASS SPECTROMETERS;GAS CHROMATOGRAPHY

<080065>
TITLE: Black Lung
PROJECT NUMBER: 2830
PRINCIPAL INVESTIGATOR: Friedman, A.M.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The development of a radioisotope generator for use in pulmonary function measurements.
APPROACH: Both normal volunteers and patients with chronic obstructive lung disease will be tested using the /sup 81/Rb-/sup 81m/Kr generator. A series of tests will be done at the Thomas Cochran Hospital in St. Louis to determine the utility of the /sup 81m/Kr system for early diagnosis of black lung disease.
PROJECT MILESTONES: Complete the analysis of the utility of the /81m/Kr system compared to other tests.
KEYWORDS: LUNGS;PATHOLOGICAL CHANGES;DISEASES;HEALTH HAZARDS;INHALATION;MINING;PHYSIOLOGY;NUCLEAR MEDICINE;DIAGNOSIS;KRYPTON 81;ISOMERS;TRACER TECHNIQUES

<080066>
TITLE: Fluidized Bed Research Project
PROJECT NUMBER: 2563
PRINCIPAL INVESTIGATOR: Morris, W.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$400,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: Evaluate health effects resulting from exposure to effluents and waste from experimental FBC P.D.U.
APPROACH: Use multi disciplinary research activities as a strategic approach to evaluating toxicity of effluents and waste from P.D.U. type fluidized bed combustor operated under a variety of conditions. The project includes chemical and biological characterization of effluents (cellular/molecular screening), acute inhalation toxicology, chronic toxicology, including carcinogenesis and mutagenesis.
RESULTS: Experimental risk estimates resulting from exposure to toxic FBC effluents and waste.
KEYWORDS: FLUIDIZED-BED COMBUSTION;PROCESS DEVELOPMENT UNITS;CHEMICAL EFFLUENTS;WASTES;TOXICITY;EVALUATION;CARCINOGENESIS;MUTAGENESIS;CHEMICAL PROPERTIES;BIOLOGICAL EFFECTS;RISK ASSESSMENT;DISEASES;AEROSOLS;NEOPLASMS;IN VITRO;IN VIVO

<080067>
TITLE: Radioactive and Trace Element
PROJECT NUMBER: 2490
PRINCIPAL INVESTIGATOR: Marshall, J.H.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$255,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: In order to determine the risk to man from internally deposited radioactivity, we need theory concerning long-term effects of radiation. Such theory must be capable of synthesizing existing data from cell culture, animals, and man within a logical, mechanistic framework that can be tested by experiment. As a start in this direction, we are developing a theory of the induction of bone cancer by alpha radiation. With relatively simple postulates this theory is proving capable of explaining and fitting the quantitative features of the data for radium in man and in the Salt Lake dogs. If its predictions are confirmed, this theory will provide us with answers to many of the practical questions of the risk to man from long-term alpha radiation from different elements and different schedules of exposure.
APPROACH: Our purpose is to synthesize the data for man, animals, and cell culture which bear on the induction of bone cancer by alpha radiation within a single logical, mechanistic framework. The data of prime importance for such a synthesis are the data for radium in man, because it provides our most extensive experience of the risk of internal alpha irradiation to man. However, to understand the human data we need controlled experiments in animals and culture. By on-line modeling using the computer language SPEAKEASY, we try to fit postulates, mechanisms, and data together in a three-dimensional analysis of tumor rate, dose rate, and time. The first requirement of such modeling is that it fits the data. The second is simplicity; the number of facts fitted must be larger than the number of variable parameters. The third is that most of the parameters of the model should be defined so that they can be measured in separate experiments. And finally, the model itself should be capable of firm predictions that can be tested by experiment. Such a model spotlights the gaps in existing data and points the way towards new experiments. The results should be a more productive interaction between theory and experiment, leading to a reliable summary of existing data and to functions of dose and dose rate that give us the risk to man in practical situations.
KEYWORDS: NUCLEAR INDUSTRY;ENVIRONMENTAL IMPACTS;CHRONIC INTAKE;CARCINOGENESIS;BIOLOGICAL MODELS;ALPHA PARTICLES;BIOLOGICAL RADIATION EFFECTS;DOGS;MAN;BONE TISSUES;DOSE-RESPONSE RELATIONSHIPS;DATA ACQUISITION;CELL CULTURES;COMPUTER CODES;S CODES;HEALTH HAZARDS;RADIOINDUCTION

<080068>
TITLE: Biological Consequences of Chemical Speciation of Heavy Metals in Natural Waters
PROJECT NUMBER: 002522
PRINCIPAL INVESTIGATOR: Allen, H.E.
ADDRESS: Department of Environmental Engineering, Illinois Institute of Technology, Chicago, IL 60616
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: To determine kinetics and equilibria of metal complexation with inorganic and organic ligands.
APPROACH: (1) Development of analytical methods for determining concentrations of metal ligands and complexes in aquatic samples (Cd, Cu, Pb, and Zn). (2) Determination of the stoichiometry and stability constants of complexation reactions. (3) Measurement of the complexation kinetics. (4) Assessment of the effects of complexation on toxicity to algae. (5) Spatial and temporal mapping of the concentrations of metals, ligands and complexes in natural waters. (6) Assessment of the biological effects of increased input of metals or ligands into natural waters. (7) Characterization of the component fractions of the environmental ligand pool.
PROJECT MILESTONES: A basic characterization of kinetics and equilibria of chelated compounds in natural waters by Sept. 1979.
KEYWORDS: CADMIUM;COPPER;LEAD;ZINC;BIOLOGICAL EFFECTS;AQUATIC ORGANISMS;AQUATIC ECOSYSTEMS;WATER POLLUTION;ENVIRONMENTAL EFFECTS;CHEMICAL REACTIONS;WATER;CADMIUM COMPLEXES;LEAD COMPLEXES;ZINC COMPLEXES;COPPER COMPLEXES;CHELATES;HUMIC ACIDS;UNICELLULAR ALGAE

<080070>
TITLE: Surplus Facility Surveillance
PROJECT NUMBER: 800004
PRINCIPAL INVESTIGATOR: Cheever, C.L.;Bartusek, J.F.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-W-31-109-Eng-38;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION/Plutonium/enriched uranium/mixed fission product (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objectives of the program are to provide radiation hazard surveillance and maintenance of contaminated surplus facilities. So as to maintain the total safety integrity of the facilities until such time that proper disposal is accomplished.
APPROACH: Periodic air and contamination smear samples are checked for radioactivity level. The data is evaluated and the results are recorded. Samples are taken in the Bldg. 37 - Panhouse No. 1, Bldg. 335 - Juggernaut Reactor Facility, and Building 331 - EBWR reactor shell. Power and maintenance to the surplus facility are to be provided.
RESULTS: Appropriate radiation safety associated with the storage of surplus facilities and appropriate records to verify same.
PROJECT MILESTONES: Continuing surveillance be made and increased as required.
KEYWORDS: SURVEILLANCE;NUCLEAR FACILITIES;RADIATION MONITORING;DECOMMISSIONING;RADIOACTIVE EFFLUENTS;RADIOISOTOPES

<080071>
TITLE: Salvage of Alpha Contaminated Metals
PROJECT NUMBER: 800012
PRINCIPAL INVESTIGATOR: Webster, D.S.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-W-31-109-Eng-38
77 FUNDING: Energy Research and Development Administration FY77:$59,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION/Alpha (100%)
CHARACTER OF STUDY: RESEARCH/Applied (75%);ANALYTICAL (25%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To provide and evaluate techniques for the decontamination of contaminated metals in light of criteria for release, reuse, or disposal.
RESULTS: Assay methods will be monitored and tested. Conceptual flow diagrams will be prepared.
PROJECT MILESTONES: (1) April 1, 1977 Complete identification of current practices used at ERDA sites for release, reuse, and disposal of alpha-contaminated metals. (2) April 1, 1977 Complete experimental program for test of selected methods for the treatment of metallic equipment to provide data on the efficiency of decontamination and the nature of the product. (3) September 30, 1976 Complete summary report.
KEYWORDS: SALVAGE;SOLID WASTES;PLUTONIUM;ALPHA SOURCES;CONTAMINATION;DECONTAMINATION;METALS;MATERIALS HANDLING;MATERIALS RECOVERY;WASTE PROCESSING;RECYCLING

<080072>
TITLE: Environmental Control Technology for Generation of Power from Coal
PROJECT NUMBER: 800057
PRINCIPAL INVESTIGATOR: Sather, N.F.
ADDRESS: Bldg. 12, 9700 South Cass Ave., Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Mott, William E.
TELEPHONE: F233-5225
TYPE OF FUNDING: Contract No.-W-31-109-ENG-38
77 FUNDING: Energy Research and Development Administration FY77:$1,035,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub x/ (50%);METALS/Trace elements (10%);PARTICULATES/Including fines (20%);ORGANICS/Polyaromatic hydrocarbons (10%);SPECIFIED OTHER POLLUTANTS/Waste solids (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To provide the Division of Environmental Control Technology with comparative engineering/cost assessments of environmental control technologies for processes for generation of electric power from coal. The power generation processes to be evaluated include processes under development such as fluidized-bed combustion and coal cleaning/combustion, as well as conventional power plants with stack gas cleaning. All factors that affect the selection of the processes and the pollution control systems will be considered.
APPROACH: Information on the costs, pollution control, reliability, availability and energy requirements of power generation processes and the associate pollution control systems will be compiled from reports and discussion with manufacturers, users and developers of these processes and control technologies. A methodology for comparing alternative coal-electricity processes on the basis of their capacity for cost-effective control of environmental impacts will be developed. A comparative analysis of coal-electricity options will be made during FY 1977; this analysis will be revised in subsequent years as

new information from utility installations and process development facilities becomes available. It is planned that subcontractors will be employed to compile and evaluate information on specific control technology areas.
SULTS: The product of the program will be a series of semi-annual reports beginning in October 1977 that describe the current status of development of control technologies for power generation processes. The end-of-year reports issued each October will present the results of the comparative assessments of cost-effective environmental control of alternative coal-electricity processes.
PROJECT MILESTONES: (1) 10/1/76 Environmental Control Technology (ECT) Status Report. (2) 4/1/77 FY 77 Interim Report. (3) 10/1/77 FY 77 Final Report on Assessment of ECT for Coal-Electricity Processes. (4) 4/1/78 FY 78 Interim Report. (5) 10/1/78 FY 78 Final Report on Assessment of ECT for Coal-Electricity Processes.
KEYWORDS: ENVIRONMENTAL CONTROL TECHNOLOGY;COAL;ENERGY;COST;ELECTRIC POWER;COMBUSTION;POLLUTION;CONTROL;POWER GENERATION;HYDROCARBONS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS;PARTICLES

<080073>
TITLE: Identification of Refractory Organic Compounds in Treated Refinery Wastewater
PROJECT NUMBER: 800058
PRINCIPAL INVESTIGATOR: Raphaelian, L.A.
ADDRESS: Argonne National Laboratory, Energy and Environmental Systems Division, 9700 S. Cass Ave., Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000; Energy Research and Development Administration FY77:$77,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (80%);WASTE MANAGEMENT (20%)
POLLUTANTS: ORGANICS/Petroleum and refractory (100%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);DEVELOPMENT/Pilot plant (20%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Plant locations
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To determine at four oil refineries presently using activated sludge for wastewater treatment: (1) The effectiveness of their present wastewater treatment. (2) The usefulness of a secondary treatment consisting of activated carbon as outlined in EPA's ''Refining Guidelines Document,'' the standard for 1983 ''Best Available Treatment Economically Achievable (BATEA).''
APPROACH: By Gas Chromatography/Mass Spectrometry, each specific organic and its concentration will be determined at the following sampling points: (1) At the influent of the activated sludge treatment plant. (2) At the effluent of the activated sludge treatment plant. (3) At the effluent of the activated carbon treatment.
RESULTS: It is expected that many of the organics present in the influent to the activated sludge treatment will be broken down and missing from the effluent and certain new organics will have been produced. Many of the organics in the effluent of the activated sludge will be eliminated by the activated carbon filter. From the data generated, the effectiveness of activated sludge and activated sludge/activated carbon wastewater treatment can be evaluated.
PROJECT MILESTONES: (1) Development of a suitable method for extracting organics from water samples 31/3/76. (2) Development of GC columns for separating complex mixtures of organics and establishment of limits of detection on the GC/MS/Data System 30/9/76. (3) Setting up collection equipment at oil refineries and collection of samples at four refineries 30/9/76; 31/12/76; 31/3/77; 30/6/77. (4) Isolation and analysis of organics in collected samples of four refineries 31/12/76; 30/6/77; 31/12/77; 30/6/78. (5) Analysis and interpretation of data. Ongoing through 30/6/78. (6) Preparation of final report 30/9/78.
KEYWORDS: PETROLEUM INDUSTRY;ENVIRONMENTAL EFFECTS;PETROLEUM REFINERIES;WASTE WATER;REFRACTORIES;QUANTITATIVE CHEMICAL ANALYSIS;WATER POLLUTION;ACTIVATED SLUDGE PROCESS;ORGANIC COMPOUNDS;SAMPLING;CARCINOGENS;CHEMICAL EFFLUENTS;HYDROCARBONS;MEASURING INSTRUMENTS;ACTIVATED CARBON;WASTE PROCESSING

<080074>
TITLE: Environmental Control Technology Survey of Selected U.S. Strip Mining Sites
PROJECT NUMBER: 800109
PRINCIPAL INVESTIGATOR: Johnson, D.O.
ADDRESS: Argonne National Laboratory, EES-12, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Mott, William E.
TELEPHONE: F233-5225
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$125,000; Energy Research and Development Administration FY77:$270,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (90%);PROCESSING, CONVERSION (2%);WASTE MANAGEMENT (8%)
POLLUTANTS: METALS/In mine drainage (25%);PARTICULATES/In mine drainage (25%);ORGANICS/In coal (25%);SPECIFIED OTHER POLLUTANTS/Major, minor and trace elements in mine drainage, coal, and coal overburden (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;HYDROGRAPHIC AREAS/Other hydrographic areas Numerous river basins
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To identify sites east of the 100th meridian where surface mining is likely to increase over the next 20 years. To intensely study these sites to obtain a data base from which to assess potential health and environmental impacts from their being mined. To assess the effectiveness of the control technology utilized and examine alternatives. To develop a matrix which will recommend control technologies for new or expanding mines to allow those mines to operate in an environmentally safe manner. To recommend future R and D needs and priorities in environmental control technology.
APPROACH: Survey future coal production areas and select case study sites. Bi-weekly sampling and analyzing of site effluents, collecting and analyzing of climatic, hydrologic, and geologic data. Project site impacts and extrapolate for coal regions. Examine control technology economics and efficiency. Include waste product disposal/reclamation. Matrix site characteristics, control technology practices, and effectiveness of treatment. Analyze matrix and make recommendations for alternatives to existing

technologies and for future R and D needs.
RESULTS: Reports on: (1) 20-year overview of new and expanded surface mining areas and resultant health and environmental impacts. (2) 20-year overview of mining methodology and technology. (3) Control technology effectiveness, economics, and waste products. (4) Evaluation of newly promulgated effluent limitations guidelines. Development of site specific predictive matrix to recommend effluent control technology for existing or expanding mines. Report on control technology research and development needs and priorities.
PROJECT MILESTONES: Milestones being revised to reflect recent decision to extend program through FY 1978. Dates below are current. (1) Report on 20-year overview of new or expanded surface mine production areas and related technology development trends. Report on case study site selection--criteria and rationale July 1, 1976. (2) Report on 20-year projection of potential health and environmental impacts related to increased surface mining based on effluent volume and characteristic data collected at case study sites. (3) Report on effluent control technology effectiveness, economics, and waste product problems. Report on comparison and evaluation of program data with effluent limitations guidelines. Computer storage of information July 1, 1977. (4) Final report with site specification predictive matrix capability to recommend effluent control technologies for existing or expanding mines. Report on control technology research and development needs and priorities October 1, 1977.
KEYWORDS: MINING;HEALTH HAZARDS;ENVIRONMENTAL EFFECTS;DATA ACQUISITION;COAL MINES;ECONOMICS;RECOMMENDATIONS;POLLUTION;WASTE DISPOSAL;CHEMICAL EFFLUENTS;SULFUR COMPOUNDS;WASTE WATER

<080075>
TITLE: Chemical Characterization of Aerosols
PROJECT NUMBER: 2239
PRINCIPAL INVESTIGATOR: Cunningham, P.
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-4488;C(301)353-4488
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (80%);DEVELOPMENT/Laboratory scale (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To develop for the greater Northeastern U.S. a data base on the distribution and chemical analysis of ambient aerosol pollutants and relate these to energy related sources.
APPROACH: The program will provide for the collection and chemical (molecular) characterization of size and time classified atmospheric aerosols samples obtained at a series of selected sites (3-4) in the N.E. USA. Specific attention will be given to the amount of sulfate present and the degree of acidity in the collected aerosols.
RESULTS: Four hour samples will be taken using a Lundgren impactor sampler and evey fifth one will be analyzed. Particle acidity will be determined by IR spectroscopy with emphasis on sulfate and nitrate species in the 0.3-0.1 mu m diameter particle size range.
PROJECT MILESTONES: FY 77 Select and establish four sites for collection of samples for analysis of aerosol samples. (Sites already identified are at Penn State Univ., Univ. of Virginia and B.N.L.)
KEYWORDS: INSTRUMENTATION;AEROSOLS;CHEMICAL ANALYSIS;DATA COMPILATION;AIR POLLUTION;ENERGY SOURCES;PARTICLE SIZE;SULFUR COMPOUNDS;SPECTROSCOPY;NITROGEN COMPOUNDS;SAMPLING;CHEMICAL PROPERTIES;MEASURING METHODS

<080076>
TITLE: Oxygen Isotope Radiostudies of Sulfur Dioxide
PROJECT NUMBER: 1749
PRINCIPAL INVESTIGATOR: Cunningham, P.
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David
TELEPHONE: F233-4488;C(301)353-4488
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine whether oxygen isotopic analysis can be used to differentiate the mechanism of sulfate formation in the atmosphere.
APPROACH: Samples of ambient atmosphere are collected seasonally and analyzed for the isotopic ratio of O16, O18 in SO2 and sulfates and water vapor and the results tested against models for the mechanism of sulfate formation.
RESULTS: The oxygen-isotopic ratio in both atmospheric water vapor and precipitation showed a marked seasonal variation with both phases being relatively more depleted in O18 during winter months. Water vapor is depleted in O18 compared to condensed water by about 10% at all times of the year. The oxygen isotopic ratio of SO2 showed marked seasonal variation similar to atmospheric water vapor but significant deviations were also noted. Oxygen isotopic ratio of aerosol sulfate showed no seasonal variation but sulfate found in precipitation does appear to have an oxygen isotopic ratio similar to the water with

which it is associated.
PROJECT MILESTONES: Continue collection and analyses to confirm seasonal trends and collect samples of dry deposition and observe trends at other locations.
KEYWORDS: OXYGEN ISOTOPES;AIR POLLUTION;SULFATES;AEROSOLS;ISOTOPE RATIO;SULFUR DIOXIDE;OXYGEN 16;OXYGEN 18;WATER VAPOR;SEASONAL VARIATIONS;ENVIRONMENTAL EFFECTS;CHEMICAL REACTIONS

<080077>
TITLE. Assessment of Once-through Cooling Water Control Technology
PROJECT NUMBER: 800190
PRINCIPAL INVESTIGATOR: Ditmars, J.D.
ADDRESS: Energy and Environmental Systems Division, Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology Division
MONITOR: Grua, Charles
TELEPHONE: F233-5517
TYPE OF FUNDING: Contract No.-W-31-109-ENG-38
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (60%);CONSERVATION/Improved conversion efficiency (20%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;COASTS/Other coasts All coasts;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: (1) Assessment of the efficacy of once-through cooling systems, i.e. surface and submerged discharges, for electric power generation. (2) Evaluation of statistical bases for the prediction of once-through cooling water system performance.
APPROACH: (1) Various once-through cooling system characteristics are compared with applicable water quality standards and guidelines for thermal discharges. (2) Prototype data from Argonne thermal plume measurements are used in the evaluation of statistical approaches to once-through cooling system prediction.
RESULTS: (1) Recommendations on the efficacy of once-through cooling systems for a variety of receiving water environments. (2) Recommendations on the validity of statistical bases for once-through cooling system performance and design.
PROJECT MILESTONES: July 1978 Report on once-through cooling system efficacy; August 1978 Report on statistical basis approach; September 1978 Final project report.
KEYWORDS: EFFLUENTS;ONCE-THROUGH COOLING SYSTEMS;ELECTRIC POWER;ENVIRONMENTAL EFFECTS;THERMAL EFFLUENTS;STATISTICS;RECOMMENDATIONS;EFFICIENCY;PLUMES;WASTES;WATER

<080078>
TITLE: Identification, Transport and Conversion of Energy-Related Pollutants in the Environment-Oceans-Fate of Nuclear Pollutants-Disposal and Dumping
PROJECT NUMBER: 2521
PRINCIPAL INVESTIGATOR: Edgington, D.N.
ADDRESS: Argonne National Laboratory, 9700 So. Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-W-31-109-ENG-38
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Transuranics;METALS/Fission products (50%);RADIATION/Transuranics;RADIATION/Fission products (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Site specific England;COASTS/Other coasts Irish Sea;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To develop an understanding of processes that govern the physical, chemical and biological behavior of plutonium, americium and other transuranic elements under oceanic conditions associated with waste disposal.
APPROACH: Sampling and analysis of the water, sediments and biota of the Irish Sea where the UK discharges wastes from their nuclear fuel reprocessing plant. Initial emphasis is on the characterization of chemical form, molecular weight, charge and oxidation state of the transuranics in the environment. Subsequently, biogeochemical processes will be studied.
RESULTS: Quantitative models depicting the interactions and fate of transuranics in the ocean environment of temperate latitudes.
KEYWORDS: FATE;PLUTONIUM;AMERICIUM;TRANSURANIUM ELEMENTS;WASTE DISPOSAL;CHEMICAL ANALYSIS;SAMPLING;SEAS;SEDIMENTS;AQUATIC ORGANISMS;CONTAMINATION;CHEMICAL PROPERTIES;BIOGEOCHEMISTRY;FUEL REPROCESSING PLANTS;ENVIRONMENTAL EFFECTS;POLLUTION;OCEANOGRAPHY;RADIOISOTOPES

<080079>
TITLE: Research Vessel Support
PROJECT NUMBER: 2448
PRINCIPAL INVESTIGATOR: Edgington, D.N.
ADDRESS: Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Field investigations which represent a major portion of the Great Lakes Research Program require the periodic use of research vessels for sampling and other in situ experimental activities. These vessels are required to be equipped for deepwater limnological studies and must be capable of operating in the open lakes.
APPROACH: Shiptime is leased from other midwestern research groups who are so equipped.
KEYWORDS: TRANSPORTATION;SUPPORT;RESEARCH PROGRAMS;GREAT LAKES;LIMNOLOGY;SHIPS

<080080>
TITLE: Environmental Control Technology Survey of Selected U.S. Strip Mining Sites
PROJECT NUMBER: 800109
PRINCIPAL INVESTIGATOR: Johnson, D.O.
ADDRESS: Argonne National Laboratory, EES-12, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Mott, William E.
TELEPHONE: F233-5225
TYPE OF FUNDING: Contract No.-W-31-109-ENG-38;Agency in-house effort;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (90%);PROCESSING, CONVERSION (2%);WASTE MANAGEMENT (8%)
POLLUTANTS: METALS/In mine drainage (25%);PARTICULATES/In mine drainage (25%);ORGANICS/In coal and in mine drainage (25%);SPECIFIED OTHER POLLUTANTS/Major, minor, and trace elements in mine drainage, coal, and coal overburden (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;HYDROGRAPHIC AREAS/Other hydrographic areas Numerous river basins
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: (1) To identify sites east of the 100th meridian where coal surface mining is expected to increase over the next 20 years. (2) To intensely study these sites to obtain a data base from which to assess potential health and environmental impacts of increased coal surface mining. (3) To assess the effectiveness of the control technologies utilized and examine alternatives. (4) To recommend control technologies for new and expanding mines to allow those mined to operate in an environmentally safe manner. (5) To recommend future R and D needs and priorities in environmental control technology.
APPROACH: (1) Survey future coal production areas and select case study sites. (2) Bi-weekly sampling and chemical analyses of sites effluents; also sampling and analyses of coal, overburden, and sediments/sludges; also collection and analysis of climatic, hydrologic, and geologic data. Project site impacts and extrapolate for coal regions. (3) Examine control technologies' efficiency and economics, including waste product(s) disposal/utilization. (4) Matrix site characteristics, control technology practices, and treatment effectiveness. (5) Make recommendations for alternatives to existing technologies and future R and D needs.
RESULTS: Reports on: (1) 20-year overview of new and expanded surface mining areas and resultant health and environmental impact; (2) 20-year overview of mining, methodology and technology; (3) control technology effectiveness, economics, and waste products; and (4) evaluation of newly promulgated EPA effluent limitations guidelines. Development of matrix to recommend control technology for existing or expanding mines. Report on control technology research and development needs and priorities.
PROJECT MILESTONES: (FY 77, 78, and 79) (1) Report on 20-year overview of new or expanded surface mine production areas and related technology development trends. Report on case study site selection, criteria, and rationale 12/77. (2) Report on 20-year projection of potential and environmental impacts related to increased surface mining based on effluent volume and characteristics data collected at case study sites 3/78. (3) Report on effluent control technology effectiveness, economics, and waste products; report on alternative processes, including availability and economics; develop computer storage information system 6/78. (4) Report on preliminary study of priority pollutants (organics and metals) in surface coal mine drainage, including discussion of control technology effectiveness and recommendations for control technology research 6/78. (5) Report on comparison and evaluation of program data with effluent limitations guidelines. Hold conferences with participating states regarding guidelines applicability and validity 9/78. (6) Final report including matrix to recommend effluent control technologies for existing or expanding mines. Report on control technology research and development needs and priorities 3/79.
KEYWORDS: COAL MINING;SURFACE MINING;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;REGIONAL ANALYSIS;AIR POLLUTION;WATER POLLUTION;HAZARDOUS MATERIALS;LAND USE;CHEMICAL EFFLUENTS;WASTE MANAGEMENT;ENVIRONMENTAL TRANSPORT;CALCIUM;SODIUM;IRON;MANGANESE;ALUMINIUM;COPPER;ZINC;SULFATES;CHLORIDES;FLUORINE;STRONTIUM;MAGNESIUM;AMMONIA;POTASSIUM;MERCURY;CADMIUM;COBALT;CHROMIUM;ANTIMONY;ARSENIC;SILVER;VANADIUM;MOLYBDENUM;NICKEL;LED;BERYLLIUM;SELENIUM;THALLIUM;TRACE AMOUNTS

Energy Research and Development Administration/Brookhaven National Laboratory

<081001>
TITLE: Plant Physiology
PROJECT NUMBER: 000005
PRINCIPAL INVESTIGATOR: Hillman, W.S.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$100,000

TECHNOLOGY: SOLAR/Biomass (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/General (100%)
ARACTER OF STUDY: RESEARCH/Laboratory (100%)
GIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The effects of intermittent environmental stress by agents such as chemicals or extreme temperature frequently depend on timing. Day or night exposures, even exposures a few hours apart, may have drastically different actions. The long term goals of this project are the understanding of timed environmental responses, with a view to their possible modification.
APPROACH: As a model of timed responses, photoperiodism, the control of development by the daily duration of light, has been chosen for study. Experiments are in progress with Lemna perpusilla, a photoperiodic plant, grown in axenic, biochemically defined and usually heterotrophic conditions. By varying the medium, the course of carbon dioxide output can be made to reflect the actions of two known components of plant photoperiodism: the light-absorbing pigment, phytochrome, and a circadian rhythm (or ''biological clock'').
RESULTS: The immediate objective is information on the biochemical results of photoperiodically effective light-dark schedules, using carbon dioxide flux and the underlying metabolic changes as probes. The data obtained should also bear on photorespiration and other metabolic control phenomena that affect the overall photosynthetic efficiency, and thus the productivity, of higher plants in general.
PROJECT MILESTONES: (1) 1-10-77 Improved CO/sub 2/-monitoring system capable of assaying CO/sub 2/ over wide concentration range. (2) 1-10-77 Determination of role of nitrogen source in modifying photoperiodic and circadian rhythm. (3) 1-7-78 Identification of sources of that CO/sub 2/ output which is modulated by photoperiodism. (4) 1-10-78 Initiate studies of metabolic intermediates to identify reactions controlling indicator patterns in photoperiodism.
KEYWORDS: PLANTS;RESPIRATION;DAILY VARIATIONS;PHOTOSYNTHESIS;PRODUCTIVITY;BIOMASS;CHEMICAL EFFLUENTS;TEMPERATURE EFFECTS

<081002>
TITLE: Genetics and Regulation of the Plant Cell Division Cycle
PROJECT NUMBER: 000006
PRINCIPAL INVESTIGATOR: Van't Hof, J.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$143,000
TECHNOLOGY: NUCLEAR/General (40%);CONSERVATION/General (20%);GENERAL SCIENCE (40%)
POLLUTANTS: ORGANICS/Mutagenesis (30%);RADIATION/X and gamma rays (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of our research are threefold: The first of these is the manner in which chromosomal DNA grows, how this growth contributes to the time required for cell reproduction, and how physical and chemical mutagens affect the growth. The second concerns the effect of physical and chemical mutagens on the controls that determine when cells replicate chromosomal DNA and when they divide. The third objective is to determine the function of proteins needed for recovery of gamma irradiated cells before they proceed to mitosis.
APPROACH: (1) The biological materials used are cultured cells and roots of three plant species: Pisum sativum, Helianthus annuus, and Crepis cappillaris. (2) The analyses fall into four categories that are interrelated: (a) cell kinetics and associated aspects of the cell division cycle, (b) chromosomal DNA fiber replication (replicons) of isolated molecules via autoradiography, electron microscopy, and immuno-fluorescence techniques, (c) identification and translation of recovery and cell cycle related proteins by acrylic gel autoradiography and wheat germ translation system, and (d) cell cycle mutant selection and quantitation with emphasis on the reversible process in plants of single cells reversible organcgenesis which is required to determine effect of mutant cells in complex tissues.
RESULTS: (1) A quantitative description of the relationship between the replicons of the chromosome and the cell cycle duration. (2) The interaction between the mutagen, gamma-azaguanine, the functional state of the replicon, and the induction of polyploidy in Pisum sativum. (3) Identification of the more easily mutable cell cycle genes by common energy-related mutagens. (4) A molecular description of the recovery processes of dividing cells exposed to ionizing irradiation.
PROJECT MILESTONES: The first evaluation of the quantitative effects of single cell mutants on the function of a proliferative, complex tissue.
KEYWORDS: PLANTS;DNA REPLICATION;CELL DIVISION;AUTORADIOGRAPHY;MUTAGENS;BIOLOGICAL EFFECTS;PLANT GROWTH;GAMMA RADIATION;BIOLOGICAL RECOVERY;PLANT CELLS;NITROGEN COMPOUNDS;MUTAGENESIS

<081003>
TITLE: Early and Late Effects of Radiation of Different Quality and at Different Dose Rates
PROJECT NUMBER: 000008
PRINCIPAL INVESTIGATOR: Bender, M.A.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$216,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION/All (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH

EFFECTS
PROJECT DESCRIPTION: Determination of variations in dose-response curves for important biomedical endpoints including cancer induction, mutation and chromosomal aberration production, and cell killing as a function of the microscopic distribution of energy deposition in tissue and of dose rate.
APPROACH: This project, a collaborative venture between the BNL Medical Department and the Columbia University Radiological Research Laboratory, employs a dedicated 4 MeV Van de Graaff accelerator capable of producing monoenergetic neutrons of from 0.1 to about 15 MeV and charged particles ranging up to about 8 MeV. The accelerator is used to irradiate a variety of experimental materials ranging from rats to single human cells in tissue culture for the study of radiation effects, as well as for microdosimetric measurements of energy deposition.
RESULTS: Careful study of the effects of radiations of different LET at various doses and dose rates and in the presence or absence of oxygen allow the validation and extension of theoretical explanations of the biological and physical mechanisms involved in carcinogenesis, mutagenesis and lethality. Determination of these mechanisms will allow the health effects of the exposure of human populations to the low levels of radiation anticipated from nuclear power generation to be accurately estimated.
PROJECT MILESTONES: (1) July 1, 1977 Completion of Track segment irradiation facility to allow irradiation of single cells with narrow bands of energy deposition ranging from about 10 up to about 200 keV/mu for study of lethality and chromosomal aberration production. (2) July 1, 1979 Completion of hardware for single proton microbeam irradiation of selected sites in cells with an accuracy of about 1 mu m.
KEYWORDS: INSTRUMENTATION;NEUTRONS;CHARGED PARTICLES;LET;BIOLOGICAL RADIATION EFFECTS;DOSE-RESPONSE RELATIONSHIPS;CARCINOGENESIS;MUTAGENESIS;DOSE RATES;ANIMAL CELLS;MICE;RADIOSENSITIVITY EFFECTS;NEOPLASMS;DNA;GENETIC RADIATION EFFECTS

<081004>
TITLE: Effects of Energy Derived Pollutants and Deuterium on Immune Systems
PROJECT NUMBER: 000009
PRINCIPAL INVESTIGATOR: Stoner, R.D.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$220,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION/Co-60 gamma-radiation (20%);SPECIFIED OTHER POLLUTANTS/Heavy water (D/sub 2/O) (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Primary emphasis for next two years will be on the effects of ozone and heavy water (D/sub 2/O) on immune reactions. The objectives of these studies on non-nuclear and nuclear energy-related effects on immune systems are directed to the following interdependent areas of study: (1) alteration of antibody responses by exposure of mice to deuterium and pollutants, (2) effects of D/sub 2/O upon anaphylactic shock, (3) alteration of in vitro antigen-antibody reactions, (4) effects of D/sub 2/O on the incidence and time of onset of lymphocytic leukemia in HRS mice, and (5) cellular proliferation in regional and peripheral lymphoid tissues during antibody responses in mice maintained on D/sub 2/O.
APPROACH: (1) It is now apparent that mice seldom survive more than 35 percent substitution of D/sub 2/O for H/sub 2/O in their body water. (2) A preliminary report will be issued in July, 1976 concerning the suppressive effects of D/sub 2/O on antibody responses to tetanus toxoid. (3) A preliminary report may be issued in later 1976 concerning the susceptibility of mice to anaphylactic shock after maintenance of D/sub 2/O. (4) Experiments will be initiated in 1977 concerning in vitro antigen-antibody reactions in the presence of heavy water. (5) Experiments will be initiated in 1977 concerning the effects of D/sub 2/O on the incidence of lymphocytic leukemia in HRS mice (see 189). Initial results would be available in mid-1978.
RESULTS: Preliminary studies in this exploratory research indicate that primary antibody responses are greatly suppressed when mice are maintained on 10 to 40% D/sub 2/O in their drinking water. Higher levels of D/sub 2/O (30-75%) inhibited secondary responses. Even though radiation is not involved with D/sub 2/O, these findings are similar to the radiosensitivity of antibody responses observed in earlier studies after exposure to graded doses of ionizing gamma-radiation. Severe atrophy of the thymus and spleen was observed with the higher amounts of D/sub 2/O. In contrast, lower levels of D/sub 2/O given daily over a period of 60 days resulted in hypertrophy of the thymus and spleen.
PROJECT MILESTONES: (1) A preliminary report will be issued in July 1976, concerning the sensitivity of primary and secondary tetanus antitoxin responses when mice are maintained on graded amounts of D/sub 2/O before and during active immunization to tetanus toxoids. (2) It may be possible to issue a preliminary report by the end of 1976 concerning the effects of D/sub 2/O on sensitivity of mice to anaphylactic shock after maintenance on D/sub 2/O for extended periods of time (weeks and months).
KEYWORDS: DEUTERIUM;POLLUTION;BIOLOGICAL EFFECTS;IMMUNE REACTIONS;PATHOLOGICAL CHANGES;ANIMALS;DISEASES;INTAKE;TOXICITY;DRINKING WATER;GAMMA RADIATION

<081005>
TITLE: Plant Biochemistry
PROJECT NUMBER: 000011
PRINCIPAL INVESTIGATOR: Siegelman, H.W.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$155,000
TECHNOLOGY: SOLAR/General (50%);SOLAR/Biomass (50%)
ENERGY CYCLE: EXTRACTION (20%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (10%)
POLLUTANTS: METALS (30%);ORGANICS (10%);RADIATION (40%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)

REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
OJECT DESCRIPTION: We are determining the structure and function of the solar energy capturing pigment systems of marine and freshwater phytoplankton. These studies provide information on the effects of environmental factors including effluents from power generating on the growth of the primary producers. We are particularly interested in the red tide dinoflagellate algae which are important as a food resource for marine animals and are toxic to man.
APPROACH: We have developed reproducible large-scale culture procedures for growing marine phytoplankton. The algae are grown under varied environmental conditions and growth is measured either by cell number or biomes. Biochemical and physiological studies on phytoplankton include effects of environmental factors on toxin production in dinoflagellate algae. We will examine enzymes concerned with nutrient uptake of phytoplankton.
RESULTS: The effects of effluents associated with power generation in the marine environment may be beneficial if properly managed. These studies will provide information on those nutritional and physical factors which regulate phytoplankton growth. Knowledge of the regulating factors for phytoplankton growth will allow management to achieve optimal productivity and to control undesirable phytoplankton such as toxic red tides. Marine productivity is completely dependent on phytoplankton productivity.
PROJECT MILESTONES: (1) 1977 The structures of the toxins of Gonyaulux tamarensis, the red tide organisms of the northeast coast, will be determined. (2) 1978 An analysis of the environmental factors which regulate phytoplankton growth will be made.
KEYWORDS: FLORA;PHYTOPLANKTON;PIGMENTS;BIOCHEMISTRY;CHLOROPHYLL;ENERGY TRANSFER;ALGAE;MIGRATION;SEAWATER;TOXINS;PHOTOSYNTHESIS;PLANTS;WATER

<081006>
TITLE: The Fine Structure of Cells
PROJECT NUMBER: 000012
PRINCIPAL INVESTIGATOR: Ledbetter, M.C.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$127,000
TECHNOLOGY: SOLAR/General (30%);SOLAR/Biomass (20%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project seeks a better understanding of the relationships between structure and function in tissues, cells, and cellular organelles. These relationships will be determined for organisms undergoing normal differentiation and development to establish a basis for interpreting cellular and organismal responses to various environmental factors. Among the environmental factors to be studied will be light and temperature regimes, chemical agents, gravity, and high flux magnetic fields. The principal tools are microscopes of three types: (1) conventional high resolution transmission electron microscopes for the study of ultra thin specimens especially sections, replicas, and isolated macromolecules; (2) a moderate resolution scanning electron microscope utilizing secondary electrons to reveal surface topography, and detection of light emitted by cathodoluminescence; and (3) a high resolution scanning transmission electron microscope available under Dr. J. Wall's project, to study biological structures through the use of specific heavy atom labeling and to study thick sections for three-dimensional reconstruction.
APPROACH: The areas of investigation using these electron microscopes are: (1) The relationship of plant cell organelles, especially microtubules, to wall synthesis. Cells will be examined from plants grown under regimens known to influence wall deposition, and cell division (to study new walls), and under environmental influences expected to affect wall formation. The fine structure of cytoplasm will be examined by TEM of thin sections, by SEM of wall and cytoplast surfaces, and by STEM of thick sections. (2) The formation of antigen by Trichinella worms. Isolated worms from the host will be studied by SEM using antibody labeled variously for cathodoluminescence to determine the sites of antigen secretion. (3) Drug synthesis, transport, and accumulation in opium poppy (Papaver) and marijuana (Cannabis). Sites of drug synthesis will be sought at the cellular and organelle level. Developmental aspects of laticifer (in Papaver and Cannabis) and gland development (in Cannabis) will be determined by TEM as related to drug transport and accumulation in cultivars of known high and low drug yield. Morphological changes which accompany floral initiation by environmental induction will be determined by SEM for Papaver. (4) Environmental effects on embryogenesis in carrot cell cultures. Embryos grown in weightless conditions (Kosmos 782 K-102) will be examined to determine morphogenic responses at the organismal and cellular level detectable by SEM or TEM.
RESULTS: Studies with Drug Plants. The relation of epidermal glands of marijuana to drug production will be determined for cultivars of known high and low drug content. Response of the shoot apex of opium poppy to floral induction will be examined. Antigen Formation in Trichinella. Freshly prepared fluorescent-labeled antibody will be used to determine bound antibody distribution on worms by SEM-cathodolumiescence. Plant Cell Wall Formation. The distribution of microtubules relative to other cell organelles and microtubule length will be determined in the cytoplasm adjacent to side and end walls of root meristematic cells. Various stages of mitosis and the new walls following cytokinesis will be explored. Thick sections and serial thin sections for TEM will be used as necessary. Embryogenesis in Carrot Culture. Comparisons will be made in fine structure between embryos which developed under weightless conditions and controls.
KEYWORDS: ORGANELLES;PLANT CELLS;ELECTRON MICROSCOPY;ORGANOIDS;ANTIGENS;BIOSYNTHESIS;TRICHINELLA;ANTIBODIES;DRUGS;PAPAVER SOMNIFERUM;PLANTS;MORPHOLOGICAL CHANGES;CARROTS;EMBRYOS;CELL WALL;VISIBLE RADIATION;TEMPERATURE EFFECTS;GRAVITATION;MAGNETIC FIELDS;IMMUNE REACTIONS;BIOLOGICAL EFFECTS;PHOTOSYNTHESIS;PLANTS;TISSUES;FINE STRUCTURE

<081007>
TITLE: Protein Chemistry
PROJECT NUMBER: 000013
PRINCIPAL INVESTIGATOR: Shaw, E.N.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$222,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To devise sensitive assay methods for analyzing tissue levels of proteases thought to be involved in carcinogenesis and the development of emphysema. (2) To synthesize selective protease inhibitors for the analysis of the role of a given enzyme in the pathological process and to provide a method for treatment.
APPROACH: New substrates are produced by synthesis to yield fluorescent products for increased sensitivity. Specific inhibitors are devised by employing affinity labelling. The inhibitors are substrate-like and inactivate target enzymes by chemical reaction. The enzymes of interest are plasminogen activator, plasma kallekrein and elastase. Synthesis and evaluation of the effectiveness of inhibitors will be carried out on purified enzyme preparations. Application to in vivo systems will be by collaboration.
RESULTS: Useful methods of improved analysis and treatment are expected.
PROJECT MILESTONES: (1) Improved assay methods for elastase 1978. (2) Plasminogen activator 1978. (3) Selective inhibitors of the above 1980.
KEYWORDS: ENZYMES;BIOCHEMISTRY;CARCINOGENESIS;SUBSTRATES;HYDROCARBONS;INHALATION;LUNGS;PATHOGENESIS

<081008>
TITLE: Photosynthesis
PROJECT NUMBER: 000016
PRINCIPAL INVESTIGATOR: Olson, J.M.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: SOLAR/General (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: COASTS/Other coasts Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the structure of the solar energy conversion system in green photosynthetic bacteria in order to further the long-range goal of developing solar energy converters based on biological principles and able to compete with silicon cells in cost and efficiency.
APPROACH: To break down the bacterial energy conversion system into its component parts by conventional biochemical techniques and to characterize each part by spectrophotometry, electron spin resonance spectroscopy, and polyacrylamide gel electrophoresis. Further to elucidate the organization of the parts in various subsystems and in the intact energy conversion system by x-ray diffraction and electron microscopy.
RESULTS: The isolation and characterization of the photochemical reaction center.
PROJECT MILESTONES: (1) Isolation of a photochemical reaction center free of light-harvesting chlorophyll. (2) Determination of the structure of a reaction-center containing membrane and its relationship to bacteriochlorophyll a-proteins. (3) Determination of the structure of a chlorobium vesicle and its aggregated chlorobium chlorophyll.
KEYWORDS: BACTERIA;PHOTOSYNTHESIS;SOLAR ENERGY CONVERSION;PHOTOCHEMISTRY;CHLOROPHYLL;BIOCHEMISTRY;MOLECULES

<081009>
TITLE: Structure, Function and Biological Activity of Naturally Occurring Proteinase and Peptidase Inhibitors
PROJECT NUMBER: 000017
PRINCIPAL INVESTIGATOR: Greene, L.J.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To determine the role of the vasoactive peptides bradykinin and angiotensin in inflammatory processes in the lung. (2) To establish the nature of tissue protease inhibitors which normally protect against degradative influences.
APPROACH: Biochemical methods of analysis are being devised for the characterization of minute amounts of

peptide hormones. Normal tissue inhibitors are being isolated and purified; some from snake venom are also studied to provide unique tools for physiological investigation.
RESULTS: The results are expected to clarify the role a group of hormones may play in the development of pathogenesis in the lung and to suggest methods for treatment.
KEYWORDS: INFLAMMATION;LUNGS;ENZYMES;PHYSIOLOGY;INHIBITION;HORMONES;BIOCHEMISTRY;LUNGS;PATHOGENESIS

<081010>
TITLE: Nucleic Acid Structure
PROJECT NUMBER: 000019
PRINCIPAL INVESTIGATOR: Studier, F.W.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To understand basic genetic processes such as regulation of gene expression, replication of DNA and genetic recombination at the molecular level. A simple system is being studied so that a complete understanding might be possible, but techniques and concepts developed and tested in this system should be applicable to more complex systems as well.
APPROACH: A combination of genetic and biochemical techniques are being applied to the study of bacteriophage T7 and its host, E. coli. Approximately 30 T7 genes have been identified, and mutations have been found in 25 of them. The protein specified by each T7 gene has been identified by gel electrophoresis. T7 DNA is being analyzed by cutting with specific restriction endonucleases, and specific signals for transcription, RNA processing, translation and replication are being identified and mapped. Functions of T7 genes involved in regulation of gene expression and replication are being analyzed by using appropriate mutants. Ability of gel electrophoresis to resolve different forms of native and single-stranded DNAs is being defined.
RESULTS: We soon expect to understand completely how T7 DNA is transcribed after infection, and the role of each T7 and E. coli gene involved in this process. Eventually, replication of T7 DNA should be understood in the same detail. The limits in the ability of gel electrophoresis to resolve large DNA molecules are being tested. The T7 system and the techniques developed for analyzing it are finding wide application in studies of the detailed biological effects of mutagens, carcinogens and radiation.
KEYWORDS: DNA REPLICATION;GENE RECOMBINATION;BACTERIOPHAGES;ESCHERICHIA COLI;ENZYMES;MOLECULAR STRUCTURE;BACTERIA;DNA;GENETICS;MOLECULES;RNA;VIRUSES

<081011>
TITLE: Energy Transduction in Chloroplasts
PROJECT NUMBER: 000020
PRINCIPAL INVESTIGATOR: Hind, G.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: SOLAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Manganese;METALS/Magnesium;METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To define the sequence and kinetics of interaction of electron-carrying components in the photosynthetic membranes of plants. (2) To determine the ion permeability characteristics of photosynthetic membranes in dark and light, and find which ion movements accompany the establishment and relaxation of the trans-membrane proton gradient. This basic knowledge will aid in the development of a photoelectrodialysis device (see Project 001827). It is also important to understand how light intensity regulates the terminal rate-limiting steps of photosynthesis.
APPROACH: (1) Sensitive differential absorption spectrophotometry in the visible and ultraviolet is coupled with computerized data retrieval and analysis to resolve the complex spectra of electron transport pigments in chloroplasts and thus their role in electron transport in transient and photostationary states. (2) Ion specific electrodes are employed to monitor simultaneously the ion fluxes induced by light in suspensions of isolated chloroplasts. Ionophase antibiotics are used as an exploratory tool to modify membrane permeability. They are also incorporated into inert synthetic membrane matrices to give ion-specific electrodes of required selectivity. These electrodes could find application in monitoring for metal pollutants.
RESULTS: (1) The role of quinones and cytochromes in photosynthetic electron transport will hopefully be resolved in the long term. Near term goals include an understanding of the function of b-type chromosomes. (2) The interaction of illuminated chloroplasts with Mn is under study. The light-induced movements of ions in intact CO/sub 2/-fixing chloroplasts and in intact protoplasts will be investigated as a measure of the ion redistribution across the various cell membranes which must accompany the onset of photosynthesis.
PROJECT MILESTONES: (1) 1-10-76 Understand significance of light-driven Mn uptake by chloroplasts. (2) 1-10-77 Conclude development of Mn-selective electrode. (3) 1-10-78 Determine entire pattern of light-induced ion fluxes in intact green cells. (4) 1-10-79 Elucidation of role of b-type cytochromes in photosynthetic electron transport. (5) 1-10-81 Elucidation of role of quinones cytochromes in photosynthetic electron transport.
KEYWORDS: PHOTOSYNTHESIS;CHLOROPLASTS;ENERGY TRANSFER;ELECTRON TRANSFER;CYTOCHROMES;IN VITRO

<081012>
TITLE: Study of Biological Structures by X-ray and Neutron Diffraction
PROJECT NUMBER: 000021
PRINCIPAL INVESTIGATOR: Schoenborn, B.P.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$480,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (5%);RADIATION (5%)
CHARACTER OF STUDY: RESEARCH/General (60%);DEVELOPMENT (40%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Determine basic concepts of biological structures and relate molecular architecture to functional properties. Apply structure dependent interactions to biomedical problems like pollutant effects on enzymatic systems.
APPROACH: Structural investigations are being carried out by neutron and x-ray scattering techniques. In order to facilitate such scattering investigations, large high efficiency 2-dimensional counters and beam optical devices are being developed.
RESULTS: Determine the role of water of hydration and hydrogen atoms on enzyme kinetics and specificity. Development of scattering techniques for the analysis of biological complex structures like ribosomes and membranes. Determination of the protein distribution in the 30S subunit of ribosomes Completion of search for agents similar to dichloromethane that prevent sickle cell anemia.
PROJECT MILESTONES: Refinement of myoglobin structure localizing all H atoms. Localization of proteins in riboscmal subunits. Evaluation of light induced structural changes in retinal rods. Characterization of the interactions of anesthetics with proteins, i.e., prevention of sickle cell anemia by dichloromethane and other anesthetics.
KEYWORDS: X-RAY DIFFRACTION;NEUTRON DIFFRACTION;MOLECULAR STRUCTURE;POLLUTION;BIOLOGICAL EFFECTS;ENZYMES;SCATTERING;OPTICAL SYSTEMS;HYDROGEN;RIBOSOMES;MEMBRANES;MYOGLOBIN;METABOLISM;SPECIFICATIONS;BIOCHEMISTRY;BLOOD;DISEASES;HYDRO ARBONS;MOLECULES;THERMAL NEUTRONS

<081013>
TITLE: Neutron Diffraction Studies of Protein
PROJECT NUMBER: 000022
PRINCIPAL INVESTIGATOR: Kossiakoff, A.A.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: The detailed study of the high resolution protein structure of alpha-thymotrypsin to determine and classify the ordered water structure which interacts with the protein molecule. Also to study the protonation states of the chemically important amino acids in chymotrypsin at varied pH's.
APPROACH: The study will be performed using neutron diffraction. Neutron diffraction has a great advantage over the conventional x-ray technique when studying problems involving protons and water structure. The data will be collected at the HFBR using the recently developed two dimensional counter system. The initial chymotrypsin phasing model will be taken from the previously determined x-ray structure and then refined with the neutron data to obtain an accurate set of neutron phases.
RESULTS: A detailed model including the water structure and protonation states of the proteolytic enzyme chymotrypsin. Such a study has not yet been done on an enzyme and will be of general interest to many scientists working in related fields.
PROJECT MILESTONES: (1) Data collected to 1.5 A resolution 10/1/76. (2) Structure refinement and interpretation 4/1/77.
KEYWORDS: PROTEINS;MOLECULAR STRUCTURE;PH VALUE;NEUTRON DIFFRACTION;PROTONS;WATER;CHYMOTRYPSIN;BIOCHEMISTRY

<081014>
TITLE: Function of DNA Polymerases and the Effects of Environmental Contaminants on DNA Replication
PROJECT NUMBER: 000023
PRINCIPAL INVESTIGATOR: Popenoe, E.A.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (15%);PROCESSING, CONVERSION (15%);COMBUSTION OR END USE (20%)
POLLUTANTS: ORGANICS/Hydrocarbons (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: In order to understand the mechanism of action of mutagens and carcinogens, a much clearer understanding is needed of the mechanism of DNA replication in cells of higher organisms. The

objective of this project is to contribute to this understanding. Specifically it aims to determine whether the function of the three known DNA polymerases is for normal DNA replication, repair, or some as yet unknown function. It further aims to locate the DNA polymerases within a cell during the cell cycle, and in specific cells in a mixed population such as tissue.
APPROACH: Anti-DNA polymerases beta antibodies will be tested for ability to inhibit DNA polymerases from a variety of sources, including viral reverse transcriptases. The antibodies will be used to locate the polymerase microscopically in sections of various human tissues by labeled antibody techniques. Antibodies will be prepared against polymerase alpha from a suitable human source for similar studies. Isolated nuclei from red cells of anemic chickens, which contain almost exclusively polymerase beta, yet can synthesize DNA, will be studied to determine whether this synthesis is repair or replication and whether the type of synthesis can be modified by addition of purified polymerase alpha.
RESULTS: These studies are expected to add considerable new insight into the location of the individual DNA polymerases in cells and tissues in different stages of proliferative activity, and into their function in the processes of DNA replication and repair.
PROJECT MILESTONES: (1) September 30, 1976 Study on inhibitory action of at least one metal completed. Begin studies on misreading of genetic message. Begin studies on metal inhibition of DNA polymerase alpha. (2) March 30, 1977 Studies on action of at least one metal on fidelity of replication to be completed.
KEYWORDS: CARCINOGENS;MUTAGENS;BIOLOGICAL EFFECTS;DNA REPLICATION;POLYMERASES;CELL CYCLE;BIOCHEMISTRY;DNA;ENZYMES;IN VITRO;MOLECULES

<081015>
TITLE: Effect of Chemicals and Radiation on Control of Hemopoiesis
PROJECT NUMBER: 000024
PRINCIPAL INVESTIGATOR: Cronkite, E.P.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$514,000
TECHNOLOGY: FOSSIL FUEL/General (10%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (60%);FOSSIL FUEL/Oil Shale (10%);GENERAL SCIENCE (20%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (10%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS/Ozone (10%);METALS/Heavy (5%);PARTICULATES/Sulfates (20%);ORGANICS/Polycyclic (20%);RADIATION (45%);SPECIFIED OTHER POLLUTANTS/Nitrogen oxides (0%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Test systems are in vivo mice, dogs and man. In vitro murine, canine and human bone marrow cells are studied and effects on blood cell production, feedback loops, chromosomes, marrow cellularity and induction of leukemia observed.
APPROACH: Radiation effects are being terminated. Radioactive pollutants will be synthesized. The tagged pollutants will be used to treat animals in vivo and stem cells in vitro. The cellular location of the non-nuclear pollutants will be identified by measuring the accumulated radiation effect on frozen cells. Thus through using radioactive labeling of pollutants one will determine the amount of pollutants in target cells by measuring the radiation effect accumulated in frozen state. Initially, acute exposures and later chronic exposures will be used.
RESULTS: The biological endpoints are reduction in number of hemopoietic stem cells, diminution in production rates of differentiated blood cells, induction of chromosome abnormalities and leukemia.
PROJECT MILESTONES: (1) October 1976 Commence development of labeling pollutants. (2) January 1977 Commence utilization of radiolabeled pollutants and measurement of effect in frozen state; stem cell separation and concentration techniques developed and in operation. (3) July 1977 Exposure of whole animals to gases and aerosols commence. (4) January 1978 Initial results on leukemogenesis.
KEYWORDS: BLOOD FORMATION;CONTROL;POLLUTION;STEM CELLS;MICE;MAN;GAMMA RADIATION;IRON 55;NEUTRONS;NITROGEN OXIDES;SULFUR OXIDES;OZONE;HYDROCARBONS;CHROMOSOMAL ABERRATIONS;LEUKEMIA;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL EFFECTS;RADIOINDUCTION;BLOOD;CARCINOGENS;INGESTION;INHALATION;NEOPLASMS

<081016>
TITLE: Effects of Important Energy-Related Pollutants on Storage and Transfer of the Genetic Message
PROJECT NUMBER: 000025
PRINCIPAL INVESTIGATOR: Hamilton, L.D.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION IN SITU (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (25%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/Photochemical oxidants (33%);PARTICULATES (33%);ORGANICS/Polycyclic hydrocarbons;ORGANICS/Etc. (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This program aims at developing understanding of how residuals from energy production and use affect human health. The impact of various energy technologies on human health and the environment is an important element in their cost to society. The assessment of the biomedical and environmental costs of residuals from energy production and use can be accurate, especially for costing the impact of residuals present at low levels, only when one has a precise understanding of how they induce effects such as oncogenesis. These studies are having increasing predictive value; they are essential for informed and practical cost-benefit analyses of energy control technologies.
APPROACH: The approach to how energy-related residuals induce effects such as oncogenesis and genetic

mutation is being made in several complementary and directly interrelated ways: (1) study of the interaction and complexes with other molecules such as histones, novel chemicals, and important energy-related pollutants, with the 3-dimensional structure of natural double-stranded DNA's, RNA's and of synthetic polynucleotides; (2) study of factors affecting the mammalian cell proliferation cycle and the effect of important energy-related pollutants on these and associated synthetic enzymes; and (3) study of factors affecting cell function, e.g., lymphocyte transformation and lymphocyte antibody production and the effect of important energy-related pollutants on these.
RESULTS: Scientists at HEW NCI and NIEHS, US EPA and ERDA will be consulted regarding potential hazardous materials produced by major synthetic fuel technologies, including their products and end use. Model hydrocarbon compounds representative of these will be selected and made available for this and other programs. Potentially significant compounds will be complexed with DNA and other polynucleotides and their effects assayed on cell division (in synchronized HeLa cells). Additional information will be obtained on how poly(I.C) interacts with cell membranes to inhibit DNA synthesis and determine where this inhibition takes place in the DNA double-helix.
PROJECT MILESTONES: (1) October 31, 1976 Complete preliminary consultation with scientists at HEW NCI, NIEHS, US EPA and ERDA on hazardous emissions from major synthetic fuel technologies plus collation of these with results of workshop on health effects of synthetic fuels. (2) November 1, 1977 Begin study of interactions of chemicals in emissions recognized as carcinogenic with DNA and other polynucleotides. (3) August 30, 1978 Elucidate site of inhibition of synthesis by poly(I.C) in DNA double-helix. (4) September 30, 1979 Complete several interactions of energy-related pollutants with DNA. Update survey and assessment of synthetic fuels.
KEYWORDS: DNA;BIOSYNTHESIS;NUCLEOTIDES;PROTEINS;CELL PROLIFERATION;INHIBITION;CELL MEMBRANES;SYNTHETIC FUELS;BIOLOGICAL EFFECTS;HELA CELLS;POLYCYCLIC AROMATIC HYDROCARBONS;CARCINOGENS;RNA;MOLECULAR STRUCTURE;HEALTH HAZARDS;IN VITRO

<081017>
TITLE: Plant Cell and Tissue Culture Genetics
PROJECT NUMBER: 000027
PRINCIPAL INVESTIGATOR: Smith, H.H.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$190,000
TECHNOLOGY: SOLAR/Biomass (20%);GENERAL SCIENCE (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The overall objective of this project is to determine and manipulate genetic controls of plant development through the use of cell and tissue culture and the analysis of genetic tumors. By using methods developed for somatic cell genetics, variants can now be induced, recognized and selected with greater speed, precision and economy than is possible with intact multicellular plants. Preparations of wall-less cells, protoplasts, are being used to produce hybrids by fusion of somatic cells, to extend the range of hybridization beyond that possible by cross-pollination, and to introduce foreign DNA and chromosomes with specific effects on plant development, differentiation, and tumor formation.
APPROACH: The experimental approaches have been mainly aimed to exploit genetic uses for plant protoplasts and haploid cell lines. Protoplasts from two different species are prepared by enzymic digestion of the cellulose wall, are mixed under sterile culture conditions in the presence of a fusion-enhancing agent, and are subjected to procedures that select out the products of hetero-fusions. Some hybrid products are sufficiently novel (as intergeneric to interkingdom fusions) to be of intrinsic value for microscopic and immunological analysis of the new genotypes; others can be differentiated into mature plants and produce unique progenies. Haploid cell lines are used for other purposes. They are exposed to mutagens, grown under specific conditions (as a sublethal level of an amino acid analog) and selected for resistance to the toxic agent. They are then analyzed to determine the cause of the resistance, are differentiated, and can finally be subjected to classical genetic tests.
RESULTS: Protoplast research is expected to demonstrate that plant hybrids can be formed by fusion of somatic cell protoplasts and that this method can be used to extend the range of hybridization beyond that possible by sexual means. It is expected that entirely new viable plant types will eventually be produced by this method, particularly in the family Solanaceae which includes tomato, potato, peppers and eggplant. Since a single foreign chromosome introduced into a plant species can cause genetic tumors, it should now be possible, with protoplasts acting as the recipient cells, to introduce small amounts of foreign DNA and eventually to determine the nature of the DNA that controls the switch from normal growth to tumor formation.
PROJECT MILESTONES: (1) 1972 Demonstration that parasexual interspecific hybrids could be produced by protoplast fusion and selection of hybrids on the basis of the less stringent cell culture requirements of the hybrid (tumorous) tissue. (2) 1975 Verification and extension of the original finding, showing high frequency of parasexual hybridization and production of novel chromosomal types. (3) 1976 Demonstration of interkingdom fusion between human (HeLa) cells and tobacco protoplasts.
KEYWORDS: PLANTS;PLANT CELLS;CELL CULTURES;GENETICS;CHROMOSOMES;DNA;CELL DIFFERENTIATION;HYBRIDIZATION;MUTAGENS;GENETIC EFFECTS;MUTAGENESIS;NEOPLASMS;TISSUE CULTURES

<081018>
TITLE: Cellular Radiobiology
PROJECT NUMBER: 000028
PRINCIPAL INVESTIGATOR: Sparrow, A.H.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$135,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS (10%);RADIATION (80%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (10%)

CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
OJECT DESCRIPTION: The main goal is to improve our understanding of the nature of changes produced in living cells by ionizing radiation and the biological, biophysical, and environmental factors that determine and/or modify such responses. The relative effectiveness of several kinds of radiation is being studied as well as the influence of a wide range of dose or dose rate, and varied environmental conditions on radiation responses. Possible synergistic responses of ionizing radiation and air pollution will be examined. Hybrids between existing Tradescantia clones have given several highly mutable seedlings. Some of these should be more highly sensitive to radiation. If so, we hope to find out why.
APPROACH: Higher plants serve as the main test organisms and special genetic stocks with inherently different mutation frequencies have been produced and are used to measure mutagenesis. Growth or survival, somatic mutation and chromosomal damage are the main end points studied. Results to date offer explanations of the marked differences in sensitivities of different clones, species or groups of organisms, and also allow prediction of radiobiological responses in species for which adequate radiobiological data do not exist. Chromosome size and/or DNA content per chromosome are the main factors determining differences in radiosensitivities among species although spontaneous and perhaps induced mutation frequencies can also be influenced by many other factors.
RESULTS: The work has application to problems relating to possible plant or crop damage from ionizing radiation in the environment, and to radiation genetics in general. The high sensitivity of Tradescantia makes it especially useful for the study of genetic effects of low doses or low dose rates. Genetic effects of very low doses of x-rays, neutrons and of beta radiation from tritiated water will be studied.
PROJECT MILESTONES: (1) FY 77 Work on the shape of mutations dose-response curves at low doses and low dose rates will be extended and interpreted in terms of microdosimetry and enzymatic repair of damaged DNA. (2) FY 78 Evidence should be obtained to indicate whether or not certain common air pollutants interact synergistically with ionizing radiation. It is expected that new clones more sensitive to radiation will be available and we hope to show them to be deficient with respect to DNA repair.
KEYWORDS: PLANTS;PLANT CELLS;BIOLOGICAL RADIATION EFFECTS;IONIZING RADIATIONS;AIR POLLUTION;SYNERGISM;MUTAGENESIS;CHROMOSOMES;DNA;RADIOSENSITIVITY;BIOLOGICAL REPAIR;DOSE-RESPONSE RELATIONSHIPS;DOSE RATES;X RADIATION;NEUTRONS;BETA PARTICLES;HYBRIDIZATION;GENETICS;MUTAGENESIS

<081019>
TITLE: Microbial Genetics
PROJECT NUMBER: 000029
PRINCIPAL INVESTIGATOR: Lacks, S.A.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (45%);ORGANICS (45%);RADIATION (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The main objective is elucidation of the molecular mechanism of genetic transformation by DNA. This includes uptake of DNA from outside the cell, molecular conversions of the DNA, recombination with DNA inside the cell and repair of mismatched DNA. Bacterial transformation systems can provide a convenient assay of damage to DNA by environmental pollutants. Additional objectives focus on other aspects of the reactivity of DNA within cells: mutagenesis by agents acting directly on DNA; role of DNA methylation; function of DNases, particularly sequence-specific (restriction) endonucleases.
APPROACH: The fate of radioactively labeled DNA in the transformation of pneumococcal bacteria is investigated by analysis of products formed at each step and by characterization of mutants blocked at different steps of the process. Enzymes and other cellular components involved in DNA binding, entry, and recombination within the cell are isolated and analyzed biochemically. An unusual pair of restriction endonucleases in pneumococcus, one of which acts only on methylated DNA and the other at the same sequence but only when it is unmethylated, are also being studied.
RESULTS: Interactions between DNA, surface binding factors and a membrane-located DNase will be clarified and the hypothesis that the DNase acts by pulling in one strand of DNA as it degrades the complementary strand will be tested. Such information will enhance the usefulness of transformation in screening for effects of pollutants on DNA. It may also be applicable to genetic engineering, which requires introduction of DNA into mammalian cells. An enzyme system responsible for mismatch correction in pneumococcal transformation should be isolated and characterized; this system appears to protect the cell from excessive mutation.
PROJECT MILESTONES: (1) May 1977 Determination of mode of binding of DNA to cell surface. (2) August 1977 Elucidation of membrane structure containing DNase involved in DNA entry. (3) December 1977 Determination whether DNA methylation regulates gene function. (4) Isolation of enzyme system responsible for base mismatch repair.
KEYWORDS: DNA;GENETICS;MOLECULAR BIOLOGY;GENE RECOMBINATION;POLLUTION;MUTAGENESIS;BACTERIA;METHYLATION;DNA-ASE;NUCLEASES;PNEUMOCOCCUS;METABOLISM;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL EFFECTS;BIOCHEMISTRY;ENZYMES;MUTATIONS

<081022>
TITLE: Evaluation of Hazards of By-Products from Nuclear and Non-Nuclear Energy Generation
PROJECT NUMBER: 000038
PRINCIPAL INVESTIGATOR: Carsten, A.L.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/Fusion (100%)
ENERGY CYCLE: COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (80%)
POLLUTANTS: NOXIOUS GAS/Ozone (5%);ORGANICS/Polycyclic hydrocarbons (10%);RADIATION/H/sup 3/ as tritiated

H/sub 2/O (60%);SPECIFIED OTHER POLLUTANTS/D/sub 2/O (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas All fresh H/sub 2/O
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Determine what might be the genetic and/or somatic effects of long term exposure to radioactive tritium and/or non-radioactive deuterium, isotopes of hydrogen which are major by-products of power reactors. (2) To compare these effects with those arising from exposure to nonradioactive energy related pollutants.
APPROACH: Second generation mice on tritiated water (1 mu Ci/ml and 3 mu Ci/ml) are mated and the pregnant females examined for the frequency of early and late in utero embryoneal deaths. The early deaths are an indication of dominant lethal genetic effects. Mice on tritium throughout their lifetime will be evaluated for changes in growth, life span, liver chromosome abnormalities and alterations in the bone marrow. Microscopic examination of the regenerating liver following partial hepatectomy will be used as an indication of somatic genetic effects. Bone marrow will be evaluated for cellularity and content of hematopoietic stem cells.
RESULTS: The final results will give an estimate of the relative hazard of exposing a population to long-term effects of radioactive and nonradioactive by-products of nuclear power reactors. From what is known about the generation of these products in power reactors, an evaluation can be made of the health effects of a nuclear power technology. As comparable data on the effects of non-nuclear energy related pollutants become available a comparison of the relative health effects of these processes may be made.
PROJECT MILESTONES: (1) Genetic and stem cell studies on animals on 3 mu Ci/ml tritiated water completed 1/12/76, on 1 mu Ci/ml completed 6/1/76. (2) Growth, mortality and tritium distribution studies on 3 mu Ci/ml complete 9/1/76; on 1 mu Ci/ml on animals 12/1/76. (3) First pilot studies on effects of non-nuclear pollutants also to be completed 12/1/76. (4) 9/1/77 Genetic studies on 1 mu Ci/ml animals to be completed and decision to be made as to whether to examine lower H-3 concentrations.
KEYWORDS: TRITIUM;GENETIC RADIATION EFFECTS;MICE;DEUTERIUM;BIOLOGICAL EFFECTS;LETHAL MUTATIONS;RADIOINDUCTION;CHROMOSOMAL ABERRATIONS;BONE MARROW;BY-PRODUCTS;BLOOD;RADIOACTIVE EFFLUENTS;GENETICS;IN VIVO;MUTAGENESIS;RADIOISOTOPES

<081024>
TITLE: Terrestrial Ecology
PROJECT NUMBER: 000037
PRINCIPAL INVESTIGATOR: Sparrow, A.H.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: NUCLEAR/General (60%);GENERAL SCIENCE (40%)
POLLUTANTS: RADIATION (80%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this basic research program in ecology is knowledge of the structure and function of natural ecosystems. Special emphasis is on the adverse effects of ionizing radiation. The program has been focused in past years on the field-to-forest sere on central Long Island, examining not only the structure and function of the communities of that sere but also the effects of long-term chronic gamma irradiation. It is anticipated that the chronic irradiation will cease in a year or two and be followed by a detailed study of recovery of the severe ecological disturbances presently evident.
APPROACH: The program has contributed importantly to methods of analysis of a terrestrial ecosystem. It has also revealed starkly that ionizing radiation causes changes in the structure of natural systems that are by no means unique; the changes follow definable patterns that are closely related to changes caused by a wide range of different types of disturbance. The patterns appear to be explained in a large part by an hypothesis relating evolution of high resistance to radiation damage to the evolution of low mutation rates, although the topic is extremely difficult to examine in detail. The evidence on radiosensitivity of plants increasingly appears to support this hypothesis. The hypothesis provides one further basis for understanding the patterns of degradation of structure of natural ecosystems caused by accumulating small physical, chemical and biotic changes in the environment.
RESULTS: It is hoped that results obtained will provide further understanding of (1) the effects of chronic ionizing radiation on structure and function of the forest; (2) mineral inventory and recycling (What is the inventory of nutrients required to sustain the forest and the successional communities leading to it.); (3) how fast recovery occurs and is succession the same after damage from gamma radiation as it is after other severe ecological disturbances.
PROJECT MILESTONES: This project is essentially one in which data are accumulated as a function of time of exposure, since no ''milestones'' are reached. However, in spite of the fact that very much remains to be studied and that the project is unique, it seems possible that the irradiation phase may be terminated during FY 1978 and future work would then concentrate on a detailed study of recovery of the severe ecological disturbances presently evident.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;ECOLOGY;GAMMA RADIATION;CHRONIC IRRADIATION;BIOLOGICAL RADIATION EFFECTS;NUTRIENTS;FORESTS;BIOMASS

<081026>
TITLE: Radiological and Chemical Physics
PROJECT NUMBER: 000040
PRINCIPAL INVESTIGATOR: Baum, J.W.;Varma, M.N.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/General (100%)

ENERGY CYCLE: TRANSPORTATION (5%);ELECTRICITY GENERATION (90%);WASTE MANAGEMENT (5%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
EARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Interaction of radiation with matter and fundamental dosimetry concepts are investigated. Emphasis is placed on studies which improve our knowledge and understanding of the mechanisms and space and time relations of energy deposition and transport in irradiated tissue-like materials.
APPROACH: Studies of energy deposition in nanometer sized regions of tissue-like materials are made using a special low pressure ionization chamber and theoretical models. Results from these studies are correlated with available data on biological effects to further our insights into possible basic mechanisms of radiobiological damage.
RESULTS: Theoretical models relating nanometer energy deposition patterns, LET, and biological effects are being developed in order to (a) explain variations of RBE with LET, oxygen tension, dose rate and other factors, (b) understand mechanisms responsible for radiation induced tumors, and (c) determine proper methods of extrapolation of data to very low doses where measurements of biological effects are not possible. Collaborative studies of radiation induced mutations and tumors are conducted with members of the BNL Biology and Medical Departments in order to aid in the timely accumulation of data used for testing models and theories of action.
KEYWORDS: W-VALUES REQUIRED TO PRODUCE AN ION-PAIR);IONIZING RADIATIONS;INTERACTIONS;TISSUE-EQUIVALENT MATERIALS;ENERGY ABSORPTION;BIOLOGICAL RADIATION EFFECTS;LET;RBE;NEOPLASMS;DOSIMETRY;RADIOBIOLOGY

<081027>
TITLE: Radiation Instrument Development
PROJECT NUMBER: 000041
PRINCIPAL INVESTIGATOR: Radeka, V.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION IN SITU (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is development of new scientific instrumentation. The principal areas of effort are radiation detectors, processing of signals from radiation detectors and electronic circuits for signal processing. In radiation detectors particular emphasis will be placed on position-sensitive detectors for charged particles, neutrons, x-rays and gamma rays. These developments are essential to a number of diverse techniques within the ERDA program.
APPROACH: The approach is based on continuing effort in areas which are fundamental to the new instrument development. Two such areas are liquid and gas mixtures as ionization media for radiation detectors and low noise techniques. These efforts are then focused toward recognized particular needs, such as neutron position-sensitive detectors. These detectors are required for molecular and crystal structure determination by neutron diffraction, the method which has opened new possibilities in biological research and in materials research.
RESULTS: (1) A new large area (0.5 x 0.5 square meters) position-sensitive detector for thermal neutrons. (2) New position readout methods. (3) New gas mixtures for high-resolution position-sensitive detectors.
PROJECT MILESTONES: (1) FY 1977 Development of large area position-sensitive detector for thermal neutrons. (2) FY 1978 Investigation of charge-transfer semiconductor devices as radiation detectors.
KEYWORDS: INSTRUMENTATION;POSITION SENSITIVE DETECTORS;DESIGN;THERMAL NEUTRONS

<081029>
TITLE: Interrelationship Between Genetic and Environmental Factors in Clinical and Experimental Hypertension
PROJECT NUMBER: 000043
PRINCIPAL INVESTIGATOR: Iwai, J.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, Walter W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$350,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS/Carbon monoxide (30%);METALS/Cadmium (70%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Major experimental efforts using two strains or rats with opposite genetically determined predisposition to experimental hypertension include studies on: (a) the influence of cadmium on hypertension and hyperlipidemia; (b) the influence of chronic carbon monoxide exposure on atherosclerosis in hypertension; (c) the influence of the kidney on blood pressure, as demonstrated by renal transplant; (d) isolation of pressor substance from hypertension-prone rats. Clinical studies involve the measurement of cadmium in the kidney and its correlation to kidney function and steroid metabolism in hypertensive patients.
APPROACH: The effect of a subtoxic dose of cadmium in drinking water on blood pressure, growth, and life span will be investigated in hypertension-prone and hypertension-resistant rats. The effect of cadmium on cardiac output and on regional blood flow will be studied by radioactive microspheres. The cadmium concentration in the kidney of hypertensive patients will be studied by prompt gamma and neutron irradiation technique.

PROJECT MILESTONES: (1) Purification of two strains of rats, with opposite genetic propensities for hypertension January, 1977. (2) The study of cadmium-binding protein, metallothioneins, in two strains of rats January, 1977. (3) Specific pathogen free rat breeding system established May, 1977. (4) Investigate the effects of various trace metals (e.g., cadmium) on the development of hypertension and accompanying behavioral changes September 30, 1978.
KEYWORDS: HYPERTENSION;ETIOLOGY;GENETICS;ENVIRONMENTAL EFFECTS;KIDNEYS;BLOOD PRESSURE;TRANSPLANTS;HORMONES;DIURETICS;BIOLOGICAL EFFECTS;CADMIUM;RATS;HEART;CARBON MONOXIDE

<081032>
TITLE: Nucleic Acid Replication
PROJECT NUMBER: 000047
PRINCIPAL INVESTIGATOR: Dunn, J.J.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The principal objective of this program in FY 1977 and 1978 will be to determine whether regulatory signals of biological importance have been preserved during evolution. We are particularly interested in determining if similar enzymes are involved in the post-transcriptional processing of RNA in bacterial and mammalian cells.
APPROACH: One approach will be to ask whether extracts prepared from mammalian cells will faithfully process precursor RNAs of bacterial origin. A complementary approach will be to test mammalian precursor RNAs with purified processing enzymes of bacterial origin to see if the mammalian RNA contains processing signals and if specific products are generated.
RESULTS: The studies in progress have required and will continue to require the development of new techniques, both analytical and preparative, that will be extremely useful in studies with more complex biological systems. In addition, the models developed will serve as a foundation for future work in related areas.
PROJECT MILESTONES: In bacteria mutations that impair RNA processing frequently result in the loss of a particular biological function. By knowing what features of nucleic acid structure are important for RNA processing, it is often possible to predict how a certain type of mutation will affect biological function. If it can be demonstrated that similar RNA processing mechanisms exist in bacterial and mammalian cells then it should also be possible to predict the effect of an identical mutation in a mammalian cell.
KEYWORDS: BACTERIOPHAGES;RNA;BIOSYNTHESIS;MUTATIONS;BIOLOGICAL EFFECTS;BIOCHEMISTRY;DNA;ENZYMES;GENETICS;MOLECULES

<081033>
TITLE: Low Angle Neutron Diffraction
PROJECT NUMBER: 000048
PRINCIPAL INVESTIGATOR: Moody, M.F.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the structural change undergone by the allosteric enzyme aspartate transcarbamylase during its activation, and to investigate how the extent of this change is affected by various activators and inhibitors. To determine the rate of this structural change, and to see if any intermediate structures are revealed during it.
APPROACH: The main approach is X-ray solution scattering (at small and large angles) of the enzyme solution. For kinetic experiments using this technique, the X-ray source will be synchrotron radiation emitted from a storage ring. Subsidiary approaches are electron microscopy and standard kinetic experiments using spectroscopic monitoring.
RESULTS: Information concerning the probable structure of the activated form of the enzyme at low resolution. Information about the extent of the structural change in the presence of different concentrations of various activators and inhibitors. Diffraction patterns indicating the speed of the structural change in solution, and the presence or absence of substantial concentrations of intermediate species with substantially different structures.
PROJECT MILESTONES: (1) Survey of qualitative diffraction pattern changes due to principal activators/inhibitors. (2) Quantitative scattering curves for the inhibited and activated forms. (3) Survey of electron microscope images of the inhibited and activated forms using standard preparation techniques. (4) Determination of optimum conditions for kinetic X-ray experiment. (5) First kinetic X-ray experiment.
KEYWORDS: NEUTRON DIFFRACTION;ENZYMES;MOLECULAR STRUCTURE;SCATTERING;X-RAY SOURCES;SYNCHROTRON RADIATION;ELECTRON MICROSCOPY;SPECTROSCOPY;MONITORING;X RADIATION

<081034>
TITLE: Oxidative and Free Radical Mechanisms Underlying the Actions of Pollutants
PROJECT NUMBER: 000049
PRINCIPAL INVESTIGATOR: Borg, D.C.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$265,000
TECHNOLOGY: FOSSIL FUEL/General (55%);SOLAR/General (5%);GENERAL SCIENCE (40%)
ENERGY CYCLE: COMBUSTION IN SITU (5%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (60%);ELECTRICAL TRANSMISSION (10%)
POLLUTANTS: NOXIOUS GAS/Ozone;NOXIOUS GAS/NO/sub 2/ (45%);ORGANICS/Carcinogenic hydrocarbons (50%);RADIATION/Ionizing (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Several aspects of the molecular toxicology of oxidizing pollutants and of carcinogenesis/mutagenesis are investigated. Oxidative and free radical mechanisms underlying these effects are emphasized. Specific objectives include assessment of biological damage processes of hydrocarbons and other oncogenic pollutants, evaluation of tumorogenicity and systemic toxicity of ozone and other oxidizing gases, and elucidation of the photochemistry of photosynthesis.
APPROACH: Advanced electron spin resonance (esr) methods are often used, including double resonance (endor,eldor), saturation transfer techniques, and flow apparatus for esr and Q band to follow reactions of free radical forms of carcinogens with target biomolecules. An ozone exposure chamber permits ozonization of animals, cells and biochemicals; and a battery of biochemical techniques plus esr are used to assess effects on blood tissues of female Sprague-Dawley rats. Peroxidation and ozonization reactions on model lipid/protein systems also are studied. Free radicals of natural and synthetic porphyrins and chlorophylls are examined by esr and derivative methods, electrochemistry and optical spectroscopy.
RESULTS: The present hypothesis that metabolically activated forms of carcinogenic pollutants act via formation of addition compounds with DNA should be further supported or refuted. The question of whether tissue distribution and metabolism of some pollutants can be monitored by way of changes in intrinsic tissue esr signals should be answered. The possibility of systemic toxicity and tumorigenicity from respiratory exposure to ozone will be further evaluated and dose-effect relationships established in Sprague-Dawley rats. Knowledge of free radical electron donor and acceptor forms in bacterial and plant photosynthesis may lead to improved methods for conversion of solar energy to electricity or to hydrogen fuels. An interdepartmental (conjoint) radiation facility to study oxidizing damage by chemical and gaseous pollutants, using esr on-line at BNL's Dynamitron electron accelerator, will be established.
PROJECT MILESTONES: (1) Determination of ozone carcinogenicity in rats June 1977. (2) Establishment of conjoint (interdepartmental) radiation facility to study oxidative actions of pollutants from energy generation and use Oct. 1977. (3) Preliminary assessment of tissue esr signals as pollution damage monitors December 1977. (4) Support or refutation of carcinogen free radical hypothesis June 1978. (5) Dose-response data on systemic ozone toxicity and carcinogenicity Dec. 1978.
KEYWORDS:
HYDROCARBONS;OZONE;TOXICITY;CARCINOGENESIS;MUTAGENESIS;PHOTOSYNTHESIS;PHOTOCHEMISTRY;OXIDATION;RADICALS;LIIDS;PROTEINS;RATS;CARCINOGENS;OXIDATION

<081035>
TITLE: Studies of Biological Structures by Scanning Transmission Electron Microscopy
PROJECT NUMBER: 000225
PRINCIPAL INVESTIGATOR: Wall, J.S.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: SOLAR/Biomass (10%);GENERAL SCIENCE (90%)
POLLUTANTS: METALS (80%);PARTICULATES (10%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: Determination of the structure of biological molecules at 2 to 5 A resolution with special emphasis on determining the conformation of active sites of proteins, the mechanism of interaction of DNA and protein, and development of capability for direct reading of DNA sequences.
APPROACH: A new Scanning Transmission Electron Microscope (STEM) has been developed which can image single heavy atoms and unstained biological molecules. Specimens will be observed in the frozen state to improve the preservation of the native structure. Interesting sites within the molecule will be tagged in vivo or in vitro with heavy atom reagents. The location of heavy atoms within the biological molecule will then be observed with the STEM.
RESULTS: FY 1977-1978 We expect to be able to sequence normal and abnormal DNA and RNA molecules and study protein binding to these sequences. Rapid analysis possible by direct visualization of individual molecules with on-line computer analysis should allow us to characterize at a molecular level any environmentally produced alteration in the DNA of an organism, as well as any change in its protein binding pattern. Similar programs will be started to characterize the structures of free proteins and membrane bound complexes. Of particular interest are the membrane-bound proteins involved in bioconversion of solar energy.
PROJECT MILESTONES: (1) FY 1977 Opening of user facility, observation of known DNA sequences, observation of known protein structures at low temperature. (2) FY 1978 Sequencing of naturally occurring DNA moecules, determination of effects of pollutants on DNA, determination of structure of protein complexes and membranes.
KEYWORDS: PROTEINS;MOLECULAR STRUCTURE;ELECTRON MICROSCOPY;DNA;BIOCHEMISTRY;MUTATIONS;PHOTOSYNTHESIS

<081036>
TITLE: Atmospheric Diagnostics
PROJECT NUMBER: 000493
PRINCIPAL INVESTIGATOR: Newman, L.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$254,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/Ozone (10%);METALS/Iron;METALS/Vanadium (5%);PARTICULATES/Sulphate (80%);ORGANICS/Weak acids (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The Atmospheric Diagnostics Program is concerned with the implementation and development of capabilities for studying the evolution, chemical composition, and physical properties of airborne constituents, both gases and particles under the dynamic meteorological conditions of the atmosphere. The overall goal of the program is to develop the best analytical methodologies (using both continuous and time-averaged sampling) for atmospheric pollutants of interest.
APPROACH: Understanding the regional nature of air-pollutant transport and transformation requires studies of power plant plumes, urban plume transport into rural areas, vertical pollutant composition profiles and ambient aerosol composition and particle size documentation. To obtain this understanding requires implementation of developing analytical techniques and development of a broad range of new techniques. Major emphasis is on analytical methods for specific determination.
RESULTS: In FY 1977 and 1978 laboratory studies of the extent of oxidation of SO/sub 2/ to sulfate on treated quartz and related filters will be completed. Filter sampling procedures for ambient ammonia will be optimized. The effect of ambient ammonia on the measured acidity of airborne particles will be investigated using diffusion under technology. A semi-automated procedure for coulometric determination of titratable acidity in airborne particles and generation of Gram titration curves will be implanted. Use of a dichotomous sampler and a Lundgren impactor in conjunction with the Sinclair diffusion battery will permit determination of size distributions of ambient aerosol particles from 0.01 to 710 mu m diameter. Improvements in determination of soluble nitrate, ammonium, total mass and transition metals in airborne particles collected in connection with the MAP3S program will be implemented.
PROJECT MILESTONES: (1) Determination of acidity, ammonium and soluble sulfate in routinely airborne particle samples collected with time resolution of 10-20 min. in connection with the MAP3S program 1/1/1977. (2) Complete size distributions (with chemical composition determination) from 0.01 to >10 mu m diameter with time resolution of <3 hr 1/7/1977. (3) Real time sulfate monitor for field applications 1/1/1978.
KEYWORDS: INSTRUMENTATION;AEROSOL MONITORING;DIFFUSION;AEROSOLS;PHYSICAL PROPERTIES;METEOROLOGY;AIR POLLUTION;MEASURING METHODS;PARTICLE SIZE;SAMPLING;SULFUR DIOXIDE;NITROGEN OXIDES;OZONE;IRON;VANADIUM;INORGANIC ACIDS;ORGANIC ACIDS;QUANTITATIVE CHEMICAL ANALYSIS;QUALITATIVE CHEMICAL ANALYSIS;EARTH ATMOSPHERE;CHEMICAL EFFLUENTS;AMMONIA

<081037>
TITLE: Coastal Meteorology
PROJECT NUMBER: 000547
PRINCIPAL INVESTIGATOR: Michael, P.;Raynor, G.S.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3600
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this study is to obtain an understanding of meteorological processes in the coastal region that affect siting, operations, and safety of power providing and related facilities located either offshore or near a coastline. A major goal of the program is to develop a reliable system for observation diffusion conditions affecting releases from coastal or offshore sites and to predict them from measurable meteorological and surface parameters.
APPROACH: This program is being conducted by a contribution of experiments tracer studies from offshore and coastal sites. Measurements of meteorological parameters, relating the experimental results to the meteorological conditions and incorporating these relationships with mathematical diffusion models.
RESULTS: Results expected included improved methods for plant site relation and prediction of diffusion of materials released to the atmosphere from cover in the coastal zone.
PROJECT MILESTONES: (1) September 1975 Publication of first major contribution on results of project. (2) May 1976 Completion of data analysis from water effects studies on Great Gull Island. (3) August 1976 Start experimentations on diffusion from coastal location. (4) October 1976 Start experiments on diffusion into transition zone from off-shore sites using SF/sub 6/ tracer.
KEYWORDS: THERMAL POWER PLANTS;SITE SELECTION;SHORES;METEOROLOGY;DIFFUSION;MATHEMATICAL MODELS;PLUMES;WATER;CHEMICAL EFFLUENTS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT

<081038>
TITLE: High School Teachers Institute
)JECT NUMBER: 000655
:NCIPAL INVESTIGATOR: Price, G.A.;Metz, D.J.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ycung, Harold
TELEPHONE: F233-4678
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (15%);STORAGE (15%);PROCESSING, CONVERSION (15%);COMBUSTION OR END USE (15%);ELECTRICITY GENERATION (15%);ELECTRICAL TRANSMISSION (5%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (40%);RADIATION/Fission products (40%);HEAT, THERMAL/Btu-health effects (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To review the fundamental concepts of energy from the perspectives of the basic sciences and engineering, to explore the various aspects of power generation and utilization in an industrial society, and to review energy sources and environmental effects.
APPROACH: Present a series of 32 lectures and working sessions, at which the basic aspects of energy generation are presented. Participants in the program prepare individual papers on some aspects of power generation and utilization, or environmental effect, as may be related to a hypothetical situation on Long Island.
RESULTS: 30 High School science teachers should be better informed on the various aspects of energy as a result of their participation in this program, and should be able to improve their teaching techniques accordingly.
PROJECT MILESTONES: Institute is scheduled from September to May each year. It concludes in May with a presentation by each participant of a paper on some topic in the area of energy production, utilization, or environmental effects.
KEYWORDS: ENERGY;POWER GENERATION;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;EDUCATION;AIR;ECONOMICS;CHEMICAL EFFLUENTS;ANIMALS;PLANTS;METEOROLOGY;MINING;PLUTONIUM;RADIOACTIVE WASTES

<081039>
TITLE: Electron Capture Detector Advancements and Separation and Concentration Techniques
PROJECT NUMBER: 000753
PRINCIPAL INVESTIGATOR: Dietz, R.N.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$118,000
TECHNOLOGY: FOSSIL FUEL/General (75%);GEOTHERMAL/General (25%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NH/sub 3/ (100%)
CHARACTER OF STUDY: RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale (40%);FULL SCALE DEMONSTRATION (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Develop improved electron capture gas chromatographic procedures for SF/sub 6/ and other meteorological tracer gases (e.g., perfluoro dimethycyclobutane). Demonstrate new techniques for tracer compounds in actual field tests including grab sampling and portable, real-time continuous determination. Improve existing flame photometric detection methods for determination of sulfur compounds in the ambient. Examine new method for detection of ambient S compounds via conversion to SF/sub 6/. Prepare low rate permeation standards (less than nl/min) for various air pollutants (H/sub 2/S, SO/sub 2/, NH/sub 3/) and ultra-trace sources for meteorological tracer compounds.
APPROACH: The electron capture solute switching technique will be used to improve the signal to noise ratio by at best a factor of 10. Removal of oxygen continuously by catalytic conversion to water or chemical reaction with alkaline pyrogallol will provide continuous detection capability for SF/sub 6/ and other perfluorocarbon compounds. Solute switching and synchronous demodulation detection will also be used to reduce noise substantially from a flame photometric detector. The signal will be enhanced by operating the flame in the presence of added sulfur. Reaction of sulfur compounds with elemental fluorine over a catalyst surface followed by EC detection of the resultant SF/sub 6/ will give at least 3 orders of magnitude better sensitivity than flame photometric detection.
RESULTS: Early in FY 1977 a prototype continuous SF/sub 6/ and perfluorocarbon detector with a limit of detection near 1 x 10/sup -14/ should be ready. An improved sensitivity flame photometric detector will be constructed. A prototype sulfur to SF/sub 6/ converter/detector will be tested. Low rate permeation standards will be available for calibration of field monitoring instruments.
PROJECT MILESTONES: (1) Demonstrate continuous SF/sub 6/ detection by October 1976. (2) Participate in National Oceanic and Atmospheric Administration on tracer experiment at Idaho Falls, September 1976. (3) Test improved flame photometric detector by 31 May 1977.
KEYWORDS: AIR POLLUTION;SAMPLING;CARBON COMPOUNDS;FLUORINE COMPOUNDS;GAS CHROMATOGRAPHY;TRACE AMOUNTS;TRACER TECHNIQUES;HYDROGEN SULFIDES;SULFUR DIOXIDE;AMMONIA;QUANTITATIVE CHEMICAL ANALYSIS;SEPARATION PROCESSES;MONITORING;ELECTRON CAPTURE;MEASURING INSTRUMENTS;METEOROLOGY;PLUMES

<081040>
TITLE: Assessment of Biomedical and Environmental Cost of Energy Systems
PROJECT NUMBER: 000756
PRINCIPAL INVESTIGATOR: Hamilton, L.D.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$595,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (8%);COMBUSTION IN SITU (1%);TRANSPORTATION (6%);STORAGE (1%);PROCESSING, CONVERSION (6%);COMBUSTION OR END USE (12%);ELECTRICITY GENERATION (52%);ELECTRICAL TRANSMISSION (2%);WASTE MANAGEMENT (12%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/Carbon monoxide;NOXIOUS GAS/Trioxide (15%);METALS/Mercury;METALS/Cadmium (5%);PARTICULATES/TSP;PARTICULATES/SO/sub 4/;PARTICULATES/NO/sub 3/ (50%);ORGANICS/Hydrocarbons (?5%);RADIATION (10%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;GEOGRAPHIC AREAS/Site specific Fossil power plants;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This program aims at developing a systematic overview of biomedical and environmental costs of energy production and use. All forms of energy are being considered. The initial focus is on biomedical effects and environmental effects on animals, crops, and other vegetation and on land, known to affect man. This evaluation relies on available information; epidemiological data, field and laboratory studies carried out on appropriate animals and vegetation, and basic biomedical research designed to elucidate molecular and cellular mechanisms underlying biological responses to various residuals. By taking account of the magnitude of energy flow through the system and of the populations exposed, total effects are calculated.
APPROACH: Starting with a compilation of residuals from the energy system, the various pathways to man are traced. Work has been divided into three tasks: (I) Integrative Assessment: integration of best available information into an overall assessment of the total health and environmental cost of energy; (II) Impact Evaluation: Centers on areas identified in Task I as most in need of analysis. Includes (a) impact of coal extraction, transport and conversion, (b) correlation of health effects with energy related residuals, and (c) health impact of energy use in urban environments; (III) Special Studies: as required for the development of the program and as requested by DBER.
RESULTS: Integrated assessment activity in this area is designed to serve two purposes: (1) Guide the allocation of resources in the biomedical research program, and (2) provide information on biological and environmental costs required to make decisions regarding alternative energy systems. The direct products are reports to ERDA and publications in the open literature. The results expected are more rational allocation of biomedical and environmental research efforts in anticipation of energy developments and a wider information base leading to better decision regarding energy development policies.
PROJECT MILESTONES: (1) Report, County Level Energy-Environmental Atlas 30 June 1976. (2) Report on Health Effects of Sulfate Air Pollution 30 September 1976. (3) Report on Integration of Energy Model Data Base, County Level Energy/Environmental Data Base and National Water Emissions Data Base 30 Sept. 1976. (4) Report on Health Effects of Synfuels Production and Use 31 Dec. 1976. (5) Report of Health Effects of the Coal Fuel Cycle 31 Dec. 1976. (6) Report on Demonstration Analysis Using Integrated Energy, Environmental Data Base 30 June 1977. (7) Report, Second Iteration Assessment of Health and Environmental Effects of Energy Systems 30 Sept. 1977.
KEYWORDS: ENERGY SYSTEMS;ENERGY;BIOLOGICAL EFFECTS;ENVIRONMENTAL EFFECTS;HUMAN POPULATIONS;FOOD CHAINS;URBAN AREAS;ENERGY MODELS;TECHNOLOGY ASSESSMENT;DATA ACQUISITION SYSTEMS;HEALTH HAZARDS;SYNTHETIC FUELS;AIR POLLUTION;WATER POLLUTION;DISEASES;DECISION MAKING

<081041>
TITLE: Coastal Transport and Diffusion
PROJECT NUMBER: 000913
PRINCIPAL INVESTIGATOR: Scott, J.T.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$450,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (60%);NUCLEAR/General (20%);SOLAR/General (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To understand the dynamics of seashore transport and diffusion. (2) To obtain coastal circulation and physical data in support of marine ecosystem studies. (3) Development of physical models of coastal region and continental shelf circulation.
APPROACH: An automated ''real-time'' data collections system is used for measuring current, temperatures and salinity supplemented by shipboard measurement of the same parameters in a network of stations and depths on a transect south of Long Island. Physical models are developed to explain the circulation patterns obtained.
RESULTS: Description of the two-dimensional flow pattern of velocity, temperature and salinity in an offshore cross-sectional transect with detail never produced before. Of particular interest is the description of nearshore upwelling and downwelling processes. Development of dynamical models to explain nearshore

circulation.
PROJECT MILESTONES: (1) One full year of data (velocity, salinity and temperature) from the instrumented spar buoy system will be obtained by June 1977. (2) Data for two-three months from deck-readout instruments to supplement (a). (3) The above will lead to a description of circulation in the oceanic coastal boundary layer.
KEYWORDS: COASTAL WATERS;DIFFUSION;TEMPERATURE GRADIENTS;SALINITY;AQUATIC ECOSYSTEMS;DATA ACQUISITION;HEAT TRANSFER;ENVIRONMENTAL TRANSPORT;WATER

<081042>
TITLE: Oceanographic and Environmental Data Acquisition and Monitoring System Development
PROJECT NUMBER: 000920
PRINCIPAL INVESTIGATOR: Dimmler, D.G.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R. W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project is concerned with the development of new methods and techniques in systems for continuous large scale and automated data acquisition, monitoring, data verification and experimental contrcl in real-time of oceanographic parameters. Emphasis is given to the following subjects: (1) Development of techniques and instruments concerning filtering sampling, integration and averaging of parameters from sensors; (2) techniques and instrumentation for data communication systems which are suitable for transmission of oceanographic data from remotely located stations and for commanding remotely located stations. Special attention is given to telemetry communication within line-of-sight and satellite communication for longer distances; and (3) application of computer techniques for the purposes of experiment automation, real-time data acquisition, control of experimental equipment and sensors as well as improved data verification in real-time.
APPROACH: Adequate techniques and devices for automated data acquisition and monitoring instrumentation systems which can be used for collection of correlated data from remotely located stations in real-time are still not generally available. These systems are mandatory for environmental and biological studies in the coastal regions. Essential requirements for such systems are (1) low power consumption data acquisition and monitoring stations operating in-situ which are operated remotely in command-response mode from an accessible central station; (2) development and implementation of valid data sampling, averaging and reconstruction techniques; (3) real-time monitoring of the experimental progress from a central, accessible station; (4) command-response telemetry connection between the central, accessible station and the remote stations; and (5) techniques for verification and ordering of collected data in real-time.
RESULTS: (1) (a) A Controllable Automated Environmental Data Acquisition System now used routinely in the Coastal Boundary Layer Transect Experiment in Physical Oceanography. (b) A processor for real-time, in-situ data processing. (c) A Central Station Operation System. (2) Development of large-scale low-power, in-situ memories. (3) Investigation of telemetry link beyond line-of-sight distances. (4) Investigation of Momentum Flux Measuring System. (5) Development of above techniques.
PROJECT MILESTONES: FY77: (1) Development of large-scale, low-power, in-situ memories; (2) Investigation of telemetry link beyond line-of-sight distances; and (3) Investigation of Momentum Flux Measuring system. FY78: Development of above techniques.
KEYWORDS: INSTRUMENTATION;CONTROL COMPUTERS;SENSORS;OCEANOGRAPHY;DATA ACQUISITION;AUTOMATION;MONITORING;TELEMETRY;COMMUNICATIONS;ECOSYSTEMS

<081043>
TITLE: National Environmental Research Park
PROJECT NUMBER: 000992
PRINCIPAL INVESTIGATOR: Raynor, G.S.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, C.L.
TELEPHONE: F233-4208
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Atmospheric pollutants (20%);METALS/Heavy metals (10%);PARTICULATES/Sulfates (30%);ORGANICS/PCB's;ORGANICS/Etc. (20%);RADIATION/Radioisotopic fallout (20%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: In the interest of promoting research and study in the environmental sciences on the part of qualified investigators at educational and research institutions in the Northeast, a National Environmental Research Park (NERP) will be established at BNL that will provide an agency for making these facilities available on a cooperative basis. The cost, complexity, and space requirements would otherwise put these facilities beyond the reach of most of these institutions.
PROACH: Sites at BNL and other Long Island locations will be provided to institutions interested in carrying out experimental studies on the environment and energy-related impacts upon it.
SULTS: Broad-based experimental data and evaluated results of studies of energy-related impacts on natural ecosystems.
KEYWORDS: ENERGY;ENVIRONMENTAL EFFECTS;ENERGY PARKS;ECOSYSTEMS;ECONOMICS;COORDINATED RESEARCH PROGRAMS;PLANNING;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;ANIMALS;PLANTS

<081045>
TITLE: Radiation and Chemical Damage to DNA and its Repair
PROJECT NUMBER: 001285
PRINCIPAL INVESTIGATOR: Setlow, R.B.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$185,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (10%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (20%);ORGANICS (30%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The responses of cells to the deleterious agents in the environment that arise from nuclear, fossil and synthetic fuel technologies are governed by the fact that DNA is not only the most vulnerable but also the most important cellular target. Thus cellular responses depend on the radiation and chemically induced changes in DNA and how cells cope with these changes. Our goal is to understand the repair systems in a number of different animals, how they mitigate deleterious effects, and if such systems are inhibited by pollutants from fuel technologies.
APPROACH: We analyze, at the molecular level, the characteristics of the repair steps that take place both before and after DNA replication in bacteria and mammalian cells. We attempt to correlate biological, enzymological, chemical and physical data on bacterial and various types of mammalian cells so as to identify quantitatively the changes in DNA that have serious biological consequences, and how physical and chemical agents affect the repair systems themselves.
RESULTS: These data plus a knowledge of the efficiencies of repairing particular types of damage are aimed at permitting us to estimate the hazards of radiations and chemicals to cells and to extrapolate these findings to animals and man.
PROJECT MILESTONES: (1) July 1977 A knowledge of the interaction at the repair level between chemical carcinogens and radiation. (2) July 1978 A relation between chemical damages and radiation damages to DNA in their repair characteristics and their abilities to induce neoplastic transformation will be obtained.
KEYWORDS: ANIMAL CELLS;BACTERIA;DNA;BIOLOGICAL REPAIR;CARCINOGENS;IONIZING RADIATIONS;MUTAGENESIS;ULTRAVIOLET RADIATION;X RADIATION

<081046>
TITLE: Recombination and Repair of DNA
PROJECT NUMBER: 001286
PRINCIPAL INVESTIGATOR: Setlow, J.K.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Nitroso compounds; organics/Mitomycin C (50%);RADIATION/Ultraviolet and ionizing (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The aim is to understand the molecular basis of damage and repair of DNA in the bacterium Haemophilus influenzae after exposure of the cells to pollutants and radiation.
APPROACH: (1) To obtain and analyze mutants of H. influenzae deficient in various steps of recombination and repair, for the purpose of defining what the various steps are. (2) To determine in radioactively labeled DNA the type and amount of damage made by pollutants and radiation in H. influenzae cells exposed to these agents and to attempt to determine which specific damages cause the mutagenic and lethal effects of the agents.
RESULTS: (1) We expect to understand a process called postreplication repair, in which pieces of damaged parental strands of DNA are inserted into daughter strands, resulting in a distribution of damages between the DNA made before and after treatment. (2) We expect to determine the nature of the photochemical lesion in DNA responsible for mutation by wavelengths 300 to 360 nm.
KEYWORDS: BACTERIA;DNA;BIOLOGICAL REPAIR;ATP;NUCLEASES;MUTANTS;ENZYMES;MOLECULES;MUTAGENESIS;ULTRAVIOLET RADIATION

<081047>
TITLE: Food Chain Dynamics
PROJECT NUMBER: 001303
PRINCIPAL INVESTIGATOR: Walsh, J.J.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biolomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$375,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND

MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: An understanding of coastal trophic dynamics as affected by natural stimuli and authropagenic perturbations.
APPROACH: A multidisciplinary group effort to understand the effects of perturbations of natural marine food chains from the consequences of energy development within the coastal zone.
RESULTS: An understanding and evaluation of the risks involved in energy development of the coastal zone with respect to alteration of production, composition, and function of the natural communities.
PROJECT MILESTONES: (1) March 1975 completion of ACE-I cruise and (2) May 1976 completion of ACE-II cruise.
KEYWORDS: COASTAL WATERS;FOOD CHAINS;ENERGY;ENVIRONMENTAL EFFECTS;BIOMASS;TERRESTRIAL ECOSYSTEMS;COST BENEFIT ANALYSIS;CHEMICAL EFFLUENTS;OCEANOGRAPHY;ECOLOGY

<081048>
TITLE: Regional Studies
PROJECT NUMBER: 001304
PRINCIPAL INVESTIGATOR: Meier, P.M.;Palmedo, P.F.;Manowitz, B.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.O.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$915,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);FOSSIL FUEL/Oil and Gas (40%);CONSERVATION/General (20%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (5%);TRANSPORTATION (5%);STORAGE (5%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%);ELECTRICAL TRANSMISSION (10%);WASTE MANAGEMENT (5%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub 4/ (15%);METALS/Various (5%);PARTICULATES/Various (25%);ORGANICS/Various (25%);RADIATION/All types of pollutants associated with health related effects (5%);NOISE, VIBRATION (5%);HEAT, THERMAL (15%);VISUAL AESTHETICS (5%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this program is the development, testing and application of data, models and assessment tools for regional energy planning. It is part of an integrated multi-laboratory effort aimed at critical energy planning problems requiring analysis at the regional (multi-state scale). Three basic programmatic themes have been identified: (1) The siting of energy related facilities, (2) the increased use of coal, and (3) the increased development of domestic oil.
APPROACH: The Brookhaven program focuses on the Northeastern U.S. Eight tasks have been identified in the program, some of which relate to data and models for the entire region; others concentrate on specific key problems of the region; each is related to one or more of the basic programmatic themes. In all cases the applicability to other regions and to a national picture are important considerations. The tasks that are included in the program are: (1) The analysis of current energy planning activities in the region, interaction with regional users and analysis of possible future regional energy planning institutions; (2) the development of regional energy/environmental and economic data, models and scenarios; (3) the analysis of regional energy conservation strategies; (4) investigations of energy facility siting issues, particularly power parks and site assessment methodologies; (5) urban energy supply options, emphasizing the prediction of health impacts; (6) a study of the potential for, and the environmental implications of, the increased use of coal in the region; (7) studies of offshore and related development, including offshore nuclear plant siting, artificial multi-purpose islands and oil and gas development; and (8) support to other laboratories in the program in the areas of health impacts and characterization of emissions.
RESULTS: The primary outputs of the program are a series of policy analyses and a set of evaluation tools that can be used by state, local and regional agencies as well as utilities and industrial groups with interests in energy-related planning. The interlaboratory collaboration also aims at the integration of the separate regional studies into national energy policy analyses.
PROJECT MILESTONES: Completion of Northeastern Energy Perspectives Study June 1976. Completion of New Jersey Nuclear Center Assessment July 1976. Start of Coal Assessment Program July 1976. Publish Annual Report for FY 76 September 1976.
KEYWORDS: REGIONAL ANALYSIS;ENERGY;PLANNING;ENERGY MODELS;TECHNOLOGY ASSESSMENT;DATA PROCESSING;DATA ACQUISITION;COAL;PETROLEUM;SITE SELECTION;ENERGY POLICY;HEALTH HAZARDS;COST BENEFIT ANALYSIS;SYSTEMS ANALYSIS;SOCIO-ECONOMIC FACTORS

<081049>
TITLE: Effects of Toxic Agents on Cells in Culture
PROJECT NUMBER: 001323
PRINCIPAL INVESTIGATOR: Cronkite, E.P.
ADDRESS: Medical Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$142,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (25%);FOSSIL FUEL/Oil and Gas (10%);FOSSIL FUEL/Oil Shale (15%)
ENERGY CYCLE: EXTRACTION (25%);COMBUSTION IN SITU (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/O/sub 3/ (25%);METALS/Trace metals (25%);PARTICULATES/Silicates et al. (25%);ORGANICS/Hydrocarbons (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Develop rapid assay of environmental contaminants. Pulmonary alveolar macrophages (PAM)

and epithelial cells (EC I and II) are studied in tissue culture in the presence of energy-derived pollutants.
APPROACH: PAM and neutrophils are exposed in vivo (mice) or in vitro to silica, asbestos, organic particulates, polycyclic hydrocarbons, etc., and allowed to phagocytose and then mixed with EC I and II or both and put into continuous culture.
RESULTS: In culture one observes cell survival, production rate, chromosomal aberrations, and transformation. Transformed cells will be transplanted into syngeneic recipient to test carcinogenic potential.
PROJECT MILESTONES: (1) January 1977 Cell culture systems developed. (2) July 1977 First results on cell survival and production rates. (3) January 1978 First results on transformation. (4) July 1978 First results on carcinogenic potential of transformed cells.
KEYWORDS: SOMATIC;ANIMAL CELLS;CELL CULTURES;POLLUTION;BIOLOGICAL EFFECTS;PHAGOCYTOSIS;CHROMOSOMAL ABERRATIONS;SURVIVAL TIME;CARCINOGENESIS;AEROSOLS;CARCINOGENS;INHALATION;LUNGS

<081050>
TITLE: Coastal Productivity
PROJECT NUMBER: 001370
PRINCIPAL INVESTIGATOR: Walsh, J.J.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$430,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Achieve an understanding of processes controlling primary and secondary productivity on the coastal shelf.
APPROACH: A multidisciplinary group effort to understand the effects of perturbations of natural marine food chains from the consequences of energy development within the coastal zone.
RESULTS: An understanding and evaluation of the risks involved in energy development of the coastal zone with respect to alterations of production, composition, and function of the natural communities.
PROJECT MILESTONES: A series of cruises, laboratory experiments, and theoretical work is now underway to achieve the above objectives.
KEYWORDS: COASTAL WATERS;AQUATIC ECOSYSTEMS;PRODUCTIVITY;ENERGY;ENVIRONMENTAL EFFECTS;FOOD CHAINS;BIOMASS;CHEMICAL EFFLUENTS;OCEANOGRAPHY

<081051>
TITLE: Health Physics Summer Training Program
PROJECT NUMBER: 001372
PRINCIPAL INVESTIGATOR: Haughey, F.J.
ADDRESS: Safety and Environmental Protection Division, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Young, Harold H.
TELEPHONE: F376-4678
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Other coasts Unspecified
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This program covers radiation protection training activities; in particular, a 10-week problems course in applied health physics for graduate students. Special emphasis is placed on direct field experience in the solution of a wide variety of radiation protection problems at reactors, accelerators, radioisotope labs and medical installations. Discussion of the health and environmental impact of alternate energy sources has been introduced.
APPROACH: A ten-week problems course which includes on-the-job training in applied health physics will be provided for graduate students from institutions such as the Universities of Illinois, Kansas, Lowell and Michigan and Rutgers University. Since most of the students will probably lack financial support, $5000 to $10,000 will be allocated for student support in the form of stipends during the training program. It is planned to broaden the involvement of the summer trainees in the health and environmental impact of alternate energy sources.
RESULTS: Satisfactory training.
KEYWORDS: INSTRUMENTATION;RADIATION PROTECTION;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;EDUCATION;ELECTROMAGNETIC RADIATION;MICROWAVE RADIATION;MUTATIONS;GAMMA RADIATION;RADIOISOTOPES

<081053>
TITLE: Fish Eggs and Larvae
PROJECT NUMBER: 001382
PRINCIPAL INVESTIGATOR: Walsh, J.J.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-E(30-1)-16

77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Assessment of the effects of anthropogenic activities upon the marine environment and its constituent animal populations.
APPROACH: A multidisciplinary group effort to understand the effects of perturbations of natural marine food chains from the consequences of energy development within the coastal zone.
RESULTS: An understanding and evalution of the risks involved in energy development of the coastal zone with respect to alteration of production, composition, and function of the natural communities.
PROJECT MILESTONES: A series of cruises, laboratory experiments, and theoretical work is now underway to achieve the above objectives.
KEYWORDS: COASTAL WATERS;AQUATIC ECOSYSTEMS;FOOD CHAINS;ENERGY;ENVIRONMENTAL EFFECTS;AQUATIC ORGANISMS;BIOMASS;CHEMICAL EFFLUENTS;WATER POLLUTION;OCEANOGRAPHY;ECOLOGY

<081054>
TITLE: Control of Gene Expression in Mammalian Cells and Viruses
PROJECT NUMBER: 001385
PRINCIPAL INVESTIGATOR: Anderson, C.W.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To identify the block to adenovirus replication in African Green Monkey cells and to discover the mechanism by which Simian virus 40 (SV40) enhances the replication of adenovirus in these cells.
APPROACH: Adenovirus-SV40 hybrids have been isolated which grow with equal efficiency in monkey cells and human cells. The SV40 coded factor specified by these hybrids will be isolated and antibodies will be made against them. These factors will be tested in in vitro systems for their effect on adenovirus-directed protein synthesis and, when possible, on adenovirus-directed RNA synthesis. Preliminary results have indicated that one or more specific late adenovirus messenger RNAs (mRNAs) are deficient and/or defective in infected monkey cells. Our working hypothesis is that any early SV40 coded function alters the metabolism of adenovirus RNA in adenovirus, SV40 co-infected cells. This factor may also affect the interaction of adenovirus mRNAs with ribosomes.
RESULTS: The goal of this project is to identify a biochemial function of an early SV40 coded protein and to relate that function to the mechanism by which SV40 induces malignant cell transformation. The SV40 proteins coded by the Adenovirus-SV40 hybrids Ad2/sup +/ND/sub 1/ - Ad2/sup +/ND/sub 5/ will be identified and related to the early protein(s) coded by Sv40 itself.
PROJECT MILESTONES: (1) Isolation and purification of the SV40 coded proteins induced by the hybrids Ad2/sup +/ND/sub 1/, Ad2/sup +/ND/sub 2/, Ad2/sup +/ND/sub 3/, and Ad2/sup +/ND/sub 4/. (2) Identification of the amino-terminal and carboxy-terminal amino acid sequences of the above proteins. (3) Identification of the relationship of the antigenicity of these proteins to each other and to the SV40 coded T-antigen.
KEYWORDS: VIRUSES;ANIMAL CELLS;MESSENGER-RNA;RIBOSOMES;PROTEINS;BIOSYNTHESIS;GENETICS;HYBRIDIZATION;DNA;IN VITRO;MOLECULES;RNA

<081055>
TITLE: Plant Cell Genetics
PROJECT NUMBER: 001386
PRINCIPAL INVESTIGATOR: Burr, B.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: SOLAR/Biomass (25%);GENERAL SCIENCE (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Plants are often a poor source of protein because they are deficient in some amino acids essential to human health. Our goal is to improve the amino acid composition of protein in the edible portion of corn and other cereal grains.
APPROACH: We suspect that the major storage protein in maize endosperm is encoded by one or two genes. We would like to induce mutations in these genes which would cause the substitution of rare essential amino acids into the amino acid sequence of the storage protein. Because this protein makes up 50% of the total seed protein a change in its composition will be reflected in the overall composition of the grain.
RESULTS: The hoped for end result is a storage protein containing appreciable levels of lysine and tryptophan.
PROJECT MILESTONES: (1) Identification of a mutationally altered storage protein which leads to the formation of a kernel with an altered phenotype. (2) Mapping of this mutation in the maize genome. (3) Selection of normal appearing revertants containing lysine and tryptophan. (4) Recombination to obtain a protein with two or more substitutions.
KEYWORDS: MAIZE;CEREALS;GENETICS;MUTATIONS;PROTEINS;LYSINE;TRYPTOPHAN;GENE RECOMBINATION;PLANT CELLS;MOLECULES;PLANTS;RNA

<081056>
TITLE: Properties of Mammalian Cells Transformed by Tumor Viruses
PROJECT NUMBER: 001387
PRINCIPAL INVESTIGATOR: Hough, P.V.C.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$95,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Carcinogens (30%);RADIATION/Oncogenesis (30%);SPECIFIED OTHER POLLUTANTS/Viral oncogenesis (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this research is to localize and identify particular biological molecules (e.g., DNA, or protein, or fluorescent antibody) at electronmicroscopic resolution in intact biological structures (e.g., chromatin). The new technique will be applied in the cell biology of viral transformation. Thus, information on the mechanism of malignant transformation may be derived from a knowledge of the space relationships of SV40 T-antigen and the DNA of transformed mouse fibroblasts.
APPROACH: Particular molecular species are identified by the wavelength of fluorescent light emitted following excitation by electrons (e.g., blue-green for DNA, UV for protein). High resolution in space is obtained by using a finely focussed beam of electrons (not by any focussing of the light). The sensitivity of the technique is increased by a nearly 4 pi photon collector and by maintenance of the specimens at liquid-helium temperature. Low temperature increases the fluorescent efficiency and also the lifetime of fluorescing molecular groups under the beam.
RESULTS: We expect to be able to take electron micrographs which show the distribution of a particular molecular species in the specimen, e.g., the DNA, or (via fluorescent antibody) a particular protein. The best resolution obtained so far is 200A for the space distribution of DNA in hamster chromosomes. Our goal is to obtain 20A resolution for DNA, protein and fluorescent antibody, this being the theoretical resolution limit for the technique.
PROJECT MILESTONES: (1) Utilization of a high-sensitivity photon detector which is under construction (summer or fall, 1976). (2) Operation at liquid-helium temperature (summer, 1976). (3) Detection of single molecules (depends on results of first two milestones, but possibly winter, 1976-77). (4) Detection of ''transforming proteins'' in association with the chromatin of a transformed cell (1977).
KEYWORDS: ANIMAL CELLS;ONCOGENIC VIRUSES;MOLECULES;ELECTRON MICROSCOPY;ANTIGENS;DNA;MICE;PHOTONS;HAMSTERS;CHROMOSOMES;CARCINOGENESIS;BIOCHEMISTRY;NEOPLASMS;CARCINOGENS

<081058>
TITLE: Ship Charter
PROJECT NUMBER: 001538
PRINCIPAL INVESTIGATOR: Walsh, J.J.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$175,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide research vessel support for coastal Oceanography programs.
APPROACH: A multidisciplinary group effort to understand the effects of perturbations of natural marine food chains from the consequences of energy development within the coastal zone.
RESULTS: An understanding and evaluation of the risks involved in energy development of the coastal zone with respect to alteration of production, composition and function of the natural communities.
PROJECT MILESTONES: The FY77 Atlantic coastal experiment three (ACE-III) dealt primarily with the highly-stratified summer hydrographic regime on the Long Island Continental Shelf and the Georges Bank. The experimental field efforts in FY78 will occur in the Mid-Atlantic right during the spring bloom in May and during the fall bloom in October.
KEYWORDS: OCEANOGRAPHY;FOOD CHAINS;ENERGY SOURCES;COASTAL REGIONS;AQUATIC ORGANISMS;HAZARDS;COMMUNITIES;ENVIRONMENTAL EFFECTS;BIOMASS;ECOLOGY;AQUATIC ECOSYSTEMS;CHEMICAL EFFLUENTS;COASTAL WATERS

<081059>
TITLE: Penetration Through the Gut and Bio-Effects of Particulate Pollutants from Non-Nuclear Energy Production
PROJECT NUMBER: 001796
PRINCIPAL INVESTIGATOR: Joel, D.D.
ADDRESS: Medical Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$162,000

TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: PARTICULATES/SO/sub x/;PARTICULATES/Asbestos;PARTICULATES/Colloidal carbon;PARTICULATES/Carcinogen absorbed on inert particulates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Particulate pollutants enter the gastrointestinal tract not only from contaminated food and water but also from swallowing inhaled particles cleared from the lung. Consequently, the mucosal surface of the gut is a major site of contact with the environment. The broad objectives of this project are: (1) to study in animals the uptake, distribution and fate of non-viable particles of various size and surface characteristics administered into the intestine and, (2) to establish the biological effects of particulate pollutants including carcinogens and suspended sulfates.
APPROACH: Initially, polystyrene particles of various uniform sizes and tagged with a stable radioisotope will be given by gastric lavage to mice of different ages (fetal through adult) and the uptake, total body burden, organ distribution, and disappearance studied. Concurrently, other particulates such as colloid carbon, asbestos, and carbonized microspheres will be employed. Subsequently, the effect of particulate pollutants, on DNA turnover rates, hematopoietic stem cells, dominant lethal mutations, and carcinogenesis will be established. Dosage schedules will vary from a single exposure to chronic ingestion up to several months.
RESULTS: A prediction of the distribution and fate of various ingested particulate pollutants will result from the animal studies. By providing a valid estimate of the hazard to animals, an approximation of the hazard to man can be established. These studies will also provide useful information on particulate antigen entry in the gut and the immunological response to pollutant haptenes absorbed on particulates.
PROJECT MILESTONES: (1) Clear demonstration that particles up to several microns in size pass the intestinal barrier and enter the circulation. Dec. 1976. (2) Estimations in mice of uptake, organ distribution and half-life of particles of defined size. April 1977. (3) Begin experiments with suspended sulfates and other energy-related particulate pollutants. June 1977.
KEYWORDS: PERSORPTION;POLLUTION;ENERGY SOURCES;GASTROINTESTINAL TRACT;FOOD;WATER;LUNGS;INHALATION;PARTICLE SIZE;CARCINOGENS;SULFATES;POLYSTYRENE;MICE;TISSUE DISTRIBUTION;STEM CELLS;DNA;MUTATIONS;CARCINOGENESIS;INGESTION;IMMUNE REACTIONS;AEROSOLS;PARTICLES;PATHOLOGICAL CHANGES;SULFUR COMPOUNDS

<081061>
TITLE: Ambient Aerosol Determination
PROJECT NUMBER: 001814
PRINCIPAL INVESTIGATOR: Marlow, W.H.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Development of means, and the exploitation thereof, to measure size distributions of aerosol particles in ways which facilitate or contribute to determination of the distribution of chemical species among particles as a function of size from about 0.01 micrometer to over 1.0 micrometers.
APPROACH: (1) Development of the diffusion sampling technique first introduced under this project. (2) Design of a unique aerosol sample concentrator particularly applicable to high-speed sampling of nonvolatile particles. (3) Studies of phenomena related to particle measurement: Time-dependent polydisperse aerosol charging by polydisperse cluster ions; means of analyzing diffusion battery data for extraction of suboptical-sized particle size distribution information.
RESULTS: Using a diffusion battery separated aerosoles in the range of 0.02 um to 0.4 um diameter into 11 fractions and established the mass distribution and chemical composition as a function of size. Results indicate that most of the sub-optical mass can be accounted for by sulfate making reasonable assumptions about the density of the small particles. Two high-volume samplers were built which draw flows of over 200 l/min. and incorporate three very different aerosol sizing and sampling methods; the vertical impactors, the Tundgren impactor and the diffusion processor.
PROJECT MILESTONES: In FY 1978, the high-volume sampler will be employed regularly in a MAP35 airplane for studying power plant plume aerosol chemical composition as a function of particle size and how it changes with distance from 1/4 mile out. Comparison of size distribution data from diffusion battery with similar data from the Electro Aerosol Analyzer.
KEYWORDS: AEROSOLS;PARTICLE SIZE;DISTRIBUTION;SAMPLING;DIFFUSION;MEASURING METHODS;AIR;METEOROLOGY;PLUMES;AERIAL MONITORING

<081063>
TITLE: Photoelectrodialysis, Research and Development
PROJECT NUMBER: 001827
PRINCIPAL INVESTIGATOR: Hind, G.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$95,000
TECHNOLOGY: SOLAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)

POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Salt in water supplies (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Global;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This project has as its goal the development of a functional and economical solar-powered desalination device. It is hoped to develop a photochemically active membrane which will pump salts from sea or saline water against a concentration gradient to the point at which desalination is achieved (less than 500 ppm salt). This process for removing salt is analogous to currently operational electrodialysis devices which, however, consume electrical power.
APPROACH: In chloroplasts in vivo a gradient in pH as great as 3.0 units can be developed across the thylakoid membranes in the light. By addition of exchange diffusion carriers, this could be converted to a salt gradient of 1000:1. A synthetic membrane embodying oriented photochemical reaction centers and exchange diffusion carriers is sought which will be large enough to install in solar ponds. The support phase under study is nylon and the photochemical centers are those from Halobacterium purple membrane, chloroplast photosystem 1, or bacterial photosynthetic particles. The exchange diffusion carrier will be a lipophilic ionophorous antibiotic initially.
RESULTS: Solar panels containing flat membrane sheets on supports behind transparent windows, input and output plumbing. Facility for tandem operation. Throughput of saline for desalination to <500 ppm to be comparable to that of current electrodialysis installations (200,000 gal/day).
PROJECT MILESTONES: (1) Synthetic membrane containing active photochemical reaction centers. (2) As (1), but membrane asymmetric and showing vectorial H/sup +/ pumping. (3) As (2), with exchange diffusion carriers, giving NaCl gradient >10:1. (4) Demonstration model, 1 gal/h (from 5000 ppm NaCl to 500 ppm NaCl).
KEYWORDS: SALT;DIALYSIS;SOLAR ENERGY;DESALINATION;PHOTOCHEMISTRY;SEAWATER;CHLOROPLASTS;PH VALUE;MEMBRANES;ANTIBIOTICS;BACTERIA;PHOTOSYNTHESIS;WATER

<081064>
TITLE: Ecological Waste Water Recycling
PROJECT NUMBER: 001830
PRINCIPAL INVESTIGATOR: Small, M.M.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, R.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: CONSERVATION/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Sanitary waste (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Current methods of sanitary waste treatment result in loss of freshwater and are expensive in energy and money. The objective is to demonstrate a natural ecosystem that can be utilized to recycle water and nutrients at reduced energy and dollar costs.
APPROACH: Use of meadow-marsh and marsh-only ecosystems to demonstrate effective closed-loop recycling of nutrients and water. Year-round operation will be demonstrated, with establishment of ability to exceed public health standards for potable water.
RESULTS: Demonstration of effective economic!natural system sanitary waste recycling system on-site at BNL.
PROJECT MILESTONES: May 1977 The least-cost land system that will meet pending secondary standards regarding pathogens, trace organics, nutrients, dissolved solids, and heavy metals will be established.
KEYWORDS: AQUATIC ECOSYSTEMS;MARSHES;WASTE WATER;RECYCLING;NUTRIENTS;DRINKING WATER;CHEMICAL EFFLUENTS;WASTE MANAGEMENT;LAND USE;SEWAGE

<081065>
TITLE: Effects of Acid Rain on Terrestial Ecosystems
PROJECT NUMBER: 001831
PRINCIPAL INVESTIGATOR: Evans, L.S.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: F233-3664
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$215,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: NOXIOUS GAS/Sulphur compounds (80%);PARTICULATES/Sulphur and nitrogen compounds (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Energy-related acid rain fall and acid particulates cause increased stress on Northeast U.S. ecosystems. Poorly buffered, sandy-soiled Long Island ecosystems are especially affected. An investigation has been mounted to determine exactly what the effects are on plant systems, soil chemistry, soil microfleura and the inter-relationships of these three.
APPROACH: Determine constituents and rates of local (Long Island) rainfall. Expose plant foliage to simulated acid rains/aerosols of various concentrations, for various durations/intervals to determine: Physical/chemical injury effects, threshold limits with no injury effects, changes in plant growth and vegetative yields. Study changes in plant cell permeability by monitoring foliage leachates. Study SO/sub 4/ + NO/sub 3/ build-up as related to degree of exposure to acid rains/aerosols.
RESULTS: Establish pH, acidity, specific conductance, NH/sub 3/, NO/sub 3/, Cl/sub 2/, SO/sub 4/ and Na in locally collected rain (using a sequential sampling device for collecting rain). Establish acute effects of acid rains/aerosols on visual and histological levels, and on leaf growth rates. Establish threshold limits beyond which no visual/cellular injury or growth retardation will occur.
PROJECT MILESTONES: It has been determined by use of Scanning Electron Microscopy that Sulphate (SO/sub

4//sup 2-/) acid rain affects the cellular integrity of specific sites on leaf surfaces (of Phoseolus vulgaris and Heliamthus annuus) namely glands (trichomes) and stomates, thus gaining access to the internal leaf structure and creating injury sites at these locations.
YWORDS: RAIN;PH VALUE;TERRESTRIAL ECOSYSTEMS;PARTICLES;PLANTS;SOILS;LEAVES;GROWTH;PRODUCTIVITY;SULFATES;NITRATES;ELECTRON MICROSCOPY;AEROSOLS;POLLUTION;ENVIRONMENTAL EFFECTS;FORESTS;SULFUR DIOXIDE;SULFATES;WASHOUT;AMMONIA;CHLORINE COMPOUNDS;SODIUM

<081066>
TITLE: Mechanisms of Aberration Production in Eukaryote Chromosomes
PROJECT NUMBER: 001845
PRINCIPAL INVESTIGATOR: Bender, M.A.
ADDRESS: Medical Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$220,000
TECHNOLOGY: FOSSIL FUEL/General (60%);NUCLEAR/General (20%);GENERAL SCIENCE (20%)
ENERGY CYCLE: EXTRACTION (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (30%)
POLLUTANTS: NOXIOUS GAS/Mutagens-ozone (20%);ORGANICS/Mutagens (60%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objective of this project is elucidation of the molecular mechanisms involved in the production of aberrations in the chromosomes of human beings and other eukaryotes by chemical agents and ionizing radiations, particularly those associated with energy production, in order to allow more accurate assessment of their effects on the health of human populations.
APPROACH: Human and other vertebrate cells in tissue culture or in vivo are exposed to mutagenic agents at known stages of the cell cycle and the resulting patterns of aberrations and sister chromatid exchanges determined. Agents are selected either to produce known DNA lesions or, as in the case of ozone, because of their practical importance. Cells from persons with genetic diseases causing increased sensitivity to mutagens are studied to elucidate the role of enzymatic DNA repair mechanisms.
RESULTS: Understanding the basic mechanisms involved in chromosomal effects will not only allow better estimation of this important class of human genetic hazard, thus allowing more realistic health cost evaluation, but may also be expected to yield improved methods for screening such effects.
PROJECT MILESTONES: July 1, 1977, completion of studies of the effect of LET on patterns of aberration production. July 1, 1978, completion of evaluation of the sister chromatid exchange phenomenon as a screening method for environmental mutagens. January 1, 1979, completion of studies of inhaled ozone as a chromosomal mutagen in small mammals.
KEYWORDS: CHROMOSOMAL ABERRATIONS;MAN;IONIZING RADIATIONS;HUMAN POPULATIONS;BIOLOGICAL RADIATION EFFECTS;TISSUE CULTURES;CELL CYCLE;DNA;MUTAGENS;BIOLOGICAL REPAIR;HEALTH HAZARDS;RADIOINDUCTION;CARCINOGENS;GENETICS;MUTAGENESIS;MOLECULES

<081067>
TITLE: Experimental Radiation-Induced and Chemical-Induced Carcinogenesis
PROJECT NUMBER: 1846
PRINCIPAL INVESTIGATOR: Shellabarger, C.J.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$190,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: As cancer of the breast occurs in approximately 1 of every 4 adult American women, it is worthwhile to develop an animal model of this disease so that a better understanding of it may be gained in order to prevent or lessen the severity of the disease. Exposure to ionizing radiation has been associated with a high risk for developing breast cancer because women exposed to repeated fluoroscopic examinations, women survivors of atomic bombings, and possibly women treated with x-rays for acute postpartum mastitis, all seem to be at an increased risk of developing breast cancer. Additionally, many women are now undergoing routine x-ray mammography. An animal model system, using the rat as the test object, is being developed in order to understand the qualitative and the quantitative aspects of radiation-induced mammary carcinogenesis.
APPROACH: A graded series of single doses of either neutron radiation or x-radiation has been studied over the entire life span of female Sprague-Dawley rats.
RESULTS: These data are now being analyzed by Professor Kellerer, University of Wurzburg, and answers to the following questions will be forthcoming: As the dose of x-radiation is increased in a regular fashion, is there a concomitant increase in the incidence of mammary tumors. Does the incidence of both malignant and benign tumors increase with dose. Is there an actual increase in the number of tumors or is there only an earlier appearance of the tumors. Does neutron radiation produce the same responses as x-radiation.
KEYWORDS: CARCINOGENESIS;BIOLOGICAL MODELS;BIOLOGICAL RADIATION EFFECTS;BIOCHEMICAL REACTION KINETICS;NUCLEAR INDUSTRY;MAMMARY GLANDS;NEOPLASMS;RATS;NEUTRONS;X RADIATION;RADIOINDUCTION;CHEMICAL EFFLUENTS

<081068>
TITLE: Real Time Measurement System
PROJECT NUMBER: 1842
PRINCIPAL INVESTIGATOR: Adamowicz, R.F.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald

TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No.-EY-76-C-02-0016;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development and utilization of advance measurement techniques for the characterization and determination of trace atmospheric constituents resulting from energy production.
APPROACH: Laser spectroscopic techniques-infrared optoacoustic spectroscopy, laser Raman spectroscopy, ultraviolet resonance fluorescence.
RESULTS: Instrumentation for real-time, simultaneous, in situ measurement of gaseous and aerosol species at ambient concentrations.
PROJECT MILESTONES: Development of (1) Opto-acoustic system and (2) Laser Raman system.
KEYWORDS: OPTOACOUSTIC SPECTROSCOPY;AIR POLLUTION MONITORS;CHEMICAL EFFLUENTS;AEROSOLS;GASEOUS WASTES;PERFORMANCE TESTING;MONITORING;SPECTROSCOPY;RAMAN SPECTRA

<081071>
TITLE: Radiopharmaceuticals and Use of Radionuclides in Biological Research
PROJECT NUMBER: 002282
PRINCIPAL INVESTIGATOR: Wolf, A.P.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
77 FUNDING: Energy Research and Development Administration FY77:$260,000
TECHNOLOGY: MEDICAL APPLICATIONS OF NUCLEAR TECHNOLOGY (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The use of radionuclides in medicine, i.e., nuclear medicine, is well established. In the past five to ten years one of the most rapidly expanding areas of investigation has involved the use of cyclotron produced nuclides. Short-lived nuclides present advantages in terms of reduction of the radiation burden to the patient, serial studies, and the availability of radioactive oxygen, nitrogen, carbon, phosphorus, sulfur, and halogen isotopes. The radioactive isotopes of oxygen, nitrogen, and carbon are especially attractive for radiopharmaceutical research and design, because they can be used to label biomolecules without distorting structure and hence function in the living organism (as contrasted to unnatural materials such as metal-labeled chelates) and because they are positron emitters and thus make tomographic imaging possible.
APPROACH: Design of radiopharmaceuticals has relied heavily on the laborious empirical approach. The plan is to develop a rationale for radiopharmaceutical design while at the same time developing new compounds for studying function and metabolism in vivo. We intend to use a multipronged approach making use of chemical and biochemical methods to assure the delivery of the labeled material to the site whose biological function is being probed. This will include labeling research, the use of specific enzyme action to aid in localization, the use of ''masked'' compounds to effect delivery to the desired site, the use of structural effects in the labeled compound to alter the desired action in a predictable and controllable way, multi-label techniques to probe in vivo cell growth rate, and the use of in vivo imaging for understanding drug transport and substrate metabolism especially as it is perturbed by disease.
RESULTS: The basic impetus of this research effort is to develop new radiopharmaceuticals, labeled mainly with positron emitting nuclides, that can be used for the dynamic evaluation of a diseased state in order to provide improved diagnostic information. The emphasis will be on function and metabolism, and on materials which can ultimately have broad clinical applicability.
KEYWORDS: OXYGEN ISOTOPES;NITROGEN ISOTOPES;CARBON ISOTOPES;PHOSPHORUS ISOTOPES;SULFUR ISOTOPES;RADIOPHARMACEUTICALS;DESIGN;DISEASES;LUNGS;MEDICINE;RADIOISOTOPES

<081074>
TITLE: Environmental Policy, Brookhaven National Laboratory
PROJECT NUMBER: 002223
PRINCIPAL INVESTIGATOR: Hamilton, L.D.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Holt, H.R.
TELEPHONE: F233-4570;C(301)353-4570
TYPE OF FUNDING: Contract No.-EY-76-C-02-0016
77 FUNDING: Energy Research and Development Administration FY77:$640,000
TECHNOLOGY: FOSSIL FUEL/General (70%);NUCLEAR/General (5%);CONSERVATION/General (25%)
POLLUTANTS: NOXIOUS GAS/Sulfur oxides;NOXIOUS GAS/Sulfates (75%);PARTICULATES (20%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Continental;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To provide DOE with analyses of the relationships between technical, environmental, health, economic and societal factors as they affect environmental regulation, energy and environmental R and D policy or the commercialization of advanced systems.
APPROACH: Conduct specific studies on the environmental costs and benefits of conservation, information pertaining to possible regulation of sulfates impacts of new source performance standards, environmental and health impacts of increased use of fossil fuels vs. nuclear development and economic impacts of energy development.
RESULTS: Periodic topical reports; monthly progress reports.
KEYWORDS: POLICY;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;ENVIRONMENT;REGULATIONS;DATA ACQUISITION SYSTEMS;COST BENEFIT ANALYSIS;ECONOMICS;SOCIO-ECONOMIC FACTORS;AIR;RESPIRATION;SULFUR COMPOUNDS;WATER

<081075>
TITLE: Chemical and Environmental Mutagenesis
PROJECT NUMBER: 002014
PRINCIPAL INVESTIGATOR: Sparrow, A.H.
ADDRESS: Biology Department, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$135,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (25%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (15%)
POLLUTANTS: NOXIOUS GAS (45%);ORGANICS (30%);RADIATION (5%);HEAT, THERMAL (10%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: The objective is to develop, improve and utilize a genetic test system capable of measuring the mutagenic hazards of even weak mutagens, especially those in the gaseous state. Also, this system will be used to evaluate the relative mutagenic potential of chemicals of diverse origins but which are known or suspected of being mutagenic. Because of the high correlation between mutagenicity and carcinogenicity the work also has a bearing on detection of carcinogens in the environment.
APPROACH: We have demonstrated that methods developed for studying the effects of physical mutagens utilizing the Tradescantia genetic test system can be applied with very little modification to chemical mutagen investigation of gaseous chemical mutagens. Also, dose response data from physical mutagen treatments can be used for baseline comparisons with data from chemical mutagen experiments. Present data indicate that the system is sensitive enough to detect a significant increase in mutation frequencies at levels well below 1 ppm for some gaseous mutagens but efforts will continue to try to increase the efficiency and sensitivity of the test system.
RESULTS: Efforts will be made to determine the mutagenicity and overall genetic hazard of both specific ambient air pollutants and certain volatile industrial chemicals. The application of known chemical mutagens with specific modes of action to existing and new repair-deficient sensitive genetic test systems is expected to help elucidate both the extent of and mechanisms involved in environmental mutagenesis. Clean air facilities will be used to try to stabilize background spontaneous mutation frequencies in test systems and to determine whether such mutations are the result of inherent genetic instability or are induced by unknown environmental mutagenic agents. A mobile monitoring vehicle will be employed to assess the mutagenic hazards of ambient air pollution and of toxic industrial pollutants in a few sites in the tristate area (Conn., N.J. and N.Y.). Data from exposures to low concentrations of both pollutants and known mutagens singly or in combination will contribute to the overall assessment of the potential genetic hazard to man of environmental mutagens.
PROJECT MILESTONES: (1) Fall 1976 Completion of clean air facility for use in studies of possible genetic effects of ambient levels of air pollutants from various sources. (2) Fall 1976 Confirmation of metabolic activation of chemical mutagens in plants. (3) Winter 1977 Completion of analysis of first Mobile Unit field monitoring data. (4) Spring 1978 Incorporation of new genetic markers in Tradescantia genetic test clones. (5) Fall 1978 Asessment off Mobile Monitoring vehicle for routine use in genetic monitoring of air pollutants. Production of more sensitive genetic stocks of Tradescantia for use in environmental mutagen studies and monitoring.
KEYWORDS: MUTAGENESIS;HAZARDS;MUTAGENS;CARCINOGENESIS;CARCINOGENS;TRADESCANTIA;MUTATION FREQUENCY;GENETICS;AIR POLLUTION;MONITORING;BIOLOGICAL REPAIR

<081076>
TITLE: Ambient Aerosol Mechanisms
PROJECT NUMBER: 002356
PRINCIPAL INVESTIGATOR: Tang, I.
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Brookhaven National Lab., Upton, N.Y. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: SURFACE AIR;AEROSOLS;CHEMICAL EFFLUENTS;AERODYNAMICS;ENVIRONMENTAL TRANSPORT;METEOROLOGY;AIR POLLUTION

<081077>
TITLE: Regional Disaggregation of Energy Futures for WRC Assessments
PROJECT NUMBER: 002565
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Brookhaven National Lab., Upton, N.Y. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$6,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ENERGY SOURCES;WATER RESOURCES;REGIONAL ANALYSIS;FORECASTING

<081080>
TITLE: Assessment of Environmental Factors Involved in (1) the Flash Hydropyrolysis of Coal (FHP) and (2) CO2 Control Technology
PROJECT NUMBER: 800264;800233
PRINCIPAL INVESTIGATOR: Steinberg, M.;Albanese, A.S.
ADDRESS: Building 526, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Witmer, Fred E.
TELEPHONE: F233-5516
TYPE OF FUNDING: Contract No.-EY-76-C-02-0016
77 FUNDING: Energy Research and Development Administration FY77:$25,000

TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (80%);COMBUSTION OR END USE (20%)
POLLUTANTS: NOXIOUS GAS/To be determined (20%);METALS/To be determined (20%);PARTICULATES/To be determined (15%);ORGANICS/To be determined (20%);HEAT, THERMAL/To be determined (5%);SPECIFIED OTHER POLLUTANTS/CO2 (20%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (10%);ANALYTICAL (90%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: FHP: to assess the environmental factors and the control technologies involved in the Flash Hydropyrolysis of coal (FHP). CO2: to investigate the historical and anticipated concentration increase of CO2 in the atmosphere and its possible effects on the environment, and to assess means of controlling the level of atmospheric CO2.
APPROACH: FHP: (1) conduct laboratory analyses on samples obtained from BNL's experimental FHP unit. Based on the experimental data, prepare conceptual flow diagrams, including mass and energy balances, of full-scale FHP-chemical and FHP-refinery complexes. (2) Survey the literature to determine available ECT's, assess available technology and identify the areas in which new technology is required. CO2: survey the literature and consolidate findings on CO2 emissions and atmospheric concentration levels. Prepare conceptual processing schemes for CO2 recovery and recycle and perform exploratory studies.
RESULTS: FHP: The results of this study will (1) provide an indication of the possible effluents from an integrated FHP complex, (2) provide a basis for establishing environmental guidelines for FHP and related processes, and (3) identify areas in which new control technologies would be required for commercialization of the process. CO2: The results of this study will identify some of the options which are available for controlling the level of CO2 in the atmosphere.
PROJECT MILESTONES: October 1, 1977: (1) FHP: complete preliminary conceptual flow diagram of FHP-chemical complex. Identify potential pollutants and source streams. (2) CO2: complete investigation of the historical and anticipated concentration increase of CO2 in the atmosphere. September 30, 1978: (1) FHP: complete conceptual flow diagrams of FHP-chemical and FHP-refinery complexes based on the data obtained from BNL's experimental unit. Complete literature survey and technology assessment. (2) CO2: complete literature survey, technology assessment and study on available options for controlling the level of CO2 in the atmosphere.
KEYWORDS: CHEMICAL EFFLUENTS;EMISSION;HYDROCARBONS;SYNTHETIC FUELS;CARBON DIOXIDE;COAL LIQUEFACTION;FLASH HYDROPYROLYSIS PROCESS;ENVIRONMENTAL IMPACTS;AIR POLLUTION ABATEMENT;WATER POLLUTION ABATEMENT;LAND POLLUTION ABATEMENT;CONTROL;TECHNOLOGY ASSESSMENT;POLLUTION CONTROL;EARTH ATMOSPHERE

<081082>
TITLE: Development of Standards and Criteria, Reactor Safety Standards Project
PROJECT NUMBER: 600026
PRINCIPAL INVESTIGATOR: Powell, R.W.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Yoder, John A.
TELEPHONE: F233-5632
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$243,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Identify the applicability of existing nuclear standards (ANSI, ANS, IEEE, ASME, ERDAM, etc.) to ERDA-owned reactors, commensurate with a reactor's potential hazards. Identify areas (siting,

design, construction, modification, operation, maintenance, etc.) where existing standards are insufficient or new standards are needed and develop these standards. Develop design guides for ERDA-owned reactors that identify and provide guidance on the application of standards and codes applicable to reactor safety and design.
APPROACH: Categorize ERDA-owned reactors into groups that have generally similar design and operating characteristics. Develop a design guide for each reactor category that identifies the applicability of existing standards to that category of reactor.
RESULTS: Comprehensive guidance to aid contractors in the siting, design, construction, modification operation, maintenance and decommissioning for new or modified reactors in accordance with generally uniform standards, guides and codes applicable to each ERDA owned reactor category.
PROJECT MILESTONES: (1) Reactor Categorization System, 10/76. (2) Complete preparation of seven design guides, 8/78. (3) Revision of design guides to reflect use, 9/79.
KEYWORDS: REACTORS;SAFETY STANDARDS;US ERDA;REACTOR SAFETY;RECOMMENDATIONS

<081083>
TITLE: MAP3S Data Management
PROJECT NUMBER: 2352
PRINCIPAL INVESTIGATOR: Benkovitz, C.M.
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David
TELEPHONE: F233-4488;C(301)353-4488
TYPE OF FUNDING: Contract No.-EY-76-C-02-0016;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Collect, evaluate, codify newly measured and historical data that pertains to the distribution and evolution of energy related pollutants over the Greater Northeast U.S. To continually build a readily accessible data bank against which regional pollutant transport and transformation models can be tested. To provide baseline air quality data for the greater Northeast to which future assessments of regional atmospheric environmental impacts from new energy technologies may be referred.
APPROACH: Coordinate with participating laboratories to establish mutually agreeable procedures for data collection, evaluation and format. Set up administrative and computer oriented processes to handle data translation and storage at BNL and disseminate such data via magnetic tape exchange and for use by participants. Evaluate existing EPA and State data sets on emissions and ambient air quality and incorporate into a central BNL data bank.
RESULTS: Development of a set of data formats useable for submittal to the central repository at BNL. Develop computer software to implement the methods agreed upon.
KEYWORDS: DATA COMPILATION;ENERGY SOURCES;POLLUTION;AIR QUALITY;AIR POLLUTION;COMPUTERS;US EPA;CHEMICAL EFFLUENTS;GASEOUS WASTES;METEOROLOGY;SULFUR DIOXIDE;NITROGEN OXIDES;MATHEMATICAL MODELS

<081084>
TITLE: MAP3S Transport and Transformation
PROJECT NUMBER: 1812
PRINCIPAL INVESTIGATOR: Michael, P.
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(30-1)-16;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$375,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (80%);DEVELOPMENT (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Develop ability to assess the environmental effects of energy related pollutants released to the atmosphere and develop a capability to characterize the transport and fate of these pollutants as they move through the atmosphere.
APPROACH: Carryout field measurement studies using aircraft and other platforms in which the chemical and physical form of SO2, particulates are collected and analyzed and correlate these changes with synoptic meteorological observations.
RESULTS: Plumes from power plant have been followed in the Northeast and St. Louis areas. Monitoring flight of hundreds of miles have been carried out to identify the vertical and horizontal distribution of pollutants east of the Appalachian Mountains in cooperation with similar flight west of the mountains by Pacific Northwest Lab.
PROJECT MILESTONES: Summer of 77-conduct monitoring flight in Northeast U.S. Spring of 1977-study SO2-sulfate conversion in an oil fired power plant plume.
KEYWORDS: EMISSIONS;INSTRUMENTATION;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;POLLUTION;AIR POLLUTION;DISTRIBUTION;AEROSOLS;SULFUR DIOXIDE;METEOROLOGY;PLUMES;MONITORING;WEATHER

<081085>
TITLE: MAP3S Modeling and Analysis
PROJECT NUMBER: 2353
PRINCIPAL INVESTIGATOR: Michael, P.
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David
TELEPHONE: F233-4488;C(301)853-4488
TYPE OF FUNDING: Contract No.-EY-76-C-02-0016;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (35%);PARTICULATES (35%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To develop and test numerical models which relate on a regional basis observed ambient levels of energy related pollutants to emissions from large stationary sources.
APPROACH: Review of the status of regional transport and diffusion models. Select appropriate models and integrate into these chemical reaction and removal mechanism parameters. Test the models against existing data bases.
RESULTS: A suite of models of increasing complexity which will accurately describe the transport and chemistry of energy related pollutants with particular emphasis on SO2 and sulfate.
PROJECT MILESTONES: Test trajectory model for the transport of ozone and ozone precursors from the midwest to the eastern U.S. Assess in a preliminary fashion the impact of increased use of high sulfur coal.
KEYWORDS: FATE;FUNCTIONAL MODELS;ENERGY SOURCES;EMISSION;DIFFUSION;DISTRIBUTION;SULFUR DIOXIDE;SULFUR COMPOUNDS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;OZONE

<081086>
TITLE: Aircraft Operations
PROJECT NUMBER: 2355
PRINCIPAL INVESTIGATOR: Garber, R.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, Davis S.
TELEPHONE: F233-3600
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$188,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: An aircraft has been leased to carry out research projects which are part of the Atmospheric Sciences programs at Brookhaven National Laboratory. The principal use for the aircraft is in conjunction with the Multistate Atmospheric Power Production Pollution Study program.
RESULTS: Approximately one half of the aircraft's scheduled flight time will be utilized to conduct routine MAP3S observations, including horizontal and vertical atmospheric pollutant profiles and regional pollution transport studies. About one quarter of its scheduled flight time will be utilized for plume studies which are part of MAP3S. The remaining scheduled flight time will be used in cooperative atmospheric studies with aircraft and ground observation teams in conjunction with organizations outside BNL, but which are part of the overall MAP3S program.
KEYWORDS: INSTRUMENTATION;LOGISTICS SUPPORT;AIRCRAFT;RESEARCH PROGRAMS;AIR POLLUTION;BNL;AERIAL MONITORING

<081087>
TITLE: Northeast Oceanography Coordination
PROJECT NUMBER: 2546
PRINCIPAL INVESTIGATOR: Walsh, J.J.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Other hydrographic areas All
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The ERDA-funded oceanographic programs in the northeast include a diverse array of facilities, talent and research objectives, and are located at geographically-dispersed laboratories and universities. The environments under study range from the open ocean, continental slope and shelf, estuaries, bays, and coastal lagoons to the intertidal zone, with particular strength in the study of estuarine and shelf ecosystems. In order to maximize the usable output from these programs, a high degree of coordination and communication among the investigators and with other programs in the northeast is highly desirable.
APPROACH: Using three types of meetings as primary mechanisms, BNL proposes to encourage better information exchange and liaison among the northeast ERDA contractors. These meetings will include (1) Annual program-review meetings among this entire group of contractors, (2) Meetings and/or experiments for the

intercomparison of methods and instruments, and (3) Meetings on single topics of timely nature. Reports from these meetings will be made available to ERDA for the periodic reevaluation of program goals, deficiencies, and accomplishments.
YWORDS: SUPPORT;COORDINATION;OCEANOGRAPHY;SEAS;CONTINENTAL SHELF;ESTUARIES;BAYS;COASTAL WATERS;AQUATIC ECOSYSTEMS;BNL;US ERDA;RESEARCH PROGRAMS;COMMUNICATIONS

<081088>
TITLE: Mass Spectrometric Determination of Environmental Pollutants
PROJECT NUMBER: 4027
PRINCIPAL INVESTIGATOR: Friedman, L.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No.-EY-76-C-02-0016;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$60,000
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development of techniques for the characterization of black anthracotic particulate matter in tracheobronchial lymph nodes.
APPROACH: Isolation of carbon from particulate matter and precise measurement of 13C/12C isotopic ratio by mass spectrometry.
RESULTS: Identification of the power of carbon in inhaled and ingested particulate matter and correlation with medical and environmental history.
PROJECT MILESTONES: Development of techniques to: (1) isolate carbon containing particles from pulmonary lymph nodes; (2) isolate carbon; (3) measure 13C/12C isotopic ratio.
KEYWORDS: MAN;INHALATION;CARBON;RESPIRATORY SYSTEM;TISSUE DISTRIBUTION;PARTICLE SIZE;MEASURING METHODS;ISOTOPE RATIO;CARBON 12;CARBON 13;TISSUES;SAMPLING;HEALTH HAZARDS;MASS SPECTROSCOPY;INGESTION;AIR POLLUTION;ENVIRONMENT

<081090>
TITLE: Detrimental Biological Effects of Magnetic Fields
PROJECT NUMBER: 001375
PRINCIPAL INVESTIGATOR: Baum, J.W.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-0936000
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Magnetic fields (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Local
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Controlled thermonuclear reactors will require the use of exceptionally large magnets of very high field intensity. The fields near these magnets will vary from approximately 100,000 Oersted inside the shields to possibly 10 Oersted at a few hundred meters. Many biological effects have been reported for such magnetic fields, however, their validity is open to question.
APPROACH: A careful study of somatic, genetic and developmental effects is planned using mutations in Tradescantia stamen hairs as the test organism for somatic mutations and using Drosophila as the test organisms for genetic and developmental effects. Tradescantia cuttings will be exposed for periods from 1 to 20 days in fields of intensity from 1 to 100,000 Oersted. Drosophila will be exposed continuously for several generations in preliminary screening studies. Later, genetic and developmental effects will be separated by exposing flies only before mating for a period of 12 hours.
RESULTS: Effects of field intensity, field gradient and exposure time will be explored. Results will be compared to previous findings involving ionizing radiation and various chemical mutagens. Implications for exposure to man will be considered in terms of appropriate permissible exposure standards for workers and the general public.
KEYWORDS: MAGNETIC FIELDS;BIOLOGICAL EFFECTS;THERMONUCLEAR REACTORS;MAGNETS;TRADESCANTIA;DROSOPHILA;MUTATIONS;IONIZING RADIATIONS;BIOLOGICAL RADIATION EFFECTS;HAZARDS

<081091>
TITLE: Effects of Radiation and Fossil Energy Related Pollutant on Tumor Virus Activation
PROJECT NUMBER: 002350
PRINCIPAL INVESTIGATOR: Pavlova, M.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-93600;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (90%);NUCLEAR/General (10%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine if radiation and toxic hydrocarbons from fossil fuel effluents activate latent tumor viruses and what dose ranges are effective in these oncogenic processes.
APPROACH: Radiation dose ranges (100 to 1200 rads exposures) will be made on chickens carrying the viruses. Four hundred 400-rad exposures will be used for in-vitro cell cultures infected with viruses. Viral replication and cell transformation will be correlated and dose dependence evaluated. Similar studies will be carried out with 3.4 benzopyrene and 7.12 dibenzanthracene (.1 to 1 mmg/ml).
RESULTS: Evaluation of radiation enhancement or inhibition of in-vivo/in-vitro activation/replication of herpes virus. Evaluation of hydrocarbon activation of viruses, and understanding of mechanism of viral latency and activation in tumorogenesis.
PROJECT MILESTONES: (1) Report data for radiation activation of viruses 1-9-77. (2) Report data for hydrocarbon activation of viruses 1-9-78.
KEYWORDS: ONCOGENIC VIRUSES;CHEMICAL ACTIVATION;POLLUTION;HYDROCARBONS;FOSSIL FUELS;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;CHICKENS;RADIATION DOSES;BENZOPYRENE;BENZANTHRACENE;IN VIVO;IN VITRO;NEOPLASMS;VIRUSES;ANIMAL CELLS

<081092>
TITLE: NMR Studies of Protein Conformation; Microtubule Assembly and Proteasas
PROJECT NUMBER: 001825
PRINCIPAL INVESTIGATOR: Stealicht, H.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Clarify mechanisms of action of drugs that interfere with microtubule polymerization. Determine the structural basis of the proteolytic specificity of plasminogen.
APPROACH: NMR study of tubulin-drug complexes study conformational charges in heavy and light chains of plasminogen after reaction with DFP.
RESULTS: Improved understanding at the molecular level of the critical properties of two important proteins: tubulin and plasminogen.
PROJECT MILESTONES: Establishment of NMR laboratory with capability of detecting H-1, C-13 and other nuclear resonances. Initiate program above.
KEYWORDS: PROTEINS;MOLECULAR STRUCTURE;NUCLEAR MAGNETIC RESONANCE;DRUGS;POLYMERIZATION;TUBULES;COMPLEXES;ENZYMES;BIOCHEMICAL REACTION KINETICS

<081093>
TITLE: Effects of Chemical Agents on DNA; Properties of Repair Enzymes
PROJECT NUMBER: 001824
PRINCIPAL INVESTIGATOR: Doniger, J.N.
ADDRESS: Biology Dept., Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To understand the human excision repair mechanisms by isolating and characterizing the enzymes involved in this process.
APPROACH: Extracts of either human placenta or bacterial cells will be prepared and endonucleases and exonucleases which can repair DNA in-vitro will be isolated and purified and their specificity and mechanism of action determined.
RESULTS: An exonuclease from human placenta which can preferentially excise pyrimidine dimers from incised uv irradiated DNA has been isolated and described.
PROJECT MILESTONES: The presence of this enzyme in Xeroderma pigmentosa cells will be determined.
KEYWORDS: DNA;REAGENTS;ENZYMES;BIOLOGICAL REPAIR;PLACENTA;BACTERIA;NUCLEASES;BIOCHEMISTRY;MAN;ULTRAVIOLET RADIATION

<081094>
TITLE: Optical Probes of Macromolecular Conformations and Interactions
PROJECT NUMBER: 001823
PRINCIPAL INVESTIGATOR: Sutherland, J.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (25%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: Use of dynamic optical techniques to measure the kinetics of interaction between proteins and nucleic acids in studies of repair systems.
APPROACH: The techniques to be used are phosphorescence and fluorescence; circular dichroism; magnetic circular dichroism and magnetic fluorescence polarization.
RESULTS: Systems to be suitable for study will include interactions between (1) DNA and photoreactivating enzyme; (2) polymerases and DNA and RNA; (3) DNA and histones and non-histones; and (4) carcinogens and DNA.
PROJECT MILESTONES: (1) Identification of chromophores of photoreactivating enzyme by July 1977. (2) Kinetics of interaction between modified DNA and histones by July 1978. (3) Kinetics of binding of hydrocarbons and proteins by July 1978.
KEYWORDS: BIOCHEMISTRY;CARCINOGENS;DNA;ENZYMES;HYDROCARBONS;RNA;BIOCHEMICAL REACTION KINETICS;MEASURING METHODS;BIOLOGICAL REPAIR;PROTEINS;HISTONES;OPTICAL EQUIPMENT;AIR POLLUTION;HEALTH HAZARDS;PHOSPHORESCENCE;FLUORESCENCE;CIRCULAR CONFIGURATION;DICHROISM

<081095>
TITLE: Occupational Health and Medical Research Inhalation Toxicology and the Physiology, Biochemistry and Morphology of Human Pulmonary Disease
PROJECT NUMBER: 2198
PRINCIPAL INVESTIGATOR: Drew, R.T.
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Weyzen, W.W.
TYPE OF FUNDING: Contract No.-EY-76-C-02-0016;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$605,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil Shale (25%);GEOTHERMAL/General (15%);SOLAR/Electric (10%)
ENERGY CYCLE: PROCESSING, CONVERSION (75%);COMBUSTION OR END USE (15%);ELECTRICITY GENERATION (10%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Study the health effects of energy related atmospheric pollutants by integrating the results of in vitro studies, animal toxicology studies, and clinical studies of human pulmonary disease.
APPROACH: In the clinical aspect of the program, the normal structure and function of gas exchange units and non-gas exchange units of the lung will be investigated. Normal biochemical, physiological, and radiological parameters will be established for healthy human beings, and the effects of pulmonary diseases, such as fibrosis, emphysema, and chronic obstructive lung disease, on these normal values will be investigated. Investigations involving patients will include pulmonary biopsies and washings to provide material for tissue culture of pulmonary macrophages and diverse epithelial and endothelial lines for biochemical and histological studies; aerosol deposition and clearance studies; and studies of respiratory physiology.
RESULTS: The conception (Title I phase) of the inhalation facility capable of handling airborne particulate carcinogens was completed and Title II phase drawings are essentially complete.
PROJECT MILESTONES: (1) Well defined animal models of fibrosis and emphysema will be developed, Sept. 30, 1977. (2) The inhalation toxicology facility will be completed and it is anticipated that chronic studies in rodents will have been initiated, Sept. 30, 1978.
KEYWORDS: AIR POLLUTION;BIOLOGICAL EFFECTS;ANIMAL CELLS;IN VITRO;LABORATORY ANIMALS;MAN;RESPIRATORY SYSTEM DISEASES;AEROSOLS;INHALATION;RESPIRATORY SYSTEM;PATHOLOGICAL CHANGES;ETIOLOGY;TOXICITY;ANIMALS;BIOCHEMISTRY;CARCINOGENS

<081100>
TITLE: Approach to the Molecular Basis of Carcinogenesis
PROJECT NUMBER: 2557
PRINCIPAL INVESTIGATOR: Slater, D.W.
ADDRESS: Brookhaven National Laboratory, Biology Department, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Global
PROJECT DESCRIPTION: The goal of the proposed research is the development of flexible, rapid and economical assay systems for the determination of teratologic risk generated by environmental insult, as well as the identification of the primary molecular lesions causal to teratogenesis.
APPROACH: The first phase entails the development of a sensitive morphological bioassay utilizing sea urchin embryogenesis as an indicator system. Sea urchin area will be fertilized and cultured through gastrulation and abnormal development monitored as influenced by potential teratogens (together with studies on the effect of activation in microsomal systems.) A second phase will be the development of a similar detection system using clones of totipotent mammalian embryonal cells derived from teratocarcinomas.
RESULTS: The above bioassay systems are expected to yield a flexible, rapid and economical means of assessing teratologic risk.
PROJECT MILESTONES: (1) FY 77 Development of the sea urchin assay system and initiation of screening tests. (2) FY 78 Development of the teratocarcinoma test system.
KEYWORDS: CARCINOGENESIS;BIOLOGICAL MODELS;CHEMICAL EFFLUENTS;FOSSIL FUELS;BIOASSAY;TERATOGENESIS;SEA URCHINS;BIOLOGICAL INDICATORS;MOLECULES;RNA;DNA;BIOCHEMISTRY;BIOCHEMICAL REACTION KINETICS;ORGANIC COMPOUNDS;GASEOUS WASTES;AEROSOLS

<082001>
TITLE: Cellular and Subcellular Biophysics
PROJECT NUMBER: 000111
PRINCIPAL INVESTIGATOR: Mel, H.C.
ADDRESS: Donner Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GENERAL SCIENCE (60%)
POLLUTANTS: METALS (75%);RADIATION (10%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (15%)
CHARACTER OF STUDY: RESEARCH/Applied (60%);DEVELOPMENT/Laboratory scale (20%);ANALYTICAL (20%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Basic Cell-Membrane Biophysics with eventual application to pollutants, human pathology; basic studies in differentiation and development.
APPROACH: Biophysical instrumentation: Development and application.
RESULTS: Detecting small quantities of agents; human and environmental screening potential; improved understanding of cell-membranes and cell populations.
PROJECT MILESTONES: (1) Improved technique of dynamic osmotic hemolysis Oct. 1976. (2) Red cell-membrane responses to lead and mercury Feb. 1977. (3) Cell-radiation response and pilot screening, human pathology June 1977.
KEYWORDS: BIOPHYSICS;CELL MEMBRANES;POLLUTION;MEASURING INSTRUMENTS;ANIMAL CELLS;ERYTHROPOIESIS;PATHOLOGY;BIOLOGICAL EFFECTS;BLOOD

<082002>
TITLE: Molecular and Cellular Biology
PROJECT NUMBER: 000112
PRINCIPAL INVESTIGATOR: Calvin, M.;Bartholomew, J.C.;Bassham, J.A.;Bennett, E.L.;Bissell, M.J.;Klein, M.P.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5168
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$288,000
TECHNOLOGY: FOSSIL FUEL/General (75%);GENERAL SCIENCE (25%)
POLLUTANTS: ORGANICS/Polycyclic hydrocarbons (25%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are to understand the response of animal cells, both in vivo and in tissue culture, to environmental stimuli including chemical pollutants. A major part of this project is directed to determining mechanisms of action of chemical carcinogens and the characterization of cells transformed by these agents.
APPROACH: Specific studies include the metabolism of polycyclic aromatic hydrocarbons and the binding of metabolic products to nucleic acids, biophysical properties of membranes, growth and metabolic regulation of cells in tissue culture, and sensitivity of these cells to chemotherapeutic drugs. This project also includes investigation of the response of animal organisms to external stimulae. As a model, the anatomical and biochemical changes in brain leading to memory are investigated. Knowledge gained is being used to obtain a better understanding of recovery from brain lesions.
RESULTS: Results expected include identification of surface proteins of normal and transformed cells and determination of the role of membrane lipids in the mobility of these proteins; better understanding of metabolic regulation of glucose metabolism in normal and transformed cells and extension of metabolic regulation; characterization of steps in cell cycle involved in growth regulation of these cells and effects of chemotherapeutic drugs on this cycle; correlation of drug effects in vivo and in cell cultures; investigation of effects of environmental pollutants, correlation of anatomical and biochemical indices

with recovery of brain function after lesion.
PROJECT MILESTONES: (1) Completion of Flow-Microfluorometer May 1, 1977. (2) Identification of an Animal Cell Surface Protein June 1, 1977.
KEYWORDS: MOLECULAR BIOLOGY;ANIMAL CELLS;POLLUTION;HYDROCARBONS;NUCLEIC ACIDS;PHYSICAL PROPERTIES;TISSUE CULTURES;DRUGS;METABOLISM;MEMBRANES;BRAIN;BIOCHEMISTRY;CARCINOGENESIS;ANIMALS;CARCINOGENS;DNA;NEUROLOGY

<082003>
TITLE: Biophysical Chemistry
PROJECT NUMBER: 000113
PRINCIPAL INVESTIGATOR: Klein, M.P.;Sauer, K.;Tinico, I.;Calvin, M.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C. E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$554,000
TECHNOLOGY: SOLAR/General (25%);GENERAL SCIENCE (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The storage and utilization of energy by biological systems, together with the nature and changes in information content of such systems, are the principal concerns of this research. Emphasis is placed on (1) the role of biological structure on the process of energy conversion in photosynthesis, (2) the way in which nucleic acid structure and organization influence its role as a repository and transmitter of cellular information, and (3) specific steric requirements related to the action of enzymes and other controlling factors in cellular regulation.
APPROACH: A variety of state-of-the-art spectroscopic methods are employed to examine the static and dynamic structures of intact biological systems, their components, and models thereof. Electron paramagnetic resonance, optical absorption, magnetic circular dichroism, circular dichroism, laser Raman, and picosecond spectroscopy are all used to study the primary and other processes in photosynthesis. Nuclear magnetic resonance and fluorescence spectroscopy are used to study the ordering and dynamics of membranes. Nuclear magnetic resonance and x-ray absorption spectroscopy using synchrotron radiation are used to study the pathway of nitrogen and the role of the metal atoms in nitrogen fixation, respectively. Circular dichrosim, NMR, and fluorescence are used to study nucleic acids.
RESULTS: (1) Improved understanding of the processes by which photosynthetic organisms transduce light into chemical energy and materials. These results will provide guides toward utilizing solar energy. (2) Improved understanding of the mode of nitrogen fixation by nitrifying organisms to provide guides to improving this process and adding to the world supply of fixed nitrogen. (3) Improved understanding of the mechanisms by which the nucleic acids perform their functions and how such information may be applied to understanding and ultimately ameliorating diseased states. (4) Improved understanding of the organization and dynamics of membranes and the changes which accompany function and malfunction.
PROJECT MILESTONES: (1) Role of manganese in photosynthetic oxygen evolution 1/1/77. (2) Role of molybdenum in di-nitrogen fixation 7/1/77. (3) Mode of interaction between t-RNA and amino acids 7/1/77.
KEYWORDS: PHOTOSYNTHESIS;ENERGY CONVERSION;SOLAR ENERGY;NITROGEN FIXATION;MEMBRANES;MOLECULAR STRUCTURE;BIOCHEMICAL REACTION KINETICS;PHOTOCHEMISTRY;ENZYMES;CATALYSIS;BIOCHEMISTRY;PLANT CELLS;NITROGEN COMPOUNDS

<082004>
TITLE: Organic, Photo-, and Geochemistry
PROJECT NUMBER: 000114
PRINCIPAL INVESTIGATOR: Calvin, M.;Lemmon, R.M.;Philp, P.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C. E.
TELEPHONE: F233-5408
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$302,000
TECHNOLOGY: FOSSIL FUEL/General (25%);GENERAL SCIENCE (75%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Far West;COASTS/Far West;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is designed to increase our fund of basic knowledge in organic, photo-, and geochemistry. As opportunities appear, this expanding basic knowledge is applied to energy and environmental problems. For example, the geochemical studies of kerogen are important contributors to our understanding of the processes of formation of fossil fuels. The studies of energetic carbon-atom chemistry may become important for the specifications of organic material in the vicinity of nuclear reactors.
APPROACH: The accumulated experience of a successful research laboratory (the Lawrence Berkeley Laboratory's Chemical Biodynamics Division) is applied to promising and interesting research in organic, photo-, and geochemistry. The Division's staff seeks basic research areas that have a potential to contribute to the solution of energy-related environmental problems. As an example, the Division's studies of the mechanisms of formation of fossil fuels will aid in the design of ways to utilize these fuels with a minimum of adverse environmental impact.
RESULTS: This research during the next three years is expected to lead to the following results: (1) The availability of diverse polynucleotides; knowledge of their specific properties will greatly increase our understanding of the mechanisms by which nucleic acids direct the formation of enzymes. (2) Understanding of the ways by which light affects enzyme functions. (3) Increased understanding of the ways by which proteins and polynucleotides appeared on the prebiotic Earth. (4) Increased understanding of the processes that led to the formation of kerogen and other fossil fuels. (5) Knowledge of the high energy reactions of carbon, a knowledge of importance to tracer chemistry, radiobiology, and reactor technology.
PROJECT MILESTONES: (1) Determine early stages of kerogen formation through identification of early compounds of algae degradation 1/1/78. (2) Complete study of difference of reactions of benzene with high energy

C/sup +/, CH/sup +/, CH/sub 2//sup +/, and CH/sub 3//sup +/ 1/1/79. (3) Complete synthesis of six hexanucleotides whose sequences will aid in studies of restriction enzymes 6/30/78.
KEYWORDS: CHEMISTRY;PHOTOCHEMISTRY;GEOCHEMISTRY;FOSSIL FUELS;RESEARCH PROGRAMS;NUCLEIC ACIDS;ENZYMES;PROTEINS;NUCLEOTIDES;RADIOBIOLOGY;REACTORS;BIOCHEMISTRY;DNA;HYDROCARBONS;MOLECULES;RADIOISOTPES

<082005>
TITLE: Plant Biochemistry
PROJECT NUMBER: 000115
PRINCIPAL INVESTIGATOR: Bassham, J.A.;Calvin, M.;Rapoport, H.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$341,000
TECHNOLOGY: FOSSIL FUEL/General (10%);SOLAR/General (50%);CONSERVATION/General (10%);GENERAL SCIENCE (30%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (20%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/CO/sub 2/ (20%);ORGANICS/Toxic substances in algae (20%);RADIATION/Algal toxicants (20%);HEAT, THERMAL/Algae growth in hot water (20%);VISUAL AESTHETICS/Algae growth in lakes (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To obtain detailed information about biochemical regulation of photosynthetic and biosynthetic pathways in green plant cells, and the effects on these of environmental variables, including CO/sub 2/, SO/sub 2/ and other gaseous products from fossil fuel combustion. Also the investigation of toxic substances produced by plants, and their biosynthesis.
APPROACH: Radioactively-labelled substrates such as /sup 14/CO/sub 2/ and /sup 32/P-labelled inorganic phosphate, are administered to plants and plant tissue including leaves, unicellular algae, isolated cells, chloroplasts, etc. under a variety of carefully-controlled conditions (e.g. presence and absence of inhibiting pollutants). The plant material is killed, and the radioactive products are isolated and identified, and the extent and location of their labelling is determined. Results are interpreted in terms of the effect of environment on pathways and their regulation.
RESULTS: Information about photosynthetic and biosynthetic pathways, their regulation, and their alteration under the influence of environmental variables including pollutants from energy technologies. Pathways leading to toxic products, and the effect of environment on formation of those products. Information about photosynthetic response, productivity and effects on end products useful in evaluation of plant systems as solar energy converters.
PROJECT MILESTONES: FY 76 Nearly completed (See comments, 96).
KEYWORDS: PLANTS;ALGAE;BIOCHEMISTRY;PHOTOSYNTHESIS;BIOSYNTHESIS;PLANT CELLS;CARBON DIOXIDE;SULFUR DIOXIDE;GASEOUS WASTES;FOSSIL FUELS;CHLOROPLASTS;BIOLOGICAL EFFECTS;SOLAR ENERGY CONVERSION;CARBON 14;PHOSPHORUS 32;AIR;METABOLISM;SULFUR COMPOUNDS

<082006>
TITLE: Genetic Study on Yeast
PROJECT NUMBER: 000116
PRINCIPAL INVESTIGATOR: Mortimer, R.K.
ADDRESS: Donner Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$128,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Genetic studies on the yeast Saccharomyces cerevisiae and Saccharomycopsis lipolytica, including genetic mapping, gene regulation, analysis of radiation sensitive and recombinationless mutants, post-meiotic segregation and models of recombination, genetics of a hydrocarbon-utilizing yeast and develcpment of strains for production of single-cell protein, and mutagenesis with chemicals and radiaticns in a multi-faceted mutagen screening system.
APPROACH: Basic laboratory research with emphasis on genetic methods.
RESULTS: Fundamental knowledge on regulation and recombination. Additional information on mutagenic and recombinogenic effects of environmental and energy-related pollutants.
KEYWORDS: YEASTS;GENETICS;SACCHAROMYCES CEREVISIAE;MUTANTS;RADIOSENSITIVITY;GENES;PROTEINS;MUTAGENESIS;MUTAGENS;GENE RECOMBINATION;POLLUTION;ENVIRONMENTAL EFFECTS;HYDROCARBONS;MOLECULES;X RADIATION

<082007>
TITLE: Scanning Electron Microscopy of Particulates on Lung and Leaf Surfaces
PROJECT NUMBER: 226
PRINCIPAL INVESTIGATOR: Hayes, T.L.
ADDRESS: 108 Donner Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$66,000

TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (60%);ELECTRICITY GENERATION (40%)
POLLUTANTS: NOXIOUS GAS (5%);METALS (5%);PARTICULATES (90%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: To characterize energy related particulates as they are found on lung and leaf surfaces with the goal of determining the chemical elements associated with single particles.
APPROACH: Scanning electron microscopy with x-ray spectroscopy is the major tool for determining size, shape and chemical element constituents of the individual particles. Related tissue damage is assessed by electron microscopic study at the site of the particle.
RESULTS: Rapid x-ray mapping of the elemental distribution on a particle by particle basis over the biological surface. We also expect to develop improved low temperature techniques for studying the leaf and lung samples in the hydrated state where more rapid and accurate analysis is possible.
PROJECT MILESTONES: (1) 1 Dec. 1976 Frozen sample techniques for scanning electron microscopy allow start of hydrated lung section study. (2) 30 Mar. 1977 Heavy ion radiography with scanning electron microscope impaging of ultra thin plates is completed for the botanical test surfaces (Onion, Pelargonium). (3) 1 Mar 1977 Rapid x-ray mapping of fly ash samples (in cooperation with Dr. C.L. Fisher, University of California, Davis) is completed and the technique is analyzed for general application value to other aerosols.
KEYWORDS: LUNGS;LEAVES;SURFACES;ELECTRON MICROSCOPY;PARTICLES;ELEMENTS;SPECTROSCOPY;PARTICLE SIZE;AEROSOLS;TOXICITY;AIR POLLUTION;BIOPHYSICS

<082009>
TITLE: Resonance Studies in Photosynthesis
PROJECT NUMBER: 000229
PRINCIPAL INVESTIGATOR: Bearden, A.J.
ADDRESS: Donner Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Donner Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C. E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405 ENG 48
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: SOLAR/General (70%);GENERAL SCIENCE (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This research in the field of molecular biophysics examines light excitation, photochemical energy transfer and storage, and electron-transport in both green-plant (chloroplast) and bacterial photosynthesis. By developing new methods of high-sensitivity, low temperature (4 degrees K and higher) electron paramagnetic resonance (EPR) spectroscopy and of using optical dye lasers as flash initiators of the photochemical steps in photosynthesis, investigations are being made of the mechanisms of photo capture and energy transfer to ''reaction centers'', the process of energy storage through production of photochemical ''charge separation'', and of the steps involving repetitive oxidation and reduction of components of the ''dark'' electron-transport chain which result in the formation of useful chemical energy in the form of ATP and reduced NADP. High-sensitivity EPR spectroscopy at low temperatures has allowed the molecular identification of previously unknown participants in the primary photochemistry of chloroplasts, i.e., bound iron-sulfur protein as the primary electron-acceptor of Photosystem I, and the identification of a chlorophyll-dimer free-radical (P680/sup +/) with the primary electron-donor of Photosystem II. The application of the rapidly-developing laser technology allows the sensing of components of photosynthetic systems with greater sensitivity and with the possibility
KEYWORDS: PHOTOSYNTHESIS;ENERGY TRANSFER;ENERGY STORAGE;ELECTRON TRANSFER;PHOTOCHEMISTRY;CHLOROPLASTS;ELECTRON SPIN RESONANCE;ELECTROLYTIC CELLS;IN VIVO;MAGNETIC FIELDS;MICROWAVE RADIATION;MOLECULES

<082010>
TITLE: Animal Colony
PROJECT NUMBER: 000303
PRINCIPAL INVESTIGATOR: Schooley, J.C.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W 7405 ENG 48
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS/O/sub 3/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/CO (50%);RADIATION/X rays (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of the Animal Colony is to provide first class housing and care for the rodents and larger animals used in the BER research projects at LBL. AALAC accreditation is the goal of the LBL Animal Welfare Committee.
APPROACH: The Colony is organized into two wings. The rodent wing operates on a clean-to-dirty flow pattern and has 16 rodent rooms housing 30,000 rodents. Specialized environmental exposure chambers are being developed for exposure of animals to ozone, nitrogen oxide, sulphur oxides, and CO. The larger animal facility includes housing for primates, cats, dogs, rabbits and goats, as well as specialized facilities

to house animals injected with radioactivity.
RESULTS: The results are reflected in the research projects' ''Accomplishments'' section of the LBL investigators using this service facility.
KEYWORDS: CANCER;LABORATORY ANIMALS;VETERINARY MEDICINE;ANIMAL BREEDING;MAINTENANCE;AEROSOLS;ANIMALS;BLOOD;CARCINOGENS;HORMONES;MEDICINE

<082013>
TITLE: Mechanism of Cancer Induction
PROJECT NUMBER: 000306
PRINCIPAL INVESTIGATOR: Jones, H.B.
ADDRESS: Donner Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (90%);NUCLEAR/General (10%)
POLLUTANTS: NOXIOUS GAS (90%);RADIATION (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To gain a better understanding of cancer risk from agents found in the environment and physiological changes related to cancer induction, and to develop methods of quantifying the risk.
APPROACH: Dose-effect-time relationships in various cancer induction systems will be studied to detect physiological factors contributing to the process. Trends in human cancer incidence will be correlated with environmental influences in carcinogenesis and the possibility of physiological modification of these factors will be studied.
RESULTS: Extension of our present dose-effect-time model is expected. From any systematic quantitative relationships detected, we expect to derive significant biological implications, e.g., (1) characteristics of dose-response relationships may imply an underlying molecular process; (2) comparison of dose-response relationships between species suggests that physiological factors may be involved in cancer induction as well as an underlying molecular-cellular process; (3) the possibility of an anti-carcinogenic process; (4) an improved evaluation of environmental factors in carcinogenesis.
PROJECT MILESTONES: (1) Analysis of mechanisms in cancer induction. (2) Evaluation of methods for estimating cancer risks at low dosage. (3) Evaluation of the present trend in environmentally induced human cancers.
KEYWORDS: CANCER;CARCINOGENESIS;HAZARDS;DOSE-RESPONSE RELATIONSHIPS;ENVIRONMENT;LUNGS;NEOPLASMS;LIFE SPAN;LEUKEMIA;IONIZING RADIATIONS;RADIOINDUCTION;CARCINOGENS;URETHANE;BIOLOGICAL EFFECTS;SAFETY;TOXICITY

<082014>
TITLE: Macromolecules and Pollutant Damage
PROJECT NUMBER: 000308
PRINCIPAL INVESTIGATOR: Lindgren, F.T.
ADDRESS: 108 Donner Lab, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$136,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO;NOXIOUS GAS/O/sub 3/ (10%);METALS/Pb/sup ++/;METALS/Hg/sup ++/ (70%);ORGANICS/Metal organics (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (80%);DEVELOPMENT/Laboratory scale (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective and goal of this project is to obtain new information and insights on: (1) the mechanism of pollutant transport in the bloodstream via lipoprotein and apoproteins, (2) the initiation and membrane and cellular damage by pollutants, and (3) correlation of degree of pollutant damage with concentrations of serum lipoproteins and/or proteins.
APPROACH: Pollutants resulting from energy production may have significant genetic and metabolic effects of man and experimental animals. To detect, measure and characterize these potential effects, for example Pb/sup ++/ and Hg/sup ++/, we are developing an automatic quantitative micro lipoprotein and protein screening test for humans and experimental animals. Application will be with experimental animals and humans accidentally exposed to these agents. Where appropriate, detailed biochemistry as well as the morphology and ultrastructure by electron microscopy will be determined on the abnormal tissues and macromolecules.
RESULTS: Qualitative and/or quantitative abnormal macromolecules are expected in both animals and humans exposed to heavy metals such as Pb/sup ++/ and Hg/sup ++/. These macromolecules will be characterized and related to extent of tissues, membrane and other damage in such key organs as liver and kidney. Lipoprotein metabolism is expected to be disturbed with heavy metal exposure and the two major enzyme systems, lecithin:cholesterol acyltransferase and lipoprotein lipase will be effected.
PROJECT MILESTONES: (1) 31 Dec. 1976 Planned completion of time dose response studies for Pb/sup ++/ exposure in the rat. Correlation with tissue damage in such organs as kidney and liver. (2) 1 June 1977 Anticipated completion of time dose response studies for Hg/sup ++/ and its organic form in the rat or other suitable animal model. (3) 1 Oct. 1977 Anticipated completion of first working program for automated quantitative protein microanalysis. (4) Sometime in 1977 Establishing collaboration with scientists with access to

specific individuals or populations at pollutant risk for the purpose of first screening for lipoprotein abnormalities and later for serum protein abnormalities.
KEYWORDS: MACROMOLECULES;POLLUTION;BLOOD;LIPOPROTEINS;ANIMAL CELLS;DIFFUSION;BIOLOGICAL EFFECTS;ENERGY SOURCES;GENETICS;METABOLISM;LEAD;MERCURY;BIOCHEMISTRY;ELECTRON MICROSCOPY;ENZYMES;PROTEINS;MOLECULES;PATHOGENESIS

<082015>
TITLE: Ecosystem Stability
PROJECT NUMBER: 000310
PRINCIPAL INVESTIGATOR: Harte, J.
ADDRESS: Energy and Environment Division, Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W-7405-Eng-48;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$135,000; Environmental Protection Agency
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Trace heavy metals (20%);ORGANICS/From coal conversion (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To better understand the stability properties of perturbed ecosystems and to develop practical stability indicators for use in predicting the responses of ecosystems to perturbations caused by energy-related activities.
APPROACH: (A) Theoretical analysis of model ecosystems. (B) Development of a laboratory microbiome system consisting of replicate freshwater tank systems. (C) Field work to begin in FY 77. The basic approach will be to perturb replicate systems with effluents expected from coal conversion technologies (phenols, trace metals, polyaromatic hydrocarbons, sulfur compounds, etc.) and to correlate the responses with previously measured parameters characterizing the decomposer-detritus dynamics of the systems.
RESULTS: Prescriptions for measurement of both specific and broad range stability indicators. Laboratory facility for analysis of ecosystem stability properties under controlled, replicable conditions.
PROJECT MILESTONES: (1) Oct. 1, 1976 Completion of basic laboratory facility. (2) Oct. 1, 1977 Completion of preliminary assessment of freshwater ecosystem stability indicators. (3) Oct. 1, 1978 Completion of preliminary field tests of indicators.
KEYWORDS: ECOSYSTEMS;STABILITY;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;BIOLOGICAL MODELS;COAL GASIFICATION;CHEMICAL EFFLUENTS;METALS;HYDROCARBONS;SULFUR COMPOUNDS;BIOLOGICAL INDICATORS;ENVIRONMENTAL EFFECTS;WATER POLLUTION;PLANTS

<082016>
TITLE: Metabolism of Transuranic Elements
PROJECT NUMBER: 000314
PRINCIPAL INVESTIGATOR: Durbin, P.W.
ADDRESS: Bldg. 74B, Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
POLLUTANTS: METALS/Heavy metals;METALS/General (10%);RADIATION/Internal emitters;RADIATION/Pu-238;RADIATION/Am-241;RADIATION/Sr-90 (90%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To describe quantitatively in monkeys (two species of Macaque) the circulatory transport, gross and microscopic distributions in tissues and bones, and temporal changes of those distributions for some biologically important and potentially hazardous radionuclides, Sr-90, Pu-238, Am-241.
APPROACH: Subjects are Macaques of known age (M. mulatta, M. fasicularis). Single doses of radionuclides are given parenterally as soluble citrate complexes to mimic behavior after absorption into the body. Dosages (5 to 10 mu Ci/kg of Sr-90 or about 0.3 mu Ci/kg of actinides) avoid acute injury but allow accurate radioanalysis. Studies and methods include metabolic balance using radiochemical analysis; kinetics using in vivo whole- and partial-body counting and scanning; and microdistribution and morphology using auto- and microradiography.
RESULTS: Metabolic parameters obtained in a closely related animal provide support for kinetic models used to set intake limits for man. Long-term study groups give insight into the toxicity of these radionuclides in primates. Information needed to develop rational therapeutic measures for decontamination is also obtained: chemical associations of the nuclides with cell and mineral constituents; mechanisms of radionuclide redistribution among tissues and elimination from the body; influences of normal growth and aging.
PROJECT MILESTONES: By July 1, 1977: report on immune binding of plutonium- and americium-transferrin, and on initial distribution of plutonium-238 in M. mulatta and M. fasicularis; complete injections of 5-year plutonium-238 and americium-241 study groups. By July 1, 1978: prepare interim report on long-term strontium-90 studies in M. mulatta, and on comparative morphology of aging monkey and human bones; complete injections of intermediate term (3 to 15 months) study groups for plutonium-238 and americium-241.
KEYWORDS: TRANSURANIUM ELEMENTS;METABOLISM;MONKEYS;TISSUE DISTRIBUTION;BONE TISSUES;STRONTIUM 90;PLUTONIUM 238;AMERICIUM 241;RADIATION DOSES;RADIOCHEMICAL ANALYSIS;SCINTISCANNING;DECONTAMINATION;TRANSFERRIN;DOGS;CERIUM 141;RADIONUCLIDE KINETICS;IN VIVO

<082022>
TITLE: Pollutants and Hematopoiesis
PROJECT NUMBER: 333
PRINCIPAL INVESTIGATOR: Schooley, J.C.
ADDRESS: University of California, Lawrence Berkeley Laboratory, Bldg. 74, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, Walter W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$255,000
TECHNOLOGY: FOSSIL FUEL/General (80%);GEOTHERMAL/General (20%)
POLLUTANTS: NOXIOUS GAS/CO/sub 2/;NOXIOUS GAS/O/sub 3/;NOXIOUS GAS/NO/sub x/ (50%);METALS/Lead;METALS/Cadmium (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To evaluate the physiological impact on the hemopoietic system of mammals resulting from exposure to a variety of environmental pollutants associated primarily with non-nuclear energy technologies.
APPROACH: Living rats, mice, rabbits, and goats and/or tissues obtained from such species will be exposed to different levels of gaseous pollutants (O/sub 3/, NO/sub x/, SO/sub x/, CO/sub x/, O/sub 2/, H/sub 2/S). Such animals will also be exposed acutely or chronically to various concentrations of heavy metal pollutants such as Pb, Hg, Cd, Pt, As, either by ingestion or injection. Various conpartments of cells in the hematopoietic system will be assessed quantitatively using the CFU-S, CFU-E, CFU-M, CFU-G, and ACFU techniques during pollutant exposures. Changes in the gas transport function of the blood (pH, pCO/sub 2/, pO/sub 2/, and P/sub 50/) will also be measured as will changes in hormones and humoral agents regulating the formation of blood cells.
PROJECT MILESTONES: (1) Systematic knowledge of temporal changes in various animal models of hematopoietic tissue will be acquired FY 80 and on; (2) fundamental knowledge of control processes involved in regulating proliferation of blood-forming tissues will be obtained with possibility of ultimate use in ameliorating any damage caused by energy pollutants in future.
KEYWORDS: POLLUTION;HEMATOPOIETIC SYSTEM;MICE;ENERGY SOURCES;INHALATION;OZONE;CARBON OXIDES;NITROGEN OXIDES;LEAD;BLOOD;BIOLOGICAL EFFECTS;CFU;ANIMAL CELLS;HORMONES;IMMUNOLOGY;IN VIVO

<082024>
TITLE: Long Term Effects of High LET Radiation
PROJECT NUMBER: 475
PRINCIPAL INVESTIGATOR: Alpen, E.L.
ADDRESS: Donner Laboratory, Univ. of Calif., Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Div. of Biomedical and Environmental Research
MONITOR: Carter, Charles
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major goals of this project are to assess the potential adverse late effects of ionizing radiations of high linear energy transfer in normal animal tissues. In particular we are concerned with tumorogenisis and delayed functional effects. We will utilize rat skin, hamster lung and rat spinal cord as model systems.
APPROACH: As required by the systems being studied, skin, spinal cord, or thorax will be irradiated with accelerated beams of Neon, Argon or Carbon Ions. Some exposures will be made with oxygen ions. At appropriate times after irradiation the animals will be either sacrificed or subjected to appropriate functional tests.
RESULTS: Will determine threshold doses and dose-response relationships for degenerative changes as well as relative biological effectiveness ratios for the end-points selected.
PROJECT MILESTONES: (1) October 1976 Complete studies on late effects on skin. (2) March 1977 Complete studies on lung. (3) July 1977 Prepare to start human therapy trials.
KEYWORDS: TISSUES;LET;IONIZING RADIATIONS;DELAYED RADIATION EFFECTS;NEON IONS;ARGON IONS;CARBON IONS;OXYGEN IONS;FUNCTIONAL MODELS;BIOLOGICAL RADIATION EFFECTS;SKIN;VERTEBRAE;CHEST;SPINAL CORD;BIOLOGICAL MODELS;RATS;DOSE-RESPONSE RELATIONSHIPS;LUNGS;HAMSTERS;NEOPLASMS;KIDNEYS;X RADIATION

<082025>
TITLE: Radiological Physics
PROJECT NUMBER: 000705
PRINCIPAL INVESTIGATOR: Chatterjee, A.
ADDRESS: Bldg. 29, Rm. 216, Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-48
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: NOXIOUS GAS/CO;NOXIOUS GAS/Oxides of nitrogen (10%);METALS/Zinc;METALS/Mercury;METALS/Lead (20%);PARTICULATES/Plutonium (20%);RADIATION/Alpha particles;RADIATION/X-rays (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (60%);DEVELOPMENT/Laboratory scale (30%);FULL SCALE DEMONSTRATION (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) A quantitative estimate of energy deposition by energetic particles and the

channeling of this deposited energy into various modes leading to chemical and biological changes in living systems. (2) To demonstrate quantitatively the correlation between actions of chemical agents such as environmental pollutants and physical agents such as radiation. (3) To apply knowledge acquired by correlating radical concentration to DNA damage in radiation therapy.
PPROACH: Theoretical model studies involving energy computation and related biological effects supplemented by physical as well as chemical experiments. Biochemical approach to the objectives will constitute an important aspect of the study.
RESULTS: (1) Quantitative results for the concepts of dosimetry for chemical, biological and physical agents. (2) Effect of chemical sensitizers and protectors in radiation therapy. (3) A possible means of harnessing energy from water as hydrogen.
PROJECT MILESTONES: Mechanism of biological damage by physical and chemical agents.
KEYWORDS: BIOLOGICAL EFFECTS;AIR POLLUTION;CHEMICAL REACTION KINETICS;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL MODELS;DNA;MUTAGENS;DOSE-RESPONSE RELATIONSHIPS;BIOLOGICAL RECOVERY;CARBON DIOXIDE;NITROGEN OXIDES;CARBON MONOXIDE;ZINC;MERCURY;LEAD;PLUTONIUM;IONIZING RADIATIONS;BIOCHEMISTRY;ANIMAL CELLS;X RADIATION

<082027>
TITLE: Radiation Detector, Materials and Detectors
PROJECT NUMBER: 000708
PRINCIPAL INVESTIGATOR: Goulding, F.S.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-48
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (20%)
POLLUTANTS: METALS (30%);PARTICULATES (30%);RADIATION (40%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale (60%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop improved types of radiation detectors and the associated electronic circuits. Also to carry out research and development on detector materials.
APPROACH: Present program is largely directed toward development and understanding of high purity germanium detectors for gamma and x-rays and the technology of detectors.
RESULTS: (1) Development of large volume high resolution gamma ray detectors for use in sensitive monitoring systems. (2) Application to plutonium monitoring in the field. (3) Application of new detectors to x-ray analysis of environmental samples.
PROJECT MILESTONES: Materials and technology project, milestones not directly applicable.
KEYWORDS: INSTRUMENTATION;RADIATION DETECTORS;ELECTRONIC CIRCUITS;MATERIALS;GAMMA RADIATION;PLUTONIUM;X RADIATION;ENVIRONMENT;RADIATION MONITORING;TECHNOLOGY ASSESSMENT

<082030>
TITLE: Electron/Diffraction Structure Analysis
PROJECT NUMBER: 000815
PRINCIPAL INVESTIGATOR: Glaeser, R.M.
ADDRESS: Donner Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Donner Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R. W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405 ENG 48
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (5%);METALS (25%);ORGANICS (70%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to develop the methods of electron microscopy so that they can be used to investigate complex biological structures at the molecular and atomic level. Knowledge must be developed concerning the structure of biological materials, organelles, and cell membranes in order to better understand the effects that potentially harmful products and effluents of energy technologies may have in altering the function and internal structure of living organisms, including man.
APPROACH: The project is among the leaders in developing electron microscopy as a structure analysis method of comparable power to x-ray diffraction. To do this, we have had to develop image processing and 3-D structure programs for the computer. We have also had to innovate new and appropriate methods for hydrated specimen preparation of biological materials. Finally, sophisticated analysis must be made of electron scattering, diffraction, and image contrast in order to account for so-called dynamical diffraction effects that rarely occur with x rays.
RESULTS: It is expected that electron microscopy will be a powerful, new structure analysis method that is capable of structure determination in many important cases where x-ray diffraction cannot succeed. Examples are virus structure; small membrane sheets; highly ordered, subcellular components (e.g., microtubules); important crystalline macromolecules which are available in quantities that are too small to support x-ray crystallographic work (e.g., proteins that are involved in the control of DNA repair, replication, and regulation).
PROJECT MILESTONES: (1) 3-D structure analysis of the T-4 bacteriophage tail-structure at 30 A resolution.

(2) Structure analysis of an organic specimen test-material (e.g., crystalline cholesterol films) at 3.5 A resolution, which is the instrumental limit. (3) Structure analysis of a native cell membrane (e.g., the gap junction complex from mouse liver cells).
KEYWORDS: INSTRUMENTATION;BIOLOGICAL MATERIALS;MOLECULAR STRUCTURE;ELECTRON MICROSCOPY;ELECTRON DIFFRACTION;COMPUTERS;ANIMAL CELLS;DNA;VIRUSES

<082032>
TITLE: Studies of Membranes
PROJECT NUMBER: 001305
PRINCIPAL INVESTIGATOR: Packer, L.
ADDRESS: Energy and Environment Division, Lawrence Berkeley Lab., Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
77 FUNDING: Energy Research and Development Administration FY77:$126,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS/NO/sub 2/;NOXIOUS GAS/O/sub 3/;NOXIOUS GAS/O/sub 2/;NOXIOUS GAS/O/sub 2//sup -/ (50%);RADIATION/Visible light (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To characterize pollutant induced membrane damage in isolated mitochondria and cultured mammalian cells, concentrating on the role of oxygen in damage propagation. To study the protective role of antioxidants and free radical scavengers.
APPROACH: Cells and organelles are subjected to pollutant stress under aerobic and anaerobic conditions and damage is assessed by physical techniques (EPR, electron microscopy) at the structural level and biochemically in functional terms. Chemical protective measures are applied to further identify damage mechanisms and potential clinical countermeasures.
RESULTS: Basic knowledge about oxidative membrane damage initiated by noxious gases in the environment at the cellular and subcellular level. Identification of protective countermeasures of potential benefit to man living in a polluted environment.
PROJECT MILESTONES: (1) To identify threshold concentrations of NO/sub 2/, light induced reagents which produce delectable structural and functioned membrane damage. (2) To localize damage among specific membrane components. (3) To identify and demonstrate the effectiveness of protective measures.
KEYWORDS: CELL MEMBRANES;MITOCHONDRIA;OXYGEN;BIOLOGICAL REPAIR;POLLUTION;HEALTH HAZARDS;BIOLOGICAL STRESS;ULTRASTRUCTURAL CHANGES;CHEMICAL REACTION KINETICS;BIOCHEMISTRY;NITROGEN DIOXIDE;NITROGEN OXIDES;RESPIRATION;IN VITRO

<082033>
TITLE: Instrumentation Technology for Energy-Related Contaminants
PROJECT NUMBER: 001307
PRINCIPAL INVESTIGATOR: Kirsten, F.A.;Amer, N.;Hadeishi, T.;Leskovar, B.
ADDRESS: Lawrence Berkeley Laboratory, East End of Hearst Street, Bldg. 50B, Rm. 4235, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Bio-medical and Environmental Research, Physical and Technological Programs
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-48;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$140,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO;NOXIOUS GAS/CH;NOXIOUS GAS/NO;NOXIOUS GAS/OH;NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/O/sub 3/;NOXIOUS GAS/SO;NOXIOUS GAS/Organics (100%)
CHARACTER OF STUDY: RESEARCH (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives are (1) to develop new techniques for the measurements of gaseous trace contaminants, (2) to develop complete instruments using these techniques in order to make them available to the scientific community and (3) to cooperate with environment or health programs which apply the instruments.
APPROACH: The techniques are investigated and developed by teams of physicists, chemists and engineers who are expert in the fields of physical and chemical processes. The developments are then designed into complete instruments by engineering teams. The techniques are selected for development on the basis of their potential for solving problems in monitoring environmental or health hazards.
RESULTS: We expect to develop new instrumental techniques and to produce complete instruments for monitoring various trace gaseous contaminants. The instruments will be designed with the idea of transferring the technology so developed into commercial channels, where applicable.
PROJECT MILESTONES: (1) Completion of prototype microwave spectrometer for SO/sub 2/ and other gases October 1977. (2) Completion of development of NO detection method using Zeeman-shifted light sources; decision whether to engage in cooperative combustion research application October 1977. (3) Determination of usability of liquid crystal techniques for personal dosimeters for contaminant gases October 1977.
KEYWORDS: AIR POLLUTION;GASES;MEASURING INSTRUMENTS;DESIGN;FABRICATION;AIR;CHEMICAL EFFLUENTS;MICROWAVE EQUIPMENT;NITROGEN COMPOUNDS;SULFUR COMPOUNDS

<082034>
TITLE: Physical Methods of Measuring Environmental Contaminants
PROJECT NUMBER: 001308
PRINCIPAL INVESTIGATOR: Goulding, F.S.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert
TELEPHONE: F233-5355

TYPE OF FUNDING: Contract No.-W-7405-eng-48
77 FUNDING: Energy Research and Development Administration FY77:$195,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: COMBUSTION IN SITU (40%);COMBUSTION OR END USE (60%)
POLLUTANTS: METALS (30%);PARTICULATES (50%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (30%);DEVELOPMENT/Laboratory scale (70%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop and apply physical methods to the measurement of environmental pollutants likely to cause health and other deleterious effects. Physical methods offer much greater potential for large scale high speed detection and analysis.
APPROACH: The program is based initially on the application of x-ray methods to elemental analysis. These methods are now being extended to analysis of the chemical state of elements by such methods as observation of the detailed shapes of x-ray absorption edges. The effort is also recently being applied to the plutonium field measurement problem.
RESULTS: Improved large-scale analysis systems capable of providing continuous automatic monitoring of many important pollutants.
PROJECT MILESTONES: (1) Already have demonstrated large-scale monitoring of elements in the field. (2) Chemical analysis of selected elements addressed to specific problems in FY 1977. (3) Plutonium monitoring demonstration of sensitive system by FY 1977-78.
KEYWORDS: POLLUTION;ENVIRONMENT;MEASURING METHODS;QUANTITATIVE CHEMICAL ANALYSIS;X RADIATION;PLUTONIUM;MOBILITY;MEASURING INSTRUMENTS;MONITORING;SULFUR DIOXIDE;AEROSOLS;AIR POLLUTION

<082035>
TITLE: Tritium Damage in Mammalian Cells
PROJECT NUMBER: 001047
PRINCIPAL INVESTIGATOR: Burki, J.H.
ADDRESS: 365 Donner Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-48
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: NUCLEAR/Fission (50%);NUCLEAR/Fusion (50%)
POLLUTANTS: RADIATION (50%);SPECIFIED OTHER POLLUTANTS/Mutagens (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To provide a quantitative framework for evaluation of the health effects and hazards of tritium (and other DNA damaging mutagens) in mammalian cells.
APPROACH: (1) Test system: mammalian cells (human, chinese hamster, and mouse), normal and malignant, from various organs including lung, kidney, ovary, testis, and skin. (2) Exposure conditions: tritium, I-125, IUdR, BudR, visible light (fluorescent) UV, ionizing radiation, nitrosoguanidine, and other carcinogens and mutagens. Route of administration: incorporation into DNA and other macromoleculaes. Dose and duration: acute 37 degrees C, chronic exposures at 4 degrees C and -196 degrees C. (3) Endpoints to be assessed: reproductive death, cell cycle kinetics, mutagenesis, chromosome changes, transformation, recovery, and molecular repair processes.
RESULTS: (1) Quantitation of the toxic and mutagenic effects of tritium with respect to ionizing radiation and other environmental mutagens. (2) Mapping of the gene organization by new non-conventional genetic techniques.
PROJECT MILESTONES: Tritium damage is analogous to x ray damage in terms of cell killing 75 and also in terms of mutagenesis June 1976. I-125 decays are like high LET radiation 75, and have been used to demonstrate the existance of critical function DNA in mammals 1976. BUdR induces mutations only when incorporated into specific parts of the mammalian cell nucleus 1976
KEYWORDS: TRITIUM;BIOLOGICAL RADIATION EFFECTS;ANIMAL CELLS;HEALTH HAZARDS;DNA;MUTAGENS;MAN;HAMSTERS;MICE;LUNGS;KIDNEYS;OVARIES;TESTES;SKIN;BIOLOGICAL RECOVERY;DOSE-RESPONSE RELATIONSHIPS;IN VITRO;MUTAGENESIS;MUTATIONS;RADIOISOTOPES

<082036>
TITLE: Probabilistic and Statistical Studies of Disease Effects of Pollutants
PROJECT NUMBER: 1531
PRINCIPAL INVESTIGATOR: Neyman, J.;Scott, E.L.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-eng-48
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (80%);DEVELOPMENT (10%);ANALYTICAL (10%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The goal of this research is to develop a reliable statistical methodology as an aid in answering the following question given the pre-existing pattern of pollutant parameters in a specific locality, and given the pre-existing of the chosen health parameters (age-specific death rates from stated causes, etc.), what changes in these parameters are to be expected from the introduction of a specified additional source of the pollutant parameters (power plant, industrial plant, etc.) in the specific locality.
APPROACH: Develop reliable statistical methodology. To answer this question requires large multipollutant and

multilccality observational studies involving cooperation among specialists in many disciplines.
RESULTS: The goal of this research is to develop a reliable statistical methodology as an aid in answering the following question given the pre-existing pattern of pollutant parameters in a specific locality, and given the pre-existing of the chosen health parameters (age-specific death rates from stated causes, etc.), what changes in these parameters are to be expected from the introduction of a specified additional source of the pollutant parameters (power plant, industrial plant, etc.) in the specific locality.
PROJECT MILESTONES: Design of large multipollutant and multilocality observational studies, involving cooperation among specialists in many disciplines. Detection of synergistic effects of different agents. Competing risks in technological systems (reliability studies). Competing risks in biological systems (Markov chain approach). Chemical and radiation carcinogenesis.
KEYWORDS: STATISTICAL MODELS;POLLUTION;HEALTH HAZARDS;POWER PLANTS;SITE SELECTION;INDUSTRY;SYNERGISM;RELIABILITY;MARKOV PROCESS;CARCINOGENESIS;FORECASTING;EPIDEMIOLOGY;CARCINOGENS;DISEASES;HUMAN POPULATIONS

<082037>
TITLE: Regional Studies
PROJECT NUMBER: 001535
PRINCIPAL INVESTIGATOR: Siri, W.E.
ADDRESS: Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Ray R.
TELEPHONE: F233-4556
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$335,000
TECHNOLOGY: FOSSIL FUEL/Coal (80%);FOSSIL FUEL/Oil and Gas (10%);NUCLEAR/Fission (10%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (20%);ELECTRICITY GENERATION (40%);ELECTRICAL TRANSMISSION (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop analytical tools and methods for assessing regional impacts of energy-related develcpments. Impacts of interest are economic and environmental. They include input requirements, income generated manpower requirements and various residuals.
APPROACH: Structuring of interindustry accounts for regions of interest, in this case California and eight Rocky Mountain states. Development of net interregional energy relationships. Development of a 2-region input-output model to study possible manpower constraints on energy facility construction.
RESULTS: State input-output tables at a highly disaggregated level. Preliminary estimates of energy flows into and out of California. Preliminary two-region input-output model, displaying relationships between the Rocky Mountain states and the rest of the United States.
KEYWORDS: ENERGY FLOWS;INPUT-OUTPUT;REGIONAL ANALYSIS;ENERGY;ENVIRONMENTAL EFFECTS;MEASURING METHODS;TECHNOLOGY ASSESSMENT;ENERGY MODELS;CALIFORNIA;ROCKY MOUNTAINS;EARTH ATMOSPHERE;ECONOMIC IMPACT;CHEMICAL EFFLUENTS;LAND USE;WATER;OCCUPATIONS;MANPOWER

<082038>
TITLE: Survey of Instrumentation for Environmental Monitoring
PROJECT NUMBER: G01598
PRINCIPAL INVESTIGATOR: Mack, D.A.
ADDRESS: University of California, Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wasson, Hodge R.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-48, b-AEN-71-04507A0-4
77 FUNDING: National Science Foundation FY77:$113,900; Energy Research and Development Administration FY77:$137,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (30%);GEOTHERMAL/General (15%);CONSERVATION/General (15%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/CO;NOXIOUS GAS/O/sub 3/;NOXIOUS GAS/HC (20%);METALS/Arsenic;METALS/Cadmium;METALS/Lead;METALS/Mercury (20%);PARTICULATES (18%);RADIATION (20%);NOISE, VIBRATION (2%);SPECIFIED OTHER POLLUTANTS/Biomedical effects (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: A comprehensive survey has been made of instrumentation suitable for environmental characterization, measurement and monitoring. Instruments being investigated are those useful for measurements in air quality, water quality, radiation and biomedicine in energy related research and operations.
APPROACH: Consideration has been given to instruments and techniques presently in use and to those developed for other purposes but having expected application to the environmental aspects of energy related technology.
RESULTS: More than 3500 volumes of the survey are presently in use throughout the world.
PROJECT MILESTONES: During the first 3 years of the project (1971-1974), gaseous air, water, radiation and bicmedical instrumentation were surveyed. In 1975 air particulate methods were reviewed together with instrument calibration procedures. In 1976 sampling methods have been studied. The contents of the survey will be continually reviewed, updated and revised in the future.
KEYWORDS: MONITORING;ENVIRONMENT;EQUIPMENT;AIR QUALITY;WATER QUALITY;RADIATIONS;MEASURING METHODS;TECHNOLOGY ASSESSMENT;TECHNOLOGY TRANSFER;ENERGY;ENVIRONMENTAL EFFECTS;BIOCHEMISTRY;MEDICINE;AEROSOLS;AIR;SOLID WASTES;MEASURING INSTRUMENTS;CALIBRATION

<082039>
TITLE: Aerosol Chemistry
OJECT NUMBER: 001599
INCIPAL INVESTIGATOR: Novakov, T.
ADDRESS: Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biological and Environmental Research
MONITOR: Blaunstein, Robert
TELEPHONE: F233-5355
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/NO;NOXIOUS GAS/NO/sub 2/ and NH/sub 3/ (50%);PARTICULATES/Sulfate;PARTICULATES/Nitrate (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Plume chem.
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of the program is to establish and to quantitate the relative roles of homogeneous (gas-phase) and heterogeneous (gas-particle) reactions in the formation of suspended sulfur, nitrogen and carbon species. The principal emphasis is on catalytic and surface chemical reactions involving combustion generated carbonaceous and other particles and principal pollutant gases, such as SO/sub 2/, NO, NO/sub 2/ and NH/sub 3/.
APPROACH: The project is mostly of laboratory nature, but supplemented and complemented with specific experiments and small scale sampling programs in the field. Physical methods, such as x-ray photoelectron spectroscopy, infrared spectroscopy, x-ray fluorescence, laser raman spectroscopy are used for chemical characterization. Wet chemical methods are also being used.
RESULTS: Quantitative results on the rate and mechanism of SO/sub 2/ yields sulfate conversion. Results should be applicable for use in plume modeling studies.
PROJECT MILESTONES: Completion of laboratory simulation exp. approximately Dec. 1976. Completion of the first phase of field exp. approximately July 1977.
KEYWORDS: AEROSOLS;QUANTITATIVE CHEMICAL ANALYSIS;SULFUR DIOXIDE;NITROGEN OXIDES;CARBON DIOXIDE;AMMONIA;CARBON MONOXIDE;CHEMICAL REACTION KINETICS;PLUMES;MATHEMATICAL MODELS;AIR POLLUTION;SULFUR COMPOUNDS;NITROGEN COMPOUNDS

<082040>
TITLE: Environmental Impacts of Geothermal and Solar Energy
PROJECT NUMBER: 001665
PRINCIPAL INVESTIGATOR: Grether, D.F.;Siri, W.
ADDRESS: 50-209, Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research, Evaluation and Assessment Program
MONITOR: Cooper, Ray
TELEPHONE: F233-3631
77 FUNDING: Energy Research and Development Administration FY77:$100,000; FY77:$177,000
TECHNOLOGY: GEOTHERMAL/General (60%);SOLAR/General (12%);SOLAR/Direct heat - cool (4%);SOLAR/Electric (20%);SOLAR/Biomass (4%)
ENERGY CYCLE: EXTRACTION (30%);STORAGE (5%);ELECTRICITY GENERATION (45%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (10%);ANALYTICAL (90%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This project has three main objectives: (1) To perform a detailed case study of the dynamics, environmental, and socio-economic impacts of geothermal development by examined what has happened and is happening at the Geysers Geothermal Area of Sonoma and Lake Counties, Calif. (2) To provide certain forms of specialized technical assistance to the government of Lake County. So far, we have helped them in compiling socio-economic data, analyzing public opinion concerning geothermal development, and evaluating the various air pollutant abatement strategies proposed by the Pacific Gas and Electric Company. (3) To assess the environmental (including socio-economic) impacts of wide spread use of solar energy. The project is concentrating on solar-termal conversion, but will branch out to other technologies.
APPROACH: The approach to this study is to use a methodology called the ''systems approach.'' This involves structuring the project along the lines of the most recent work in systems design. In this process certain issues of components and relationships are brought out and dealt with. Born as a management tool, the systems approach has recently matured enough to be used in a more general manner such as dealing with ''social systems.''
RESULTS: The results of this study will be compiled in a report at the end of the first year of investigation. This report will consist of information to be used by the resident, planners and decision makers of Lake County. This information will deal with the social system impacted by the geothermal development program in Lake County.
PROJECT MILESTONES: 1 Oct. 1977 Preliminary Report.
KEYWORDS: CASE STUDY;GEOTHERMAL ENERGY;SOLAR ENERGY;ENVIRONMENTAL EFFECTS;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;SOCIO-ECONOMIC FACTORS;PUBLIC RELATIONS;AIR POLLUTION ABATEMENT;ECONOMICS;COMPUTER CODES;ENERGY;LAND USE;CALIFORNIA;CLIMATES;CHEMICAL EFFLUENTS;EMISSION;SULFUR DIOXIDE

<082041>
TITLE: Endocrine Parameters Pollutant
PROJECT NUMBER: 001851
PRINCIPAL INVESTIGATOR: Garcia, J.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, Walter W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$140,000

TECHNOLOGY: FOSSIL FUEL/General (95%);GEOTHERMAL/General (5%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/O/sub 3/;NOXIOUS GAS/Oxides of carbon;NOXIOUS GAS/Nitrogen;NOXIOUS GAS/Sulfur (50%);METALS/Lead;METALS/Mercury;METALS/Cadmium;METALS/Nickel;METALS/Arsenic;METALS/Zinc (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The effects of non-nuclear energy pollutants on the production, secretion and metabolism of hormones in rats will be studied. Specifically, we will study the effects of gaseous pollutants such as hydrogen sulfide, ozone, and the oxides of carbon, nitrogen and sulfur, and metal pollutants such as lead, mercury, cadmium, zinc, nickel, selenium, chromium, copper, manganese, arsenic and cobalt. Initially, we will concentrate on the hormones of the anterior pituitary and their target organs and then the study will be extended to other endocrine systems.
APPROACH: In vivo studies, including both acute injections and chronic administration in drinking water or by inhalation, of the pollutants listed above will be carried out in rats. Following exposure, the rats will be sacrificed by decapitation and serum and the anterior pituitary saved for hormone assay. All six of the anterior pituitary hormones will be assayed. Mainly the radioimmunoassay technique will be used, but when useful, other assay systems such as bioassay, polyacrylamine gel electrophoresis and receptor assays will be used. After this initial survey, studies directed to an assessment of the ability of the pituitary to secrete all of its hormones in response to specific stimuli (stress, TRH, LHRH) will be carried out in rats with indwelling cannulae. Studies concerning the metabolism of the pituitary hormones will also be carried out in such animal preparations.
RESULTS: Since administration of many of the above listed pollutants are known to result in central nervous system pathology, it is expected that effects will be observed in pituitary function. Because pituitary hormone secretion responds so rapidly to a variety of influences, it is hoped that this study will lead to early hormonal changes which may be used as indicators of exposure to pollutants.
PROJECT MILESTONES: First a survey will be made of a complete anterior pituitary hormone profile in the serum and pituitary of laboratory animals exposed both acutely and chronically to various gaseous and metallic energy pollutants. The second phase will consist of studies involving the secretory ability of the anterior pituitary to various stimuli and the metabolism of pituitary hormones as tested by clearance studies. The most profitable areas for these studies will be dictated by observations made in the initial survey. Finally the project will extend itself into other non-pituitary endocrine areas.
KEYWORDS: TOXICOLOGY;FOSSIL FUELS;ENDOCRINE GLANDS;HEALTH HAZARDS;RATS;METABOLISM;CARBON DIOXIDE;CARBON MONOXIDE;NITROGEN OXIDES;SULFUR DIOXIDE;LEAD;MERCURY;CADMIUM;ZINC;NICKEL;SELENIUM;CHROMIUM;COPPER;MANGANESE;PATHOLOGICAL CHANGES;BIOLOGICAL INDICATORS;GLANDS;HORMONES;IN VIVO;DRINKING WATER;PITUITARY GLAND;HYPOTHALAMUS

<082042>
TITLE: Effects of Pollutants on Somatic Mammalian Cells
PROJECT NUMBER: 001860
PRINCIPAL INVESTIGATOR: Glaser, D.A.
ADDRESS: Department of Molecular Biology, 229 Stanley Hall, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7409-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$158,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (5%);TRANSPORTATION (5%);STORAGE (5%);PROCESSING, CONVERSION (5%);COMBUSTION OR END USE (30%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (15%);ORGANICS (40%);RADIATION (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (40%);FULL SCALE DEMONSTRATION (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Great Lakes;HYDROGRAPHIC AREAS/Other hydrographic areas Water supplies
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: A new assay system will be developed for testing mutagenic, carcinogenic, and possibly teratogenic effects of environmental pollutants on animal cells and human cells grown in tissue culture.
APPROACH: Animal and human cells will be grown on the surface of plastic or solid agar under extremely tightly controlled and reproducible conditions so that the morphology of the growing colonies of cells is accurately measurable and reproducible by a television camera which will examine time-lapse photographs of the growing colonies and report the results to an on-line moderate sized computer.
RESULTS: A dose response curve for a number of known mutagens and carcinogens will be obtained using changes in colony morphology for Chinese hamster ovary cells and for several other cell types including human diploid cells. It is hoped that these results will be of practical application in estimating the danger to human health of a wide variety of environmental pollutants.
PROJECT MILESTONES: (1) Detection of known mutagens, carcinogens, and perhaps teratogens with the Chinese hamster ovary cell system. (2) Establishment that known non-mutagens, non-carcinogens and non-teratogens produce no effect on the colonies of growing cells. (3) Establishment of dose response sensitivity for these cells. (4) Repeat the same work with at least two other cell lines, including at least one human cell line or with normal human cells.
KEYWORDS: MUTAGENS;CARCINOGENS;BIOLOGICAL EFFECTS;ANIMAL CELLS;CELL CULTURES;GROWTH;COMPUTERS;ON-LINE SYSTEMS;TERATOGENESIS;MAN;IN VITRO;MUTAGENESIS

<082043>
TITLE: National Geothermal Information Resource
PROJECT NUMBER: 002159
PRINCIPAL INVESTIGATOR: Phillips, S.L.
ADDRESS: Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Services
MONITOR: Albert, Ted M.
TELEPHONE: F233-3311
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: GEOTHERMAL/General (100%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S (75%);SPECIFIED OTHER POLLUTANTS/Subsidence; instrumentation (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Hawaii;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Collect and disseminate information relevant to environmental aspects of geothermal energy, including the following main parameters: hydrogen sulfide; subsidence; induced seismicity; monitoring; toxic trace metals; noise.
APPROACH: Information is collected from various sources (e.g., published literature), organized into appropriate categories, stored on computer tapes, evaluated, and disseminated (e.g., Federal, State, local government agencies, the private sector) on a worldwide basis.
RESULTS: A report which has been reviewed by recognized experts prior to dissemination; bibliographies which are in-depth, comprehensive, and cover specialized environmental areas.
KEYWORDS: INSTRUMENTATION;GEOTHERMAL ENERGY;ENVIRONMENTAL EFFECTS;HYDROGEN SULFIDES;SEISMIC WAVES;METALS;NOISE;MONITORING;COMPUTERS;DATA ACQUISITION;INFORMATION;GROUND SUBSIDENCE;COMPUTER CODES;CHEMICAL EFFLUENTS

<082046>
TITLE: Office of Environmental Policy, Lawrence Berkeley Laboratory
PROJECT NUMBER: 002225
PRINCIPAL INVESTIGATOR: Budnitz, R.
ADDRESS: Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Wellborn, Suzanne M.
TELEPHONE: F233-3430
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$331,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide ERDA with analyses of the relationships among technical, environmental, health, economic and societal factors as they affect environmental regulation, energy and environmental RD and D policy on the commercialization of developed energy systems.
APPROACH: Conduct specific studies on the state and federal environmental and load use policies influencing the siting of energy facilities, the institutional arrangements associated with siting strategies in non-attainment areas, alternative policies for siting energy facilities in coastal zones, and national and regional future energy systems employing small scale dispersed energy technologies.
RESULTS: (1) Periodic topical reports. (2) Monthly progress reports.
PROJECT MILESTONES: (1) Preliminary analyses Fall 1977. (2) Final report Fall 1978.
KEYWORDS: DISPERSED ENERGY SYSTEMS;ENERGY FACILITIES;SITE SELECTION;LAND USE;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;COST BENEFIT ANALYSIS

<082048>
TITLE: Trace Metals in a Marine Estuary
PROJECT NUMBER: 1857
PRINCIPAL INVESTIGATOR: Girvin, D.
ADDRESS: University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: C(301)353-5549
TYPE OF FUNDING: Contract No.-W7405-ENG-48;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$74,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Oil and Gas (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Far West;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Our approach to understanding and assessing the implications of expanding energy-related activities on the chemical environment of San Francisco Bay/Delta ecosystems is to investigate those fundamental processes which determine the interactions between trace elements and organics and their individual or combined transport and fate. Subsequent chemical modeling and laboratory bioassay experiments will enable prediction of the biological impact of expanded energy-related activities in San Francisco Bay.
APPROACH: The water and suspended particulate samples are collected from a depth of 2 m with a special

pumping system. Suspended particulate samples are collected on a separate membrane filter. Concurrently with the collection of trace element samples, measurements are conducted for salinity, temperature, pH, partial pressure of dissolved oxygen, nitrate-N, nitrite-N, ammonia, phosphate, and silica. In the laboratory total carbonate alkalinity and concentrations of dissolved organic carbon, Na, K, Mg, Ca, sulfate, and sulfide are determined. We are applying a computerized chemical model, WATEQ, to our data to determine whether specified chemical information, necessary for the modeling of dissolved trace element specification, has been overlooked. Application of the model may result in the discovery of other chemical parameters which should be included in our analytical program.
RESULTS: Information concerning trace metal behavior in estuaries.
KEYWORDS: ESTUARIES;WATER POLLUTION;TRACE AMOUNTS;AQUATIC ECOSYSTEMS;CALIFORNIA;BIOLOGICAL EFFECTS;ENERGY SOURCE DEVELOPMENT;CHEMICAL EFFLUENTS;COMPUTER CODES;W CODES;MATHEMATICAL MODELS;METALS;ENVIRONMENTAL TRANSPORT;BIOLOGICAL MODELS;NITROGEN OXIDES;SULFUR DIOXIDE

<082051>
TITLE: Inspection Guide for Seismic Safety
PROJECT NUMBER: 600063
PRINCIPAL INVESTIGATOR: Eagling, D.G.
ADDRESS: Univ. of Calif., Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Brown, B.P.
TELEPHONE: F233-3133
TYPE OF FUNDING: Contract No.-W-7405-ENG-48;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Develop and publish a reference document which will describe and provide practical guidelines for administering a comprehensive earthquake safety program. The objective is to simplify and speed up the practical application of seismic safety to ERDA facilities.
APPROACH: Utilize LBL's experience and its specialized consultants (in all aspects of earthquake science) to describe techniques, appoaches, policies, and standards which have been developed in the process of carrying out LBL's own earthquake safety program. Experience has shown that most earthquake damage has been the result of failure to implement relatively simple principles already known about earthquake engineering.
RESULTS: This project will produce a document which will provide general guidelines for performing an earthquake safety survey and implementing a comprehensive earthquake safety program. It will cover existing and new physical plant facilities as well as operational conditions and recommend an approach to risk management of the hazard. Commentary will be augmented by a compilation of seismic criteria, standards and examples generalized for use at other sites throughout the ERDA Complex.
KEYWORDS: EARTHQUAKES;SEISMIC SURVEYS;SAFETY;RECOMMENDATIONS

<082052>
TITLE: Steroid Metabolism Energy Pollutants
PROJECT NUMBER: 001852
PRINCIPAL INVESTIGATOR: Connell, G.M.
ADDRESS: Lawrence Berkeley Lab., Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-ENG-48;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/General (25%);GEOTHERMAL/General (25%);SOLAR/General (25%);CONSERVATION/General (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (40%);METALS (30%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Determine the effects of a variety of pollutants of energy producing technologies on endocrine physiology and especially those life processes which are either controlled or in part influenced by steroid hormones.
APPROACH: Rats will be exposed to oxides of nitrogen, sulfur, and certain hydrocarbons. Effects of heavy metals such as mercury, cobalt, manganese, cadmium, nickel, lead, arsenic (and organic salts of mercury and cadmium) will be studied by administration to rats. Changes in reproduction or adrenal steroid hormone synthesis and secretion and the ability of the gonad and adrenal to respond to pituitary tropic hormones will be assessed by highly sensitive and specific radioimmunoassay and radioreceptor analytical methods.
RESULTS: Adult male rats have been exposed to ozone concentrations (0.8 to 1.0 ppM) which are near the oridant concentrations reported in urban areas during serious smog alerts. Exposures have been chronic and for various times in these initial experiments, six weeks being the longest. Preliminary results suggest that exposure tc ozone significantly depresses the ability of the rats' testes to produce testosterone in vitro.
PROJECT MILESTONES: Experiments will be done to gain an understanding of the rat endocrine biochemistry which provides females greater protection to ozone exposure than males Sept. 30, 1978. Studies of gonadal response to pollutant exposures will be extended to include the functional changes observed in the tubular compartment (spermatogenesis); thus, the entire physiological response of the testis can be correlated to pollutant evoked gonadal damage.
KEYWORDS: STEROIDS;METABOLISM;POLLUTION;ENERGY SOURCES;ENDOCRINE GLANDS;PHYSIOLOGY;HORMONES;RATS;NITROGEN OXIDES;SULFUR OXIDES;HYDROCARBONS;MERCURY;COBALT;MANGANESE;CADMIUM;LEAD;BIOCHEMISTRY;OZONE;URBAN AREAS;SMOG;GONADS;SPERMATOGENESIS;BIOLOGICAL EFFECTS

<082053>
TITLE: Pollutants in Tissue Metabolism
PROJECT NUMBER: 001849
PRINCIPAL INVESTIGATOR: Dixon, J.S.
ADDRESS: Lawrence Berkeley Lab., Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-ENG-48;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GEOTHERMAL/General (25%);SOLAR/General (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To establish a rational biochemical basis for quantitating early damage measurable by changes in the blood sera of mammals exposed to environmental pollutants.
APPROACH: Rodents and rabbits will be exposed to a variety of inhaled pollutants such as enriched oxygen, ozone, oxides of nitrogen, sulfur and carbon, aromatic hydrocarbons and hydrogen sulfide or ingestible heavy metal pollutants such as lead, cadmium, zinc, selenium and mercury. Detailed investigations of affected organs in animal model systems should provide information indicating useful parameters measurable in the blood.
RESULTS: A variety of enzyme assay systems will be evaluated to determine which may prove useful for monitoring levels of activity either in the blood or in tissue extracts from normal or pollutant-exposed animals.
KEYWORDS: TISSUES;METABOLISM;POLLUTION;MAMMALS;BLOOD SERUM;RABBITS;OXYGEN;OZONE;NITROGEN OXIDES;SULFUR OXIDES;CARBON OXIDES;LEAD;CADMIUM;MERCURY;ENZYMES;BIOASSAY;MONITORING;BIOLOGICAL EFFECTS;IN VIVO

<082054>
TITLE: Indoor Air Pollution Epidemiology Study
PROJECT NUMBER: 001866
PRINCIPAL INVESTIGATOR: Winkelstein, W.
ADDRESS: Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-ENG-48;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study the chemical and physical behavior of indoor combustion-generated air pollution in residential and commercial buildings.
APPROACH: Indoor air pollution will be characterized and important sources, abundances and fate identified. The exposure of occupants will be characterized and health and welfare effects studied. Abatement procedures for indoor air pollutants will be evaluated.
RESULTS: Field and laboratory characterization studies have included detailed studies of nitrogen compounds in the indcor environment. Levels of CO and NO2 in the field study were found to approach or exceed existing U.S. ambient air quality standards.
PROJECT MILESTONES: (1) An epidemiological study to determine respiratory symptomatology and function in non-smoking housewives exposed to varying amounts of nitrogen oxides determined by their cooking and heating use Sept. 30, 1978. (2) In the epidemiological study, the identification and characterization of the field sample will be completed Sept. 30, 1979.
KEYWORDS: AIR POLLUTION;EPIDEMIOLOGY;COMBUSTION;COMMERCIAL BUILDINGS;HOUSES;HEALTH HAZARDS;AIR POLLUTION CONTROL;NITROGEN COMPOUNDS;CARBON MONOXIDE;INHALATION;PERSONNEL

<082055>
TITLE: Biomedical Effects of Magnetic Fields
PROJECT NUMBER: 002189
PRINCIPAL INVESTIGATOR: Rubias, C.A.
ADDRESS: Lawrence Berkeley Lab., Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (33%);ELECTRICITY GENERATION (33%);ELECTRICAL TRANSMISSION (34%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Magnetic fields (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: To explore and quantify biological effects caused by stationary and varying magnetic fields at the molecular-cellular level and in mammalian systems. To develop guidelines for protection of professional personnel and the population. Thomas Budinger, M.D., Ph.D., will be in charge of medical aspects of this investigation. The frequencies covered include D.C. to about 30 megacycles.
APPROACH: We will build and develop a variety of magnetic exposure devices for exposure of biological materials and humans to controlled field distribution with other environmental variables under rigid control. Next an assessment of the basic effects on cells and molecules will be measured. Certain types of

suspect effects, especially visual and nervous system effects, will be investigated in mammals and man.
RESULTS: Expect to (1) establish basic relationship between field intensity, spatial and temporal variations and biological effects; (2) remove the existing controversial and confusing information that exists; and (3) make recommendations for safe operation of future power systems.
PROJECT MILESTONES: (1) Complete 1/2 instrumentation July 1977. (2) Complete instrumentation July 1978. (3) Initial assessment effects July 1979.
KEYWORDS: MAGNETIC FIELDS;BIOLOGICAL EFFECTS;MAN;BIOLOGICAL MATERIALS;NERVOUS SYSTEM;ANIMAL CELLS;MOLECULES;MAMMALS;NERVE CELLS

<082056>
TITLE: Epidemiology of Magnetic Effects on Humans
PROJECT NUMBER: 2688
PRINCIPAL INVESTIGATOR: Budinger, T.F.
ADDRESS: University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/Fusion Magnetic (25%);CONSERVATION/General (25%);CONSERVATION/Energy storage (25%)
ENERGY CYCLE: STORAGE (25%);PROCESSING, CONVERSION (25%);ELECTRICITY GENERATION (25%);ELECTRICAL TRANSMISSION (25%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Magnetic fields (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the effects, if any, of the stationary and alternating magnetic and electric fields produced by controlled thermonuclear reactors, high-voltage transmission lines, magnetic energy storage systems and magnetohydrodynamic systems.
APPROACH: This is an epidemiological study of 2000 scientists and technicians who have been exposed to high fields for substantial cumulative exposures.
RESULTS: A critical evaluation of A.M. Vyalov's report of 1500 workers who had ill effects from magnetic field exposures will be completed. Medical data on at least 500 exposed subjects and 500 matched controls will be obtained.
PROJECT MILESTONES: Analysis of the data on the first 500 exposed subjects will be completed. The data base will be increased to include 2000 case histories of cyclotron workers and high energy researchers. The potential data base from high tension linemen, power station operators, and European scientists will be investigated.
KEYWORDS: MAGNETIC FIELDS;ELECTROMAGNETIC RADIATION;BIOLOGICAL EFFECTS;THERMONUCLEAR REACTIONS;POWER TRANSMISSION LINES;MAGNETOHYDRODYNAMICS;MAGNETIC ENERGY STORAGE;ENVIRONMENTAL IMPACTS;PATHOLOGICAL CHANGES;MEDICAL SURVEILLANCE;PERSONNEL;DATA ACQUISITION;EPIDEMIOLOGY;CHRONIC INTAKE;POWER PLANTS;PUBLIC UTILITIES

<082057>
TITLE: Health Effects Petroleum Industry
PROJECT NUMBER: 2692
PRINCIPAL INVESTIGATOR: Alpen, E.L.
ADDRESS: Univ. of Calif., Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-48;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Far West;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Study of the epidemiology of a number of diseases, concentrating on cancer, cardiovascular and respiratory disorders, among refinery workers.
APPROACH: Epidemiological study in the North Bay Counties of Northern California, a region of high activity for petroleum refining and transportation as well as related petrochemical based industries.
RESULTS: Definition of the scope of the problem, the study population, and the experimental instruments to be used.
PROJECT MILESTONES: (1) Begin data collection Apr. 1, 1978. (2) Develop body fluid sampling to a full scale study Sep. 30, 1979. (3) Complete preliminary analysis of cancer incidence rates Sep. 30, 1980.
KEYWORDS: PETROLEUM REFINERIES;HEALTH HAZARDS;EPIDEMIOLOGY;HUMAN POPULATIONS;CALIFORNIA;CARCINOGENS;CARDIOVASCULAR DISEASES;RESPIRATORY SYSTEM DISEASES;NEOPLASMS;HYDROCARBONS;HEART;ENVIRONMENTAL EFFECTS

<082060>
TITLE: Laser Optoacoustic Spectrometer
PROJECT NUMBER: 4037
PRINCIPAL INVESTIGATOR: Amer, N.
ADDRESS: Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No.-W-7405-ENG-48

77 FUNDING: Energy Research and Development Administration FY77:$127,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
)LLUTANTS: NOXIOUS GAS (100%)
[ARACTER OF STUDY: RESEARCH/Laboratory (100%)
nEGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development of an ultra sensitive, multiparameter molecular detector for the characterization of trace contaminants at the parts per billion level.
APPROACH: Laser optoacoustic spectroscopy.
RESULTS: Development of an ultra sensitive optoacoustic detector.
PROJECT MILESTONES: (1) Development of optoacoustic detector. (2) Demonstration for gases. (3) Demonstration in liquids. (4) Extension to solids and aerosols.
KEYWORDS: OPTOACOUSTIC SPECTROSCOPY;AIR POLLUTION MONITORS;WATER POLLUTION MONITORS;DESIGN;TRACE AMOUNTS;CHEMICAL EFFLUENTS;MOLECULAR IONS;LASERS;SPECTROMETERS

Energy Research and Development Administration/Lawrence Livermore Laboratory

<083001>
TITLE: Assay of Mammalian Sperm Motility
PROJECT NUMBER: 000251
PRINCIPAL INVESTIGATOR: Timourian, H.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: FOSSIL FUEL/General (80%);NUCLEAR/General (20%)
POLLUTANTS: NOXIOUS GAS/CO (10%);METALS/Manganese;METALS/Iron;METALS/Zinc;METALS/Calcium;METALS/Mercury (40%);ORGANICS/Hydrocarbons (30%);RADIATION/Gamma and X-rays (10%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the feasibility of using sperm motility as a measure of physiological and metabolic toxicity of energy related effluents as they affect the intact male mammalian organism. If feasibility is established, the method will then be applied to the screening of a variety of substances obtained from energy power plants (fossil, nuclear, geothermal) and in situ processes (coal gasification, oil shale).
APPROACH: We will use the flow-spectrophotometric method to determine sperm motility. This method, developed in our laboratory, uses the optical anisotropy of sperm to measure their capacity for randomization after flow alignment forces are discontinued. We will first test the flow-spectrophotometric method with sperm of various laboratory mammals (rat, mouse, rabbit) and then determine whether sperm motility is affected by known noxious pollutants such as metal ions and hydrocarbons.
RESULTS: Sperm motility method as a rapid, objective method for screening energy related pollutants. Rapid screening by using sperm cells obtained at different times after male mammals are exposed.
PROJECT MILESTONES: (1) 4/7/77 Determine feasibility of using flow-spectrophotometric method with laboratory mammals. (2) 8/1/77 Test for deleterious effects of known pollutants. (3) 10/1/77 Screen a variety of unknown substances in effluents from energy sources.
KEYWORDS: EFFLUENTS;SPERMATOZOA;BIOASSAY;MOTION;MAMMALS;POWER PLANTS;FOSSIL FUELS;COAL GASIFICATION;OIL SHALES;CELL FLOW SYSTEMS;RATS;MICE;RABBITS;POLLUTION;HYDROCARBONS;TOXICITY;CHEMICAL EFFLUENTS;BIOLOGICAL INDICATORS;IN VIVO;REPRODUCTION;ANIMAL CELLS

<083002>
TITLE: Radiosensitivity of Oocytes and Other Mammalian Cells During Development
PROJECT NUMBER: 000252
PRINCIPAL INVESTIGATOR: Dobson, R.L.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$208,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (30%);NUCLEAR/Fusion Magnetic;NUCLEAR/Fusion Laser (30%);GENERAL SCIENCE (40%)
ENERGY CYCLE: PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION/Gamma rays (50%);SPECIFIED OTHER POLLUTANTS/Radionuclides, especially tritium (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All coasts;HYDROGRAPHIC AREAS/Other hydrographic areas Streams
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The aims of this research are (1) to identify in the intact animal (mainly the mouse) effects induced by low exposures to tritium, other important radionuclides, and external radiation during the highly sensitive embryonic, fetal, and postnatal stages of development (the most vulnerable parts of the mammalian life cycle); and (2) to quantify these effects at the cell-population level, thus obtaining the data necessary for critical comparisons at low-level exposure where hazard evaluation is most urgently needed.
APPROACH: The approach is to give acute or chronic exposures to animals in utero and postnatally, then to

evaluate selected cell populations in terms of residual cell numbers and functions. Attention is focussed on oocytes and neuroblasts because they are highly radiosensitive and their cell numbers are set by birth or shortly after. The male germ line, also highly radiosensitive, is studied as an example of a continuously renewing population.
RESULTS: Expected results are (1) determination of the lowest exposure levels at which important cell populations are significantly affected during development, (2) measurement of quantitative dose-effect relations, (3) determination of relative effectiveness and related data required at low exposures for reliable safety standards and exposure guides.
PROJECT MILESTONES: (1) Dec. 31, 1976 Oocyte age-radiosensitivity relationship determined; Studies of tritium effects on developing nervous system well started. (2) June 30, 1977 Dose-effect relationship for neutron irradiation of oocytes measured; Endocrine effects on oocyte radiosensitivity clarified. (3) Dec. 31, 1977 Preliminary results for tritium effects on developing neurons expected; Comparative studies on tritium and gamma irradiation of the male germ line well started. (4) June 30, 1978 Results expected for effects of chronic tritium and gamma irradiation of male germ line (RBE measured); Effectiveness of tritium in damaging developing neurons quantified.
KEYWORDS: OOCYTES;RADIOSENSITIVITY;TRITIUM;MICE;RADIATION HAZARDS;GERM CELLS;BIOLOGICAL RADIATION EFFECTS;DOSE-RESPONSE RELATIONSHIPS;RADIOISOTOPES;TERATOGENESIS;TOXICITY;WATER;GAMMA RADIATION

<083003>
TITLE: Spermatogenic Variability
PROJECT NUMBER: 000254
PRINCIPAL INVESTIGATOR: Gledhill, B.L.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$123,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (10%);GEOTHERMAL/General (10%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);WASTE MANAGEMENT (40%)
POLLUTANTS: NOXIOUS GAS/Nitrogen and sulfur oxides;NOXIOUS GAS/Methane (20%);METALS/Zinc;METALS/Copper (10%);ORGANICS/Anthrocene;ORGANICS/MMS;ORGANICS/EMS (60%);RADIATION/Beta and gamma (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop sensitive bioassay methods using mammalian spermatogenesis and particularly mature sperm as indicators of genetic, teratologic and general toxicity.
APPROACH: The project uses optical, automated, high-speed, and content-oriented methods to measure the morphology, the variability in DNA content, and the nuclear protein composition of sperm and testis cells.
RESULTS: The project should result in the development of practical and sensitive assay that can be used in the laboratory and in the field on mammals (or shell fish, etc.), including man. Flow systems measurement of DNA content of mammalian sperm will be freed of the orientation artefact and will be applied to other properties of the sperm. Application to a variety of pollutants should give beginning dose-response and sensitivity information.
PROJECT MILESTONES: (1) 1 July 1976: (a) Initiate testing of 4 chemicals to determine transmissable genetic damage in spermatogenic cells of mice. (b) Continue parameterization of fluorescence frequency distributions to identify effects of sperm morphology. (c) Start study of Drosophila sperm DNA content. (2) 1 Jan. 1977: (a) Make decision on manpower commitments for new flow chamber design. (b) Produce manuscript on nuclear protein of sperm from normal and mutagen treated mice. (3) 1 July 1977: (a) Complete tests on 4 chemicals (sperm morphology, DNA content and visible chromosomal aberrations). (b) Complete study of effects of x-irradiation on sperm DNA content. (4) 1 Jan. 1978: (a) Complete study of Drosophila sperm DNA content from euploid and aneuploid males. (b) Complete study of sperm DNA content from mice with isolated Robertsonian fusions (F/sub 1/ of M. poschiavinus). (5) 1 July 1978 Initiate testing the effects of effluents and other pollutants on sperm morphology and DNA content of germ cells.
KEYWORDS: SPERMATOGENESIS;BIOASSAY;TOXICITY;DNA;PROTEINS;SPERMATOZOA;CELL FLOW SYSTEMS;POLLUTION;BIOLOGICAL INDICATORS;ANIMALS;IN VIVO;MUTAGENESIS;MORPHOLOGICAL CHANGES

<083004>
TITLE: Flow Systems Development
PROJECT NUMBER: 000256
PRINCIPAL INVESTIGATOR: Van Dilla, M.A.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$170,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project aims at improving our flow systems capabilities by incorporating the most advanced techniques. It includes the modifications, improvements,and maintenance necessary for both ongoing and new programs in the Biomedical Division. Flow systems are essential to a wide variety of projects in cell biology, mutagenesis, flow cytogenetics, reproductive biology, and cancer detection now in progress in the Division.
APPROACH: Instrument development under this project will be directed primarily by requirements developed within various experimental programs within the Division. Examples are a need to develop methods of handling asymmetric cells, improved flow stability for chromosome measurements, and incorporation of a volume sensor. There is a continuing effort to advance the state of the art in flow systems.

RESULTS: Improved flow systems will provide better, more consistent and reliable data for experimental biology programs. New developments will permit measurements not yet possible due to instrument limitations.
PROJECT MILESTONES: There are no direct definable milestones in this project.
KEYWORDS: FATE;CELL FLOW SYSTEMS;SPECIFICATIONS;CYTOLOGY;MUTAGENESIS;DIAGNOSTIC TECHNIQUES;CHROMOSOMES;RADIONUCLIDE MIGRATION;SOILS;WATER;RADIOISOTOPES;RADIOECOLOGICAL CONCENTRATION

<083005>
TITLE: Flow Systems Applications
PROJECT NUMBER: 000257
PRINCIPAL INVESTIGATOR: Gray, J.W.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$123,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is concerned with general biological applications of the flow system facilities of the division. Several projects will be supported. These include: (1) the analysis and sorting of individual human chromosomes for biological and biochemical experiments involving the effect of clastogens on chromosomes, (2) the analysis of sperm populations to reveal the presence of aberrant sperm, (3) the identification and characterization of cell mutants, (4) the development of new techniques for cell cycle analysis, (5) the development of methods for the recognition of carcinogenesis and mutagenesis, and (6) the recognition of abnormal exfoliated cervical-vaginal cells.
APPROACH: Support is provided to scientists interested in utilizing flow-systems in the study of a particular problem. This support includes flow systems operation, maintenance of permanent data-storage facilities, routine computer analysis of user generated data, help in incorporating flow-system technology into experimental design and in interpreting the resulting data, and the provision of suitable biological materials and information necessary for the development and testing of biologically useful flow systems. In addition our own investigations are initiated in areas where flow-systems technology might be useful.
RESULTS: Results in several areas are expected: (1) Continued progress will be made in the analysis of isolated chromosomes. Attempts will be made to analyze chromosomes from human cells. (2) A decision will be made concerning the utility of flow systems in the recognition of aberrant sperm. (3) Continued work will be devoted to the identification and characterization of cell mutants. (4) Newly developed cell cycle analysis techniques will be used in studies of the effects of chemicals on cell populations. (5) Continued work will be devoted to studies of mutagenesis and carcinogenesis and (6) to the recognition of abnormal cervical vaginal cells. (7) In addition, considerable effort will be devoted to the development of computer codes for the display and analysis of two parameter flow system data.
PROJECT MILESTONES: This project plays a support role in the division; the designation of specific milestone is therefore inappropriate.
KEYWORDS: CELL FLOW SYSTEMS;CHROMOSOMES;SPERMATOZOA;ANIMAL CELLS;CELL CYCLE;CARCINOGENESIS;MUTAGENESIS;COMPUTERS;COMPUTER CODES;DATA;USES;CARCINOGENS;GENETICS;REPRODUCTION

<083006>
TITLE: Cytochemistry
PROJECT NUMBER: 000259
PRINCIPAL INVESTIGATOR: Smith, R.E.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$205,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Nitrous (10%);METALS/Lead;METALS/Mercury (10%);ORGANICS (55%);RADIATION (20%);HEAT, THERMAL/Geothermals (5%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: The project is oriented toward the development and application of cytochemical procedures as biophysical cytological probes for the identification and quantitation of enzymes, nucleic acids, and protein constituents on cells and subcellular components.
APPROACH: Is the use of specific peptides coupled to 4-methoxy-beta-naphthylamine as cytochemical substrates for the assay and subcellular localization of tissue proteinases, and the use of other fluorophores for the assay of esterases and nucleotidases.
RESULTS: To develop enzyme assays to evaluate the physiologic and pathologic state of tissues, cells and cellular organelles.
PROJECT MILESTONES: To develop enzyme assays to evaluate the physiologic and pathologic state of tissues, cells and cellular organelles. (1) Development of colorimetric and fluorescent techniques for quantitation of plasminogen activator using the substrate CBZ-gly-gly-arg-4M beta NA. (2) Application of enzyme techniques to flow systems and correlation of enzyme activity to phases of the cell cycle. (3) Measurement of nuclear protease content in response to carcinogens and mutagens. (4) A colorimetric and fluorogenic test for gamma-glutamyl-transpeptidase as a means of following myocardial infarctions.
KEYWORDS: CYTOLOGY;BIOCHEMISTRY;ENZYMES;NUCLEIC ACIDS;PROTEINS;ANIMAL CELLS;CELL CONSTITUENTS;TISSUES;PATHOLOGY;PEPTIDES;BIOASSAY;ANIMALS;CARCINOGENS;HORMONES;NEOPLASMS;PATHOGENESIS

<083007>
TITLE: Mutations in Cultured Somatic Cells
PROJECT NUMBER: 000261
PRINCIPAL INVESTIGATOR: Thompson, L.H.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$288,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (20%);GEOTHERMAL/General (10%);GENERAL SCIENCE (30%)
ENERGY CYCLE: PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (35%);WASTE MANAGEMENT (5%)
POLLUTANTS: NOXIOUS GAS/Oxides of sulfur;NOXIOUS GAS/Nitrogen (15%);METALS/Heavy metal ions (15%);ORGANICS/Polycyclic hydrocarbons (55%);RADIATION/Ionizing (15%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project combines a Cell Culture Facility as a service to the Biomedical Division and an experimental program dealing with mutation in cultured mammalian cells. The latter activity is aimed at understanding mutational phenomena in near-diploid Chinese hamster cells and demonstrating their usefulness as a model for somatic mutation in vivo. Procedures are being developed for isolating mutations producing temperature sensitivity for growth; these are then characterized from the cellular and biochemical viewpoints, and then applied to genetic questions.
APPROACH: Tritiated aminoacid suicide procedures are being developed to select large numbers of mutations affecting specifically protein synthesis. Suitable biochemical and genetic analyses are applied to these mutants as well as others expected to come from an automated-colony-growth approach done in collaboration with U.C. Berkeley. In addition, the relevance of the new sister chromatid exchange assay to mutagenesis is being assessed by testing for its correlation with mutation induction at the HPRT locus.
RESULTS: We expect to isolate many protein synthesis mutants, including at least five classes of aminoacyl-tRNA synthetase mutants, in response to chemical mutagenesis. We shall use these to (1) test for evidence that we have structural (as opposed to regulatory) gene alterations and (2) test whether the genes being altered behave genetically as haploid or diploid.
PROJECT MILESTONES: (1) 10/1/76 Test for a correlation between mutation induction and sister chromatid exchange after exposure to chemical agents. (2) 1/1/77 Establish the spectrum of protein synthesis mutants isolatable (after chemical mutagenesis) using tritiated aminoacid suicide procedures. (3) 1/7/77 Establish whether this cell system behaves as diploid (vs. haploid) for certain aminoacyl-tRNA synthetase genes. (4) 10/1/77 Purification and assay of altered protein as evidence for true mutation.
KEYWORDS: SOMATIC CELLS;MUTATIONS;CELL CULTURES;HAMSTERS;TRITIUM;AMINO ACIDS;PROTEINS;BIOSYNTHESIS;CPU;MUTANTS;GENETICS;PLOIDY;BIOLOGICAL MODELS;BIOLOGICAL RADIATION EFFECTS;IN VITRO;MOLECULES;MUTAGENESIS

<083008>
TITLE: Inaccuracy in Gene Expression: Induction by Chemical Agents and Mutagenic Effects
PROJECT NUMBER: 000263
PRINCIPAL INVESTIGATOR: Branscomb, E.W.;Galas, D.J.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Metal ion;METALS/Heavy metal components (50%);PARTICULATES/Solvents;PARTICULATES/Polycyclic hydrocarbons;PARTICULATES/Polyamines (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is directed towards determining if gene expression errors are: (1) subject to a self-amplifying effect, (2) an important cause of cell failure and death, (3) an indirect cause of an enhanced spontaneous mutation rate, and (4) significantly induced by exogenous agents.
APPROACH: The initial phase of this project involves in vivo studies in the procaryote Escherichia coli. We explcit an ability unique to this system, to manipulate, both genetically and chemically (aminoglycoside antibiotics, etc.) the gene expression error rate, and to measure that rate by determining the level of variant, thermolabile forms of an unusually large and highly inducible enzyme (beta-galactodidase). Mutagenic effects of such errors are sought through measuring mutations induced in the bacterial virus T4 during its replication in treated cells.
RESULTS: A definitive fulfillment of the project's objectives would provide the groundwork for a critical and uninvestigated area in environmental toxicology.
PROJECT MILESTONES: Anticipated milestones in the initial, procaryote phase of the project were: (1) Demonstration of mutagenesis caused by errors in gene expression 3/77; (2) Determination of rate of error catastrophies in causing cell death 9/77; and (3) Definitive demonstration of error amplification 3/78.
KEYWORDS: PROTEIN SYNTHESIS;INFIDELITY;GENES;MUTATIONS;ESCHERICHIA COLI;ENZYMES;MUTAGENESIS;VIRUSES;GENETICS;MOLECULES;PATHOGENESIS

<083009>
TITLE: Cellular Functions of Vitamin B-12 and Folic Acid
PROJECT NUMBER: 000264
PRINCIPAL INVESTIGATOR: Taylor, R.T.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48

77 FUNDING: Energy Research and Development Administration FY77:$113,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
^^LLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/
(5%);METALS/Arsenic;METALS/Mercury;METALS/Tin;METALS/Thallium;METALS/Chromium;METALS/Platinum;METALS/Lead;
ETALS/Cadmium (45%);ORGANICS/Polynuclear hydrocarbons;ORGANICS/Methanol (45%);RADIATION/Cobalt-60 (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose is to define the enzymic regulation of folate one-carbon metabolism and to develop and validate new genetic markers in these pathways for their potential use 'in pollutant mutagenesis assays. This research will also provide needed information on this metabolism and fate of energy-related pollutants that exert their toxicity via one-carbon fragments.
APPROACH: The experimental approach is at the in vitro cellular and molecular level; it makes extensive use of cultured somatic cells, primarily chinese hamster ovary (CHO) lines. Several CHO mutants have been characterized as lacking the enzyme, folylpolyglutamate synthetase; other mutants will be derived by mutagen treatments. Once characterized, each mutant will then be evaluated as a possible mutagen tester strain. In additant, normal CHO cells and mutants with impaired folate metabolism will be employed to determine the mechanisms by which methanol metabolites damage cells and cellular components.
RESULTS: Expected end-products are a battery of biochemically characterized mutants, a few of which should serve as in vitro mammalian cell systems with which one can identify the presence of certain types of mutagenic agents. Their specificity may also allow measurements of mutation frequencies in terms of gene loci. Biochemically characterized markers which represent varied categories of genetic damage are necessary to permit a rapid, yet thorough, screening of the mutagenicity of potentially hazardous agents, particularly their quantitative dose-effect relationships.
PROJECT MILESTONES: (1) Sept. FY 1977 The ability of known mutagens to induce revertants of CHO auxotrophs requiring glycine + adenosine + thymidine will have been determined. Our research has recently shown that this triple auxotrophy is due to a specific enzymic defect in folate metabolism. (2) Sept. FY 1977 The feasibility of isolating CHO mutants with known enzymic defects in methionine biosynthesis will have been established. (3) Sept. FY 1978 The relative toxicities of methanol metabolites to normal and mutant CHO cells with markedly differing intracellular folate pools will have been ascertained; preliminary data on the mutagenicities of methanol versus formaldehyde and formate will have been obtained.
KEYWORDS: FOLATE/ONE-CARBON METABOLISM;ENZYMIC REGULATIONS;BIOCHEMICAL GENETICS;VITAMIN B-12;FOLIC ACID;ENZYMES;METABOLISM;MUTAGENESIS;POLLUTION;BIOLOGICAL EFFECTS;SOMATIC CELLS;CELL CULTURES;HAMSTERS;OVARIES;MUTANTS;DOSE-RESPONSE RELATIONSHIPS;METHANOL;BIOCHEMISTRY;SOMATIC MUTATIONS;IN VITRO

<083010>
TITLE: Membranes of Mammalian Cell Mutants
PROJECT NUMBER: 000265
PRINCIPAL INVESTIGATOR: Shore, B.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$181,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/NH/sub 3/
(15%);METALS/Mercury;METALS/Cadmium;METALS/Cobalt;METALS/Zinc;METALS/Selenium;METALS/Arsenic;METALS/Copper
METALS/Lead;METALS/Platinum;METALS/Thallium (35%);ORGANICS/Carcinogenic polynuclear
hydrocarbons;ORGANICS/Nitroso compounds (45%);RADIATION/Gamma;RADIATION/Beta;RADIATION/Alpha (5%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Develop information needed to understand mutagenesis. (2) Delineate molecular mechanisms by which certain mutations are expressed in animal cell membranes. (3) Obtain information needed to develop mutant markers for testing mutagenic agents from energy technologies. (4) Obtain information needed to understand structure and function of membranes of normal and cancerous cells. (5) Determine effects of energy-technology pollutants on cytodifferentiation. (6) Understand some important serum-cell membrane interactions.
APPROACH: We will biochemically and biophysically characterize the nature, structure, function and expression of protein (glycoprotein) markers associated with cell membrane mutations. Cells for in vitro study include (1) HeLa, CHO and other animal cells differing in sensitivity to ouabain and in cation transport, and (2) sheep erythrocytes differing in internal K+ and Na+ concentration and in Na+-K+-activated, ouabain-inhibited membrane ATPase activity.
RESULTS: (1) Biochemical and biophysical delineation of differences between normal and mutant cell membranes in glycoproteins, glycolipids, proteins, enzymes. (2) Use of these results to devise a system for mutagen testing; forward mutations to ouabain resistance are promising phenotypic changes to monitor in testing pollutant mutagenicity. (3) Valuable information in understanding the role of membranes in mutagenesis and carcinogenesis. (4) Understanding certain important serum-cell membrane interactions because they will affect dose-response of organisms to pollutants. (5) Understanding pollutant effects on cytodifferentiation.
PROJECT MILESTONES: (1) Sept. 1977 Biochemical and chemical elucidation of some important differences between normal and mutant cell membranes in glycoproteins and proteins. (2) April 1978 Elucidation of biochemical and chemical differences in membrane NA/sup +/-K/sup +/-ATPase and ouabain resistance between normal and mutant cells. (3) Sept. 1978 Biochemical and chemical elucidation of further differences between normal and mutant cell membranes in glycoproteins and proteins. (4) Sept. 1978 Elucidation of some effects of environmental pollutants on cytodifferentiation. (5) Sept. 1978 Elucidation of some effects on cells of interaction between serum constituents and cell membranes and demonstration of importance to dose-response to environmental pollutants.
KEYWORDS: ANIMAL CELLS;MUTAGENESIS;MUTATIONS;TUMOR CELLS;POLLUTION;BIOLOGICAL EFFECTS;CELL MEMBRANES;CELL DIFFERENTIATION;PROTEINS;LIPIDS;ENZYMES;CARCINOGENESIS;ATP-ASE;OUABAIN;HELA CELLS;METABOLISM;BIOCHEMISTRY;GLUCOPROTEINS

<083011>
TITLE: Biochemistry of DNA, Chromatin and Chromosomes
PROJECT NUMBER: 000266
PRINCIPAL INVESTIGATOR: Hatch, F.T.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$172,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Mercury;METALS/Platinum;METALS/Thallium;METALS/Cadmium (10%);ORGANICS/Polycyclic aromatic hydrocarbons (60%);RADIATION/Hydrogen-3;RADIATION/Gamma;RADIATION/Alpha (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Biochemical, biophysical, and cytogenic techniques will be applied to the analysis of DNA, chromatin, and chromosome structure. Correlations are being drawn between the quantitative distributions of satellite DNA and cytologic heterochromatin on one hand and variations in chromosome structure on the other hand in kangaroo rat species. These studies reveal an apparent new level in the control heirarchy of the genome, a global level that may be involved in adaptations to the environment and evolution of species. The chromatin studies are directed toward an analysis of those factors involved in the packaging of DNA in chromatin and mitotic chromosomes that may be responsible for the differential sensitivity of hetero- and euchromatin to chemical mutagens and radiation.
APPROACH: The chemical properties, chromosome location, timing of replication, accessibility to nuclease digestion in chromatin, and the comparisons of satellite DNA properties have revealed greater similarities broadly through the Order Rodentia than hitherto recognized. A function for satellite DNA that has been subject to selective conservation for at least 50 million years is implied by the data. In the chromatin studies, particular emphasis will be given to characterizing the biochemical structure of hetero- and euchromatin with respect to the types of chromosomal proteins that may be present, the extent of their modification by acetylation, methylation and phosphorylation, the spatial organization of these proteins on DNA, and the thermal stability of protein-DNA interactions.
RESULTS: Further studies on satellite DNA will extend to additional rodents and other animal species, and will include chromosomal location by in situ hybridization. The sequence organization in the poorly understood DNA fraction of density 1.702 g/ml will be evaluated as a possible ''library'' source of simple sequences for amplification into satellite DNAs. The chromatin proteins of mouse sperm are being characterized and micro techniques are being developed specially for the analysis of the chromosomal proteins in FMF sorted chromosomes. Projected studies will involve the separation of euchromatin and heterochromatin and analysis of nucleoprotein structure in each type, examination of the effects of x-rays and chemical mutagens on chromatin packaging in sperm, and characterization of the chromatin proteins in FMF sorted chromosomes and chromosome fragments.
PROJECT MILESTONES: (1) Dec. 1976 Complete characterization of sperm proteins (mice); complete further species survey of prevalence of specific satellite DNAs in rodents and other mammals. (2) Oct. 1977 Analysis of chromatin protein complement in abnormal sperm from individuals treated with X-rays and chemical mutations. In-situ hybridization studies of satellite DNA localization. Isolation of defined fragment of constitutive heterochromatin (satellite DNA containing) using restriction enzymes-partial characterization of chromosomal protein complement. Preliminary analysis of histone proteins in FMF sorted chromosomes (Muntjac). Characterization of protein-DNA interactions in different types of chromatin by thermal denaturation with ultraviolet spectroscopy. (3) Oct. 1978 Characterization of isolated heterochromatin with respect to histones and preliminary analyses of non histone proteins, and protein-protein interactions.
KEYWORDS:
DNA;CHROMATIN;CHROMOSOMES;BIOCHEMISTRY;MUTAGENS;RADIATIONS;MICE;HYBRIDIZATION;PHOSPHORYLATION;ACETYLATION; ETHYLATION;NUCLEOPROTEINS;X RADIATION;BIOLOGICAL RADIATION EFFECTS;MOLECULAR STRUCTURE

<083012>
TITLE: Cytomorphometry: Nuclear
PROJECT NUMBER: 000272
PRINCIPAL INVESTIGATOR: Mayall, B.H.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$63,000
TECHNOLOGY: NUCLEAR/General (60%);GENERAL SCIENCE (40%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop cytomorphometric techniques to measure the cytochemical properties of individual cells and chromosomes, and to apply these techniques to quantitate cellular and chromosomal effects in man.
APPROACH: A coordinated interdisciplinary effort, including scanning cytophotometry, interactive image processing and statistical analysis.
RESULTS: A quantitative approach to diagnosis, that will allow sensitive and precise detection of effects in experimental systems and in man, and will allow accurate screening for such effects.
PROJECT MILESTONES: (1) 1978 Demonstration of proof of principal. (2) 1980 Construction of prototype system. (3) 1983 Field testing of system.
KEYWORDS: CYTOLOGY;BIOCHEMISTRY;CHROMOSOMES;SCINTISCANNING;ANIMAL CELLS;STATISTICS;PHOTOMETRY;MAN;DNA;GENETICS;MEASURING INSTRUMENTS

<083013>
TITLE: Cytogenetics and Chromosome Aberrations
PROJECT NUMBER: 000273
PRINCIPAL INVESTIGATOR: Carrano, A.V.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$93,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (10%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (30%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (5%);METALS/Platinum;METALS/Lead (10%);ORGANICS/Hydrocarbons;ORGANICS/Alkylating agents (75%);RADIATION/Gamma (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This program will investigate chromosome aberrations: Mechanisms of production, specificity of induction, persistence in cell populations in vivo and in vitro, and their functional significance. The ultimate goal of this study is to identify cytogenetic lesions formed in response to chronic exposure to pollutants and to establish a rapid quantitative measure of the lesions for monitoring exposed human populations for both somatic and genetic damage.
APPROACH: Both in vivo (rodents, rabbit, blood, bone marrow, testes) and in vitro (human diploid cells, various animal cells). Test systems will be utilized. Known mutagens/clastogens (alkylating agents or radiation) will serve as a positive control for experiments. Unknown mutagens/clastogens (heavy metals, hydrocarbons) will be evaluated for their activity following acute or protracted administration. An aerosol delivery system is also proposed. Clastogen test systems will be evaluated as they can be applied to quantitation of damage. This includes flow systems analysis of chromosomal DNA content, formation and persistence of sister chromatid exchanges and direct chromosome breakage.
RESULTS: Endpoints expected include: (1) Identification and quantification of cytogenic lesions in vivo and in vitro associated with chemical exposure. (2) Functional significance of the lesions-whether it results in mutagenesis, toxicity or other biochemical defect. (3) Development of an automated approach to clastogen screening. (4) Application of this information to monitoring human populations.
PROJECT MILESTONES: (1) Dec. 1, 1976 Correlation between sister chromatid exchanges and point mutations. (2) July 1, 1977 Establishment of a dose response curve for clastogen damage (radiation initially) using flow cytometry of isolated chromosomes. (3) Dec. 1, 1976 Determination of inducibility of sister chromatid exchanges and their persistence in heterochromatin and euchromatin. (4) July 1, 1977 Design of an aerosol facility for small animals.
KEYWORDS: CLASTOGEN;CYTOLOGY;GENETICS;CHROMOSOMAL ABERRATIONS;POLLUTION;BIOLOGICAL EFFECTS;HUMAN POPULATIONS;MONITORING;CELL FLOW SYSTEMS;DNA;MUTAGENESIS;CARCINOGENS;SOMATIC MUTATIONS;IN VITRO;IN VIVO

<083014>
TITLE: Development of Instrumentation for Characterizing Pollutants and Their Behavior in the Environment
PROJECT NUMBER: 000277
PRINCIPAL INVESTIGATOR: Kirby, J.A.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (10%);PROCESSING, CONVERSION (20%);WASTE MANAGEMENT (70%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Design and development of an instrument for measuring in-situ americium and plutonium contamination, especially in soil. The instrument is to be portable and capable of operation by one person in a field situation.
APPROACH: Based upon previous experience with high purity germanium detectors, a full-scale detector system is being developed.
RESULTS: An instrument for quantifyirg in-situ americium and plutonium in soil. The sensitivity will be higher than any available technique currently in use. It will be suitable for use at all nuclear facilities and for monitoring waste management and disposal.
PROJECT MILESTONES: (1) Nov. 1976 Design completed. (2) Feb. 1977 High purity detectors fabricated. (3) Nov. 1977 Preamplifiers, amplifiers, gating circuits fabricated. (4) April 1977 Field test started. (5) Aug. 1977 Field test completed. (6) Sept. 1977 Data analysis and final report.
KEYWORDS: INSTRUMENTATION;IN-SITU;SPECIFICATIONS;GAMMA RADIATION;X RADIATION;SOILS;PLUTONIUM;AMERICIUM;RADIATION DETECTORS;DESIGN;RADIATION MONITORING

<083015>
TITLE: Nuclear Assessment and Model Development
PROJECT NUMBER: 000278
PRINCIPAL INVESTIGATOR: Ng, Y.C.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-ENG-48

77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (75%)
POLLUTANTS:
METALS/Cadmium;METALS/Mercury;METALS/Arsenic;METALS/Selenium;METALS/Chromium;METALS/Nickel;METALS/Lead;METALS/Etc. (20%);RADIATION/Radionuclides (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (25%);ANALYTICAL (75%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;GEOGRAPHIC AREAS/Site specific Various;COASTS/Far West;COASTS/Other coasts Continental;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Inland waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This project will address the following problems: (1) the individual and population doses from normal and accidental releases of radionuclides, (2) the environmental and biological costs of emissions from nuclear and non-nuclear modes of power production, (3) derived working levels and emergency reference levels for radionuclides in the environment near specific nuclear facilities, (4) long-term dose commitments to Marshall-Island inhabitants as a consequence of the U.S. nuclear testing program, (5) radiological pollution effects associated with accelerated uranium production in the Southwest.
APPROACH: The approach is to develop and update models and data bases for predicting transport and fate of radionuclides and to use these models to evaluate individual and population doses from radionuclide releases; these are used to evaluate the impacts from radionuclide releases and to develop secondary and tertiary radiation protection standards. Integrated assessment of dose commitments for the Marshall Islands includes the evaluation of alternate living patterns, remedial actions and agricultural practices.
RESULTS: Reports will document: (1) each pathway model and its data base, (2) generalized estimates of man-rem via environmental pathways and total man-rem per curie released for major nuclides, (3) derived working limits for nuclides in environmental media, (4) assessments of individual and population doses from specific nuclear activities such as weapons testing in the Marshall Islands, and (5) environmental impact from accelerated uranium production in the Southwest.
PROJECT MILESTONES: Report will be published to document the following: (1) Revised forage-cow-milk-man pathway model FY 1976; (2) Assessment of dose commitments for the returning Bikini population FY 1976T; (3) Revised plant-herbivore-meat-man pathway model FY 1977; (4) Revised soil-root-plant-man pathway model FY 1977; (5) Assessment of regional environmental impacts from uranium production in the Grants Mineral Belt, New Mexico August 1977; (6) Assessment of generalized man-rem via various exposure pathways and total man-rem per curie released for major nuclides FY 1977 or 1978; and (7) Revised aquatic foods-man pathway model FY 1978.
KEYWORDS: EMISSIONS;FATE;RADIOISOTOPES;POWER GENERATION;HUMAN POPULATIONS;NUCLEAR POWER PLANTS;EMISSION;COST;RADIATION DOSES;CONTAMINATION;MARSHALL ISLANDS;NUCLEAR EXPLOSIONS;URANIUM;DATA ACQUISITION;MATHEMATICAL MODELS;ENVIRONMENTAL EFFECTS;AGRICULTURE;TERRESTRIAL ECOSYSTEMS;RADIOACTIVE EFFLUENTS;RADIONUCLIDE MIGRATION

<083017>
TITLE: Effects of Air Pollution on Western Plant Ecosystems: Case Studies
PROJECT NUMBER: 000699
PRINCIPAL INVESTIGATOR: Shinn, J.H.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: F233-3664
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$379,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/Oxidants;NOXIOUS GAS/Sulfur dioxide (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To assess and to predict the impact of phyto-toxic air pollution on photosynthesis (primary productivity) of plant stands, and to apply the method at the San Bernardino National Forest and other sites in the economically important Western yellow pine complex (ponderosa pine dominant) where air pollution causes considerable losses.
APPROACH: A portable, temperature-controlled, null-balance leaf diffusion porometer was developed for extensive measurements on diverse leaf types where both photosynthesis (C/sup 14/O/sub 2/ methods) and transpiration are measured simultaneously. A larger, less-portable cuvette system for intensive, controlled fumigations was also developed and is used in the field. Sites are chosen in cooperation with US Forest Service.
RESULTS: At San Bernardino National Forest (SBNF) the chronology of ozone damage to ponderosa pine was found to occur initially as changes in mesophyll and carboxylation resistances before visual symptoms appeared, and subsequently as changes in stomatal response and light harvesting capability by the time chlorosis and necrosis appeared. Three major efforts underway are (1) an experimental determination of the interaction of ozone and water stress on physiological light and temperature responses including abcissic acid formation in ponderosa pine, (2) correlation of photosynthetic response with the Miller damage rating index, and (3) pine-associated species studies to generalize a process model for predicting the forest succession.
PROJECT MILESTONES: (1) July 76 Intensive study at SBNF. (2) August 76 Extensive study at SBNF for correlation with Miller Index. (3) Sept. 76 Extensive study at Sequoia National Forest. (4) Jan. 77 Data summary and analysis completed. (5) March 77 Plan for next field studies. (6) July 77 Field studies resume.
KEYWORDS: AIR POLLUTION;PINES;TERRESTRIAL ECOSYSTEMS;PHOTOSYNTHESIS;BIOLOGICAL EFFECTS;MEASURING INSTRUMENTS;SPECIFICATIONS;LEAVES;PLANTS;OZONE;MATHEMATICAL MODELS;ENVIRONMENTAL EFFECTS;EARTH ATMOSPHERE;FORESTS;WATER REQUIREMENTS;BIOLOGICAL STRESS

<083018>
TITLE: Transuranic Radionuclides in Oceanic Water Columns
OJECT NUMBER: 000934
INCIPAL INVESTIGATOR: Noshkin, V.E.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: METALS/Transuranics (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Deep ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This study investigates the distribution of Sr-90, Cs-137, Pu-238, Pu-239, Pu-240 and Am-241 in geosecs oceanic water columns to provide baseline data on the concentrations distributions and removal rates of these long-lived radiotoxic pollutants in the world oceans.
APPROACH: Large volume water samples are analyzed for specific radionuclides using low-level radiochemical techniques.
RESULTS: Models will be developed from our data that will be useful to describe and predict the fate of the transuranics in the world oceans.
PROJECT MILESTONES: A report will be prepared when sufficient results become available.
KEYWORDS: TRANSURANIUM ELEMENTS;SEAWATER;RADIOISOTOPES;STRONTIUM 90;CESIUM 137;PLUTONIUM 238;PLUTONIUM 239;PLUTONIUM 240;AMERICIUM 241;RADIONUCLIDE MIGRATION;CONTAMINATION;RADIOCHEMICAL ANALYSIS;MATHEMATICAL MODELS;DISTRIBUTION;ENVIRONMENTAL EFFECTS

<083019>
TITLE: Trace Contaminants from Fossil Fuel Power Stations
PROJECT NUMBER: 000937
PRINCIPAL INVESTIGATOR: Ragaini, R.C.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, Charles L.
TELEPHONE: F233-4708
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide (10%);METALS/Lead;METALS/Arsenic;METALS/Trace elements (40%);PARTICULATES/Sulfates (40%);ORGANICS/Polynuclear aromatics (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective is the physical and chemical characterization and the atmospheric transformations of the hazardous trace elements, radionuclides, and sulfates emitted from the stacks of fossil-fueled electric power stations. The inhalation lung-deposition of these emissions will be estimated.
APPROACH: The approach is to carry out in situ particle-sizing and collection by simultaneously using in-stack and airborne downwind cascade impactors. Gases are collected using in-stack and airborne charcoal traps. The particles and gases are analyzed for bulk trace element using neutron activation analysis, x-ray fluorescence analysis, and atomic absorption. Particle sizes are determined by electron microscopy. Chemical speciation of sulfur is done by ESCA techniques.
RESULTS: (1) Particle-size distributions and emission rates of trace elements emitted from stacks of coal plants using electrostatic precipitator (ESP) and wet scrubber control systems. (2) Emission rates and size distribution of sulfur species from scrubbers and ESP's. (3) Emission rates and size distribution of radionuclides from scrubbers and ESP's. (4) Lung-deposition of trace elements, radionuclides, and sulfates.
PROJECT MILESTONES: June 1977 Progress Report for FY 1977.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;RADIOISOTOPES;SULFATES;STACKS;EMISSION;INHALATION;ELECTRIC POWER;STACK DISPOSAL;NEUTRONS;ACTIVATION ANALYSIS;PARTICLE SIZE;ELECTRON MICROSCOPY;SULFUR;CHEMICAL PROPERTIES;PHYSICAL PROPERTIES;HAZARDS;GASEOUS WASTES;ENVIRONMENTAL EFFECTS;TRACE AMOUNTS;AEROSOLS;PLUMES;SCRUBBERS

<083021>
TITLE: Regional Atmospheric Systems: Formulation of Numerical Analytical Models
PROJECT NUMBER: 000939
PRINCIPAL INVESTIGATOR: Dickerson, M.H.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-3600;C(301)353-3600
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$220,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (80%);ELECTRICITY GENERATION (20%)
POLLUTANTS: NOXIOUS GAS/Chlorine;NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/NH/sub 3/ (30%);PARTICULATES/Plutonium (30%);RADIATION/I-131;RADIATION/Kr-88;RADIATION/Xe-133;RADIATION/HTO (30%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Estuarine;GEOGRAPHIC AREAS/Site specific Any 300 x 300 km
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop a three-dimensional time dependent atmospheric boundary layer numerical

simulation model(s). Also to develop a three-dimensional time-dependent reactive plume model for the study of large point sources of reactive pollutants and their effect on the surrounding environment. The boundary layer model(s) will be used to investigate atmospheric behavior on a scale of 40,000 to 90,000 sq. km.
APPROACH: Studies of various numerical techniques are done first with one and two dimensional models to ascertain an appropriate numerical method for solving the system of equations. Then further studies are performed using one and two dimensional problems that contain more relevant physics. After the model(s) are verified against analytical solutions for certain closed problems now realistic verification studies are conducted using measured atmospheric parameters.
RESULTS: We expected to formulate numerical models that would be used to help assess energy alternatives and options that are required to meet the nation's energy needs while at the same time producing a minimal impact on the environment. These models can also be used to study the impact of placing controls on energy related emissions and their cost/benefit to society.
PROJECT MILESTONES: (1) A working model to study an urban boundary layer. (2) A three dimensional time dependent model for studying the boundary layer over an 80,000 sq km area. Effect of terrain is to be included. (3) A three dimensional time dependent model to investigate the transport, diffusion and chemical reactions of a large point source of pollutants. (4) To be able to use some of the above models for estimating pollutant concentrations in real-time.
KEYWORDS: MATHEMATICAL MODELS;PLUMES;POLLUTION;AIR;AIR POLLUTION;ENERGY;COST BENEFIT ANALYSIS;COMPUTER CODES;METEOROLOGY;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;BOUNDARY LAYERS;URBAN AREAS;THERMAL EFFLUENTS;TEMPERATURE GRADIENTS

<083022>
TITLE: Atmospheric Release Advisory Capability
PROJECT NUMBER: 000940
PRINCIPAL INVESTIGATOR: Dickerson, M.H.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Gross, Thomas J.
TELEPHONE: F233-5586
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$560,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: NOXIOUS GAS/Chlorine;NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/NH/sub 3/ (10%);PARTICULATES/Plutonium (10%);RADIATION/I-131;RADIATION/Kr-88;RADIATION/Xe-133;RADIATION/HTO (80%)
CHARACTER OF STUDY: RESEARCH (50%);DEVELOPMENT (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the ARAC service is to provide real time predictions of the effects of atmospheric releases of hazardous materials as rapidly and accurately as possible. When implemented, the ARAC would provide advisories to support ERDA and designated sites in handling routine and accidental releases.
APPROACH: The technical basis for ARAC includes the present state-of-the-art of technology (sensing, monitoring, communications, data banking, data quality control), the utilization of existing or recently developed and validated atmospheric transport diffusion models, the use of evaluated dose conversion constants for various modes of exposure, and the availability of an advanced computer center.
RESULTS: The prototype phase ended in FY 1975 and the implementation phase, scheduled over a five year period, began in FY 1976. At the end of FY 1980 approximately 10 ERDA sites will be served 24 hours a day by ARHC.
PROJECT MILESTONES: (1) Jan. 30, 1976 3 sites (LLL, RFP and SRP) in operation in ''stand alone'' mode. (2) Dec. 31, 1976 Central facility, communication sites established. (3) Sept. 30, 1977 1 additional site on line. (4) Sept. 30, 1978 2 additional sites on line. (5) Sept. 30, 1979 2 additional sites on line.
KEYWORDS: AIR POLLUTION;MONITORING;DATA;DIFFUSION;FORECASTING;ENVIRONMENTAL EFFECTS;EARTH ATMOSPHERE;COMPUTER CODES;RADIONUCLIDE MIGRATION;ENVIRONMENTAL TRANSPORT;TECHNOLOGY ASSESSMENT;AEROSOL MONITORING;RADIOACTIVE AEROSOLS

<083023>
TITLE: Environmental Behavior of Effluents in the Coastal Environment
PROJECT NUMBER: 001309
PRINCIPAL INVESTIGATOR: Noshkin, V.E.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: METALS/Radionuclides (50%);PARTICULATES/Radionuclides (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;COASTS/Far West;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This investigation provides a basis for characterizing the rates and mechanisms of the various physical, chemical and biological processes that control the behavior of nuclear-related pollutants in the coastal environment.
APPROACH: Marine samples including water, sediment and biota are collected from specific environments and analyzed for radionuclides by a variety of radiochemical techniques. Transuranics are included among the radionuclides investigated.
RESULTS: The Humboldt Bay environmental radiological data are being assembled with consideration of the

objectives set out in Appendix I to 10 CFR Part 50 and in a series of guides acceptable to the NRC staff contained in Regulatory Guide I.EE, regarding the transport of routine releases of radionuclides in the liquid pathway. This effort will demonstrate how the research developed through ERDA support is directly applied to provide answers for the nuclear industry to comply with regulatory guidelines.
PROJECT MILESTONES: An interim report of our expected results described in Item 93C will be distributed by the end of the year.
KEYWORDS: COASTAL REGIONS;RADIOISOTOPES;TRANSURANIUM ELEMENTS;POLLUTION;SEAWATER;SEDIMENTS;AQUATIC ORGANISMS;CONTAMINATION;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;RADIOACTIVE EFFLUENTS;RADIONUCLIDE MIGRATION;PLUTONIUM

<083024>
TITLE: Regional Scale Assessments of Energy Impacts
PROJECT NUMBER: 001350
PRINCIPAL INVESTIGATOR: Layton, D.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$33,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub x/ (50%);METALS/Cadmium;METALS/Mercury;METALS/Lead;METALS/Boron;METALS/Selenium (15%);PARTICULATES/General (20%);ORGANICS (15%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas Inland water
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Definition of priority regional problems created by the development and use of energy. (2) Development of modeling and assessment technigues that can be used to evaluate regional-scale health and environmental impacts of future growth of energy-resource development. (3) Development of coordinated regional data bases which can be interfaced among different regions or among different uses within a region. (4) Assessment of regional energy-related problems. (5) Aid in the transfer of assessment data and results to federal, state, regional and local user.
APPROACH: Integrated assessment of the impact upon the environmental, health, social and economic sectors. This will require literature review, data coordination and identification of information and research needs and information transfer to user groups.
RESULTS: (A) Impact of increased coal utilization in California: (1) Related to ERDA National Coal Assessment; (2) Will be used by California State Energy Commission. (B) Relationship of Energy/Water in Califcrnia; this is a critical issue for any energy resource development in California and the far west in general. (1) Will be used in ERDA national scope energy supply/demand scenario. (2) Will be used by Califcrnia State Energy Commission.
PROJECT MILESTONES: Depending upon initiation of funding; the programs will begin in FY 1977 or FY 1978. Preliminary assessments and identifications of specific problem areas will be identified during the first year of funding; evaluation of these specific topics will begin within a framework of integrated assessment to evaluate the environmental, health, social and economic impacts associated with increased coal utilization and energy/water relationships in California.
KEYWORDS: ENERGY SOURCES;ENVIRONMENTAL EFFECTS;DATA ACQUISITION;HEALTH HAZARDS;ECONOMICS;COAL;WATER;SOCIO-ECONOMIC FACTORS;COAL INDUSTRY;REGIONAL ANALYSIS

<083026>
TITLE: Biogeochemical Cycling of the Transuranics and Other Radionuclides in the Marshall Islands
PROJECT NUMBER: 001508
PRINCIPAL INVESTIGATOR: Noshkin, V.E.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$350,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (80%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS/Transuranics;METALS/Long-lived fission products (80%);PARTICULATES (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Marshall Islands;HYDROGRAPHIC AREAS/Other hydrographic areas Lagoon and ground water
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this study are (1) to develop recommendations to minimize the passage of radionuclides (emphasizing the transuranium elements) to human populations; (2) to evaluate the cycling of radionuclides through critical processes essential for the establishment and continuity of life at the atolls; (3) to provide a fundamental base of data from these contaminated environments which will be useful in predicting future transuranic impacts on the aquatic environment from different global sources such as reactors, reprocessing facilities and accidents; (4) to provide data and recommendations to assist cleanup and reconstruction at the atolls; (5) to recommend and assist in providing usable resources of ground water for future generations of the atoll.
APPROACH: Ground water and marine samples are collected and radiochemically analyzed for the transuranics and other specific radionuclides. The data are used to construct models of radionuclide fluxes and transport mechanisms in the environment.
RESULTS: The final product will be useable models to describe the cycling of the transuranics in the terrestrial-groundwater-marine environment.

PROJECT MILESTONES: (1) Several reports on the ground water quality and radionuclide inventory at Enewetak are in preparation and will be completed during this fiscal year. (2) Ground water and drinking water quality at Bikini will be reassessed during 1977. (3) Enewetak lagoon samples are being analyzed for transuranics and an extensive report on the levels, source terms and cycling these radioelement in the marine envircnment will be started in 1977.
KEYWORDS: BIOGEOCHEMISTRY;TRANSURANIUM ELEMENTS;RADIOISOTOPES;MARSHALL ISLANDS;RECOMMENDATIONS;HUMAN POPULATIONS;RADIONUCLIDE MIGRATION;DATA ACQUISITION;GROUND WATER;SEAWATER;CONTAMINATION;FUNCTIONAL MODELS;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;FISHES;PLUTONIUM

<083027>
TITLE: Laboratory Studies of the Fate and Interaction in Marine Systems of Radionuclides Released from Califcrnia Coastal
PROJECT NUMBER: 001511
PRINCIPAL INVESTIGATOR: Harrison, F.L.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISICN: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549;C(301)353-5549
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$95,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Far West;COASTS/Far West;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Our objectives are to obtain data for radionuclides to predict their fate in marine ecosystems and their dose to man from the marine pathway. We are investigating under controlled laboratory conditions their transfer coefficients and concentration factors, their biotransformation in chemical reactions occurring in the sediment and water columns, and the critical pathway (food, water, sediment) in their accumulation in marine organisms.
APPROACH: Radionuclide transfer coefficients and concentration factors are investigated in large pool systems that contain critical compartments in marine ecosystems; the water is spiked with radionuclides and then changes in radioactivity are followed in serial samples of the compartments. Biotransformation products are tested to determine their effect on radionuclide availability. Radionuclide pathways to marine biota are investigated by exposing the organisms to differentially labeled food, water, and sediment.
RESULTS: Budget A. In our experiments on radionuclide availability we will use yellow substance, a biotransformation product isolated from local waters. For each radionuclide we will determine in seawater of known chemical composition the fraction that is ionic and chelated (bound to yellow substance) and the approximate molecular sizes of the chemical species present. In addition, the amount bound to yellow substance in the presence of measured quantities of inorganic particulates of known chemical composition will be assessed as well as the amount bound in the presence of measured quantities of specific phytoplankton species. This data on the effect of a biotransformation product on the partitioning of radionuclides among some of their most probable states in seawater in ecosystems and their availability to the marine biota will be studied.
PROJECT MILESTONES: (1) 10/1/76 Final report on the transfer coefficients and concentration factors of manganese and zinc in the marine clam Mya arenaria. (2) 2/1/77 Final report on accumulation of Ag, Cd, Co, Cr, Cs, Fe, Mn, and Zn by kelp, abalone, mussels, and blue rockfish. (3) 6/1/77 Final report on the effect of yellow substance on radionuclide availability.
KEYWORDS: TRANSURANIUM ELEMENTS;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;RADIOISOTOPES;DIFFUSION;RADIONUCLIDE MIGRATION;SEDIMENTS;FISHES;INVERTEBRATES;PLUTONIUM;WATER

<083029>
TITLE: Intercalibration of Detectors for Measuring Plutonium and Other Transuranium Elements in Man
PROJECT NUMBER: 001533
PRINCIPAL INVESTIGATOR: Dean, P.N.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$67,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Alpha;RADIATION/Gamma (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is to develop methods of improving the sensitivity of detection methods used in assaying transuranium elements in the lung, to identify and resolve current weaknesses in calibration techniques, and to execute a program to intercalibrate the detector systems in use at ERDA-supported laboratories.
APPROACH: This program will be carried out with the guidance of an Intercalibration Committee, chaired by the principal investigator, and will involve the use of anthropomorphic phantoms, accidentally exposed personnel, and human calibration studies.
RESULTS: It is expected that this program will establish standard calibration procedures that can be easily applied at all participating laboratories, providing common absolute calibrations. This will permit meaningful intercomparisons of data obtained throughout the United States.
PROJECT MILESTONES: (1) Oct. 1, 1976 Complete construction of the first anthropomorpphic phantom designed for

use with low-energy photon emitters, specifically for the lung. (2) Jan. 1, 1978 Completion of first phantom intercalibration study. Beginning of human intercalibration program.
WORDS: INSTRUMENTATION;TRANSURANIUM ELEMENTS;PLUTONIUM ISOTOPES;LUNGS;CALIBRATION;RADIATION DETECTORS;PHANTOMS;PERSONNEL;DATA;BIOLOGICAL RADIATION EFFECTS;RADIATION HAZARDS;INHALATION;RADIONUCLIDE MIGRATION;IN VIVO

<083031>
TITLE: Personal Plutonium Resuspension Studies
PROJECT NUMBER: 001644
PRINCIPAL INVESTIGATOR: Anspaugh, L.R.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: EXTRACTION (20%);WASTE MANAGEMENT (80%)
POLLUTANTS: PARTICULATES/Transuranic nuclides (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Evaluate the effects of an individual's occupational and recreational activities in altering his exposure to resuspended plutonium aerosols.
APPROACH: While performing simulated recreational and occupational activities, an individual's exposure to resuspended plutonium aerosols is measured using small battery-powered air samplers. Comparison is made to a reference concentration measured by a routine high-volume air sampler. Samples of clothing will also be assayed for plutonium contamination from the soil surface.
RESULTS: An evaluation of several ''personal'' pathways for the transfer of plutonium from soil to man.
PROJECT MILESTONES: (1) Publish interim report 30/9/77. (2) Publish final report 30/9/78.
KEYWORDS: PLUTONIUM ISOTOPES;RADIOACTIVE AEROSOLS;OCCUPATIONS;SUSPENSIONS;AIR SAMPLERS;CONTAMINATION;SOILS;CLOTHING;DIFFUSION;INHALATION;SOILS;ENVIRONMENTAL EXPOSURE PATHWAY;BIOLOGICAL ACCUMULATION

<083032>
TITLE: Marshall Islands Radioecology Studies and Dose Evaluaion: I. Enewetak
PROJECT NUMBER: 001676
PRINCIPAL INVESTIGATOR: Robison, W.L.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$272,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Sr-90;RADIATION/Cs-137;RADIATION/Plutonium;RADIATION/Co-60;RADIATION/Am-241 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Marshall Islands;HYDROGRAPHIC AREAS/Other hydrographic areas lagoon
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) To make measurements that will delineate the rates of uptake, redistribution, and removal of radionuclides in the ecosystem, and to develop or refine the concentration factors for the critical radionuclides, especially for food species in order to improve predicted dose assessments to the returning population. (2) To develop further understanding of the terrestrial foodchains so as to derive guidelines for agricultural practices and for agricultural development such that population exposure via terrestrial foods will be minimized.
APPROACH: Test Plantings and Radionuclide Recycling. Test plots of coconut, pandanus fruit, breadfruit, squash, papaya, banana, watermelon, lime, and sweet potato have been established. The food products will be analyzed as they become available for direct estimates of radionuclides concentrations that potentially reach a resident population. Soil and soil-water nuclide concentration data will also be taken, and leaf samples will be analyzed for radionuclide content. All of these data will be used to improve predictive models to assess a potential dose commitment before a food product is readily available for consumption.
RESULTS: Reports in the uptake, cycling, retention times and concentration factors in the atoll environment for key food products. (2) Reports on update dose assessments. (3) These data will lead to better evaluation of potential rehabilitation time lines and long-term use of the atoll.
PROJECT MILESTONES: Reports during FY 1977 on initial results from annual crops and plants. Observation during FY 1978 of time dependence of radionuclide removal in annual crops and native plants.
KEYWORDS: MARSHALL ISLANDS;RADIOECOLOGY;RADIOISOTOPES;UPTAKE;DISTRIBUTION;FOOD;HUMAN POPULATIONS;RADIATION DOSES;CONTAMINATION;SOILS;WATER;BIOLOGICAL MODELS;DOSIMETRY;RADIONUCLIDE MIGRATION;DATA;PLUTONIUM;ENVIRONMENTAL IMPACTS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL REPAIR

<083034>
TITLE: IVEP Geothermal: Water Quality
PROJECT NUMBER: 001944
NCIPAL INVESTIGATOR: Crow, N.B.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, Charles L.
TELEPHONE: F233-4208
TYPE OF FUNDING: Contract No.-W-7405-Eng-48

77 FUNDING: Energy Research and Development Administration FY77:$506,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (100%)
ENERGY CYCLE: EXTRACTION (10%);PROCESSING, CONVERSION (40%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/NH/sub 3/ (dissolved) (10%);METALS/Boron;METALS/Mercury;METALS/Arsenic;METALS/Lithium;METALS/Selenium;METALS/Tellurium;METALS/Others (75%);PARTICULATES/Sediments (10%);ORGANICS/Pesticides (5%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas Lower Colorado River Basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Accumulate baseline data on water quality in Imperial Valley, California. (2) Detect and evaluate any impacts of geothermal development on water quality. (3) Participate in evaluation of alternate heat sinks for geothermal power. (4) Participate in regional water resource analysis. (5) Explore ways that geothermal resources could be used to improve water quality in Imperial Valley.
APPROACH: These objectives will be accomplished by accumulating water quality data already available from many federal, California, and local agencies, collecting additional data specific to our needs, and integrating these data into an overall assessment. Water quality sampling networks will be established, and some locations will be instrumented with recording conductivity meters.
RESULTS: (1) Baseline data on water quality in Imperial Valley before geothermal development takes place will be collected and published. (2) The potential impacts on water quality will be assessed, and mitigation measures will be proposed if appropriate. (3) Various heat sink options will be studied and evaluated.
PROJECT MILESTONES: (1) 1977 Initiation of domestic well water monitoring. (2) 1977 Initiation of mobile laboratory studies. (3) 1977 Interpretation of data base begins. (4) 1977 Initiation of model construction using data base. (5) 1978 Completion of valley-wide sampling. (6) 1978 Development of water quality and water demand scenarios. (7) 1979 Interpretation of analytical chemical data. (8) 1979 Assess results of modeling studies. (9) 1979 Report water quality data. (10) Publish summary report 31/3/78.
KEYWORDS: GEOTHERMAL RESOURCES;ENVIRONMENTAL EFFECTS;WATER QUALITY;HEAT SINKS;REGIONAL ANALYSIS;WATER RESOURCES;SAMPLING;DATA;GEOTHERMAL ENERGY;BASELINE ECOLOGY;IMPERIAL VALLEY;THERMAL EFFLUENTS;BORON;LITHIUM;SODIUM;CHLORINE;POTASSIUM;WASTE WATER;CHEMICAL EFFLUENTS

<083035>
TITLE: Flow Cytogenetics, Biology
PROJECT NUMBER: 001953
PRINCIPAL INVESTIGATOR: Carrano, A.V.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (10%);STORAGE (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS/Hydrocarbons;ORGANICS/Alkylating agents (50%);RADIATION/Gamma x-ray (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this program is to develop flow cytometry of isolated chromosomes to aid karyotyping, enumerate chromosomal aberrations and yield purified chromosomes for biochemical studies. Specifically we hope to rapidly and quantitatively screen human populations for inherited cytogenic anomalies, establish dose-effect relationships for aberrant chromosomes produced by exposure to environmental clastogens and miniaturize the biochemical assays for DNA and protein so that purified chromosomes can be examined at the molecular level for mutagen/clastogen induced lesions.
APPROACH: Initially the flow instrumentation and chromosome isolation procedures must be calibrated and standardized. This will involve developing a chromosome isolation procedure for human lymphocytes in culture and eventually for animal tissues extracted by biopsy. The sources of error (preparative and instrumental) must be identified. Initially dose-response effects will be sought for acute clastogen damage (initially radiation) with later application to protracted exposure. Chromosome preparative procedures and flow sorting instrumentation will be optimized to obtain chromosome fractions of high purity for further biochemical analysis. Animal systems (hamster) in vitro will be utilized initially but human chromosomes will be used whenever possible.
RESULTS: We hope to establish a rapid screening method for clastogen damage in human populations. Specifically this would require the withdrawal of a few milliliters of blood from individuals, short term culture of the lymphocytes, isolation of the chromosomes and flow cytometric analysis of DNA content. Abnormal chromosomes produced by clastogens would produce altered DNA distributions and could be further analyzed by flow sorting. It is estimated that 40-50 individuals could be processed and analyzed per day with optimized chromosome preparative and instrumental procedures.
PROJECT MILESTONES: (1) Attainment of a dose-effect relationship with animal test systems for acute clastogen damage July 1, 1977. (2) Collection of a large number of mitotic cells from human lymphocyte cultures Dec. 1, 1976. (3) Isolation of chromosomes from human lymphocytes preserving the DNA stainability. (4) Attainment of dose-effect relationships with human chromosomes exposed to clastogens, beyond FY 1977.
KEYWORDS: CLASTOGENESIS;CELL FLOW SYSTEMS;CYTOLOGY;CHROMOSOMAL ABERRATIONS;KARYOTYPE;HUMAN POPULATIONS;DOSE-RESPONSE RELATIONSHIPS;BIOCHEMISTRY;DNA;LYMPHOCYTES;TISSUES;HAMSTERS;ANIMAL CELLS;GENETICS;MEASURING INSTRUMENTS;MUTAGENESIS;MAN

<083037>
TITLE: Cytomorphotometry: Nonnuclear
PROJECT NUMBER: 002168
PRINCIPAL INVESTIGATOR: Mayall, B.H.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E,
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-48

77 FUNDING: Energy Research and Development Administration FY77:$103,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (10%);GENERAL SCIENCE (40%)
UTANTS: NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/SO/sub 2/ (10%);METALS/Mercury;METALS/Arsenic;METALS/Tellurium 40%);ORGANICS/Polycyclic hydrocarbons (50%)
...ACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop cytomorphometric techniques to measure the cytochemical properties of individual cells and chromosomes, and to apply these techniques to quantitate cellular and chromosomal effects in man.
APPROACH: A coordinated interdisciplinary effort, including scanning cytophotometry, interactive image processing and statistical analysis.
RESULTS: A quantitative approach to diagnosis, tht will allow sensitive and precise detection of effects in experimental systems and in man, and will allow accurate screening for such effects.
PROJECT MILESTONES: (1) 1978 Demonstration of proof of principal. (2) 1980 Construction of prototype system. (3) 1983 Field testing of system.
KEYWORDS: ANIMAL CELLS;CHROMOSOMES;CYTOLOGY;MEASURING METHODS;MAN;DNA;GENETICS;MEASURING INSTRUMENTS

<083038>
TITLE: Ecosystem Quality
PROJECT NUMBER: 002342
PRINCIPAL INVESTIGATOR: Shinn, J.
ADDRESS: Lawrence Livermore Laboratory, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: C(301)353-4095
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$640,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (100%)
ENERGY CYCLE: EXTRACTION (60%);ELECTRICITY GENERATION (20%);ELECTRICAL TRANSMISSION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/H2S;NOXIOUS GAS/NH3;NOXIOUS GAS/CO2;NOXIOUS GAS/CH4 (20%);METALS/B;METALS/A;METALS/Hg (20%);PARTICULATES/Water vapor;PARTICULATES/Etc. (20%);NOISE, VIBRATION (20%);HEAT, THERMAL (10%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To provide baseline data and to examine the potential long-term effects of geothermal development in Imperial Valley on shoreline habitats, aquatics, agriculture, desert ecosystems, consumptive water-use, air pollution effects, and site-specific problems. The goal is to collect and preserve inorganic and organic materials for baseline reference data and to identify existing or potential stresses on ecosystems.
APPROACH: Seven research teams were organized to follow the above areas of focus to collect data and identify potential ecosystem stresses. Two developers of geothermal energy production sites and 10 outside agencies (universities, colleges, and government agencies) are collaborating in the field programs.
RESULTS: Baseline data banks against which future changes can be measured, publications and reports evaluating present environment of Imperial Valley and potential environmental changes likely to occur with geothermal development.
PROJECT MILESTONES: (1) Completion of standard baseline collections at San Diego Gas and Electric/ERDA site 1977. (2) Completion of ecological baselines and other phases of the ecosystem quality program 1978.
KEYWORDS: HYDROTHERMAL SYSTEMS;IMPERIAL VALLEY;BASELINE ECOLOGY;ENVIRONMENTAL EFFECTS;DATA ACQUISITION;GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS;AQUATIC ECOSYSTEMS;AGRICULTURE;HABITAT;AIR POLLUTION

<083040>
TITLE: Multistate Atmospheric Power Production Pollution Study
PROJECT NUMBER: 002343
PRINCIPAL INVESTIGATOR: MacCracken, M.C.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-4480
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$189,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/O/sub 3/ (50%);PARTICULATES/Sulfates;PARTICULATES/Nitrites (40%);VISUAL AESTHETICS/Tropospheric aerosol (10%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This project provides funding support for the project leadership of the MAP3S program. The MAP3S goal over the next three years is to improve the understanding of temporal and spatial relationships between ambient levels and emissions from utilities in order to develop the capability to simulate more accurately the changes in pollutant concentration and nature, precipitation chemistry, and atmospheric behavior relevant to understanding and evaluating human health and ecological effects which could result from alternative strategies of generating power with fossil fuel in the northeastern United States.
APPROACH: The project director is to provide program leadership that will integrate the individual efforts of the ERDA National Laboratories and other contractors into a cohesive program.
RESULTS: The director will be responsible for formulating plans for the program and for an advisory committee, to be established directly under DBER auspices, and to provide responsive direction of the MAP3S project. The project director is to provide for the interface of this project with other related

studies and to represent this project to other agencies as required by DBER.
PROJECT MILESTONES: During 1977-78 a detailed program description document will be published together with quarterly newsletters. Plans will be finalized for major field experiments.
KEYWORDS: USA;AIR POLLUTION;SULFATES;FOSSIL FUELS;POWER PLANTS;CHEMICAL EFFLUENTS;RESEARCH PROGRAMS;EARTH ATMOSPHERE;AEROSOLS;EARTH ATMOSPHERE;COMPUTER CODES;METEOROLOGY;NITROGEN COMPOUNDS;SULFUR COMPOUNDS

<083041>
TITLE: IVEP Geothermal, Air Quality
PROJECT NUMBER: 002347
PRINCIPAL INVESTIGATOR: Gudiksen, P.H.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-48
77 FUNDING: Energy Research and Development Administration FY77:$739,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (100%)
ENERGY CYCLE: EXTRACTION (10%);ELECTRICITY GENERATION (80%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NH/sub 3/ (50%);METALS/Mercury;METALS/Arsenic;METALS/Selenium;METALS/Tellurium;METALS/Boron (30%);PARTICULATES/Drift and sulfate containing (15%);ORGANICS/CH/sub 4/;ORGANICS/Isobutone (5%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Measurement of baseline levels of H/sub 2/S, SO/sub 2/, O/sub 3/, CO/sub 2/, NH/sub 3/, NO/sub x/, and particulates in Imperial Valley. Measurement of source terms from geothermal facilities and other sources. Characterization of Imperial Valley's Atmospheric transport properties. Use of above data to predict effects of geothermal development on a valley-wide basis.
APPROACH: A network of six fixed-location air-quality and meteorological stations is being established in Imperial Valley. Source terms will be measured at stacks or evaluated through the use of a mobile air-quality laboratory. Existing air transport and pollutant conversion codes will be modified as necessary to perform the predictive calculations.
RESULTS: Baseline data on air quality in Imperial Valley before geothermal development takes place will be collected and published periodically. The potential impacts on air quality will be assessed, and mitigation measures will be proposed if appropriate. Actual impacts on air quality will be documented. Noise from geothermal operations will also be measured.
PROJECT MILESTONES: July 15, 1976 installation of six air-quality stations completed. September 30, 1976 mobile van operational. October 31, 1976 first quarterly data report.
KEYWORDS: IMPERIAL VALLEY;AIR QUALITY;GEOTHERMAL FIELDS;HYDROGEN SULFIDES;SULFUR DIOXIDE;OZONE;CARBON DIOXIDE;AMMONIA;NITROGEN OXIDES;MONITORING;AEROSOLS;MERCURY;ARSENIC;SELENIUM;TELLURIUM;BORON;SULFUR COMPOUNDS;METEOROLOGY;ENVIRONMENTAL TRANSPORT;EARTH ATMOSPHERE;NOISE

<083042>
TITLE: IVEP Geothermal: Socioeconomic Assessment
PROJECT NUMBER: 2348
PRINCIPAL INVESTIGATOR: Layton, D.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Technology Overview/Integrated Assessment
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-eng-48
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (60%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (30%);HEAT, THERMAL (10%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Determine the direct and indirect impacts of a large-scale geothermal industry on the social structure and economy of Imperial County, California.
APPROACH: Characterize existing social structure and economy. Identify and characterize other areas which have experienced major development. Develop range of scenarios to identify problem areas. Assess problems and recommend mitigating measures.
RESULTS: An assessment of the impact of geothermal energy development on the social, fiscal, and economic structure of Imperial County, California.
PROJECT MILESTONES: Preliminary assessment: March 1977. Final assessment: September 1978.
KEYWORDS: IMPERIAL VALLEY;GEOTHERMAL FIELDS;SOCIOLOGY;ECONOMICS;GEOTHERMAL ENERGY;SOCIO-ECONOMIC FACTORS

<083043>
TITLE: IVEP Geothermal: Integrated Assessment
PROJECT NUMBER: 2349
PRINCIPAL INVESTIGATOR: Layton, D.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$407,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (100%)
ENERGY CYCLE: EXTRACTION (20%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (40%);ELECTRICAL

TRANSMISSION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/H/sub 2/S (30%);METALS/Cadmium;METALS/Mercury;METALS/Lead;METALS/Boron;METALS/Selenium (15%);PARTICULATES/General (20%);ORGANICS (15%);NOISE, VIBRATION (5%);HEAT, THERMAL (10%);VISUAL AESTHETICS (5%)
RACTER OF STUDY: RESEARCH/Applied (20%);ANALYTICAL (80%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Site specific Imperial Valley
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To evaluate in a quantitative manner the impact upon man and the environment resulting from geothermal development in the Imperial Valley and to make this information available to other agencies, legislative bodies, and planning groups.
APPROACH: To accumulate data from existing sources and ongoing research programs and organize into a data management system for the purpose of conducting thorough and balanced analyses of the significant direct and indirect consequences or impacts of geothermal energy development in the Imperial Valley.
RESULTS: The project will result in a description of the Imperial Valley and the potential geothermal development within it. This data base will serve as a focal point for the development of alternative geothermal scenarios. Assessments of the environmental and socioeconomic impacts resulting from the various geothermal scenarios will be conducted. The results of these integrated assessments will be provided to the appropriate decision-making bodies to insure that geothermal developments in the Imperial Valley proceed on an environmentally sound basis.
PROJECT MILESTONES: (1) FY 1977 Imperial Valley description and geothermal scenario development. (2) FY 1978 Assessment of alternative water management schemes, impacts of gaseous pollutants on major agricultural crops and completion of an integrated assessment.
KEYWORDS: IMPERIAL VALLEY;GEOTHERMAL FIELDS;ENVIRONMENTAL EFFECTS;INFORMATION SYSTEMS;PLANNING;GEOTHERMAL ENERGY;COST BENEFIT ANALYSIS;EARTH ATMOSPHERE;ENERGY SOURCE DEVELOPMENT;SOCIO-ECONOMIC FACTORS;WATER RESOURCES;AGRICULTURE;GASEOUS WASTES

<083045>
TITLE: Ground-Water Quality and Subsidence Effects Associated with In Situ Coal Gasification: Environmental Control Implications
PROJECT NUMBER: 800155
PRINCIPAL INVESTIGATOR: Mead, S.W.
ADDRESS: Lawrence Livermore Laboratory, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: ERDA: Division of Environmental Control Technology
MONITOR: ERDA: Grua, Charles;EPA: Bates, Edward R.
TELEPHONE: F233-5516
TYPE OF FUNDING: Contract No.;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$339,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: NOXIOUS GAS (15%);METALS (5%);ORGANICS (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific N.E. Wyoming;HYDROGRAPHIC AREAS/Other hydrographic areas Ground water
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: Part of this project is aimed at measuring and assessing the effects on ground-water quality that may be caused by the underground reaction products of in situ coal gasification. Additional objectives include the development of predictive capabilities, for large scale in situ coal gasification, and the identification of appropriate control technologies. Another part of this project is aimed at developing predictive capabilities and identifying control technologies appropriate for the ground movement and subsidence effects that will accompany large scale in situ coal gasification.
APPROACH: The ground-water qualities studies include water sampling and analysis (including GS-mass spec studies) before, during, and after in situ coal gasification experiments. Also included are laboratory ash-leaching and coal-sorption studies of reaction product contaminants. Computer modeling is used to predict the evolution of the contaminated plume of ground water. The subsidence studies involve the application and validation of a 3-D finite element computer code for subsidence prediction. The modeling studies will be enhanced by strength measurements of overburden cores, and by surface and subsurface geotechnical measurements in conjunction with in situ coal gasification experiments.
RESULTS: (1) A description of the nature and distribution of the underground contaminant source. (2) Information concerning the transport and sorption of the contaminants. (3) Data concerning the subsidence and ground movement that accompanies in situ coal gasification experiments. (4) A capability for computational prediction of ground-water contamination and subsidence effects that may result from in situ coal gasification. (5) An identification of appropriate technologies for controlling ground-water contamination and subsidence effects.
PROJECT MILESTONES: October, 1977: Annual Report, including: (1) A preliminary description of the underground contaminant source. (2) Preliminary subsidence and ground movement predictions. (3) A preliminary discussion of potential control technologies.
KEYWORDS: EFFLUENTS;UNDERGROUND;COAL GASIFICATION;GROUND WATER;FORECASTING;CONTROL;WATER QUALITY;SAMPLING;COMPUTERS;PLUMES;POLLUTION;COMPUTER CODES;ENVIRONMENTAL EFFECTS;GROUND SUBSIDENCE

<083046>
TITLE: IVEP-Subsidence and Seismicity
PROJECT NUMBER: 002341
PRINCIPAL INVESTIGATOR: Crow, N.
ADDRESS: Lawrence Livermore Laboratory, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Programs
MONITOR: Haugh, John R.
TELEPHONE: C(301)353-4905
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)

REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project has the objectives of documenting the naturally occurring levels of subsidence and seismicity in the Imperial Valley of California and of identifying any increase in these processes due to the development of geothermal resources. Included are development of criteria for distinguishing natural subsidence from induced movement and natural seismic activity from induced activity. A geological model of the Imperial Valley will be developed as well as a predictive model of potential subsidence due to geothermal production activity.
APPROACH: Subsidence detection is based upon precise leveling networks, surveyed to first- or second-order standards. Repeated surveys at intervals of one or two years will show any changes in elevation of points on the network, thus measuring land-surface elevation changes. A regional seismographic network and microseismic network will be utilized to determine baseline seismic activity in the Valley.
RESULTS: Baseline levels of subsidence and seismicity will allow for determination of whether or not new patterns develop after geothermal production begins.
PROJECT MILESTONES: (1) Resurvey of Imperial Valley subsidence detection network Winter 1977. (2) Installation of seismographic stations late Fall 1976. (3) Predictive model of the potential for induced subsidence 1978. (4) Construction of geological model of Imperial Valley; conclusion of project 1979.
KEYWORDS: IMPERIAL VALLEY;SEISMOLOGY;GEOTHERMAL FIELDS;GEOTHERMAL POWER PLANTS;SEISMIC EFFECTS;FORECASTING;GROUND SUBSIDENCE

<083047>
TITLE: Office of Environmental Policy, Lawrence Livermore Laboratory
PROJECT NUMBER: 002226
PRINCIPAL INVESTIGATOR: Craig, P.
ADDRESS: 633 University Hall, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Wellborn, Suzanne M.
TELEPHONE: F233-3430
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$358,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Site specific California;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide ERDA with analyses of the relationships among technical, environmental, health, economic and societal factors as they affect environmental regulation, energy and environmental RD and D policy or the commercialization of developed energy systems.
APPROACH: Conduct specific studies to examine social costs and potential inequities that are associated with large scale coal conversion, potential environmental and social obstacles to meeting future gas demand by coal gasification in California, and national and regional future energy systems employing small scale dispersed energy technologies.
RESULTS: Periodic topical reports and monthly progress reports.
PROJECT MILESTONES: (1) Preliminary reports Fall 1977. (2) Final reports Fall 1978.
KEYWORDS: DISPERSED ENERGY SYSTEMS;ENERGY SOURCES;LAND USE;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;COST BENEFIT ANALYSIS;DECISION MAKING;COMPARATIVE EVALUATIONS

<083048>
TITLE: In Situ Coal Gasification Assessment
PROJECT NUMBER: 2624
PRINCIPAL INVESTIGATOR: Layton, D.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Div. of Technology Overview/Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-eng-48
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
KEYWORDS: COAL GASIFICATION;IN-SITU GASIFICATION;TECHNOLOGY ASSESSMENT;REGIONAL ANALYSIS

<083049>
TITLE: Integrated Assessment to Support High-Priority Geothermal Development Areas
PROJECT NUMBER: 2626
PRINCIPAL INVESTIGATOR: Anspaugh, L.
ADDRESS: P.O.Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview/Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (80%);COMBUSTION OR END USE (20%)
POLLUTANTS: NOXIOUS GAS (50%);NOISE, VIBRATION (10%);HEAT, THERMAL (20%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide assessments of environmental, economic, social, and health impacts of geothermal

energy facilities.
APPROACH: Accumulate data pertaining to high-priority sites-establish data base; conduct initial assessment to characterize potential problems; formulate development scenario as basis for specific assessments; examine regional-scale issues; determine options for resource development and effluent control; disseminate results.
RESULTS: Identification of issues related to geothermal development, and proposed mitigation measures.
PROJECT MILESTONES: Project Status Report: September 1977. Final report: September 1978.
KEYWORDS: EMISSIONS;DATA ACQUISITION;ENVIRONMENTAL IMPACTS;ECONOMIC IMPACT;SOCIAL IMPACT;GEOTHERMAL ENERGY;TECHNOLOGY ASSESSMENT;REGIONAL ANALYSIS;HEALTH HAZARDS;RESEARCH PROGRAMS

<083051>
TITLE: High Efficiency Filter Fire Research
PROJECT NUMBER: 600007
PRINCIPAL INVESTIGATOR: Gaskill, J.R.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Weintraub, Arnold A.
TELEPHONE: F233-5610
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/Hcl (20%);PARTICULATES/Smoke (50%);RADIATION/Radioisotopes in smoke (30%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;COASTS/Other coasts USA;HYDROGRAPHIC AREAS/Other hydrographic areas Surface waters
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This project is directed towards devising efficient means for protecting HEPA (high-efficiency particulate air) filters and associated ductwork systems from the effects of heat and smoke particulates from fires. Excess heat will cause the filter to leak; smoke particles will plug the filter. Either can cause the release of toxic or radioactive materials into the atmosphere, since the filters are used to trap particulate matter which may escape from the work areas.
APPROACH: Employing a full scale fire test compartment, fires are set using various furnishings simulating actual fuel- and smoke-generating loadings, and their effects on heat damage and filter plugging determined. Heat abatement and smoke-scrubbing techniques are studied, and evaluated for their technical and cost effectiveness. Included in the studies is work aimed at mitigating the effects of a fire in one work area as related to a common exhaust plenum system serving several work areas.
RESULTS: (1) Recommended designs for heat abatement. (2) Recommended designs for smoke scrubbing. (3) Subsidiary recommendations re early fire warning and fire suppression methods.
PROJECT MILESTONES: (1) July 1, 1976 Complete activation and major instrumentation of full scale test facility. (2) Oct. 1, 1976 Complete assessment of filter plugging problem. (3) July 1, 1977 Complete evaluation of countermeasures. (5) Oct. 1, 1977 Start of experiments on plenum chamber. (6) Oct. 1, 1978 Interim report of cost effectiveness of various countermeasures.
KEYWORDS: FILTER;FILTER-PLUGGING;FIRE (THE PROCESS PYROLYSIS, IGNITION AND COMBUSTION ACCOMPANIED BY THE GENERATION OF HEAT, FLAMES, SMOKE AND LEADING TO DAMAGE OR DESTRUCTION TO LIFE OR PROPERTY);FIRES;ENVIRONMENTAL EFFECTS;FIRE HAZARDS;AIR POLLUTION;FILTERS;SMOKES;AEROSOLS;RADIOACTIVE MATERIALS;COST;TECHNOLOGY TRANSFER;AIR CLEANING SYSTEMS;WASTE HEAT;AIR POLLUTION ABATEMENT;SCRUBBERS

<083052>
TITLE: Criteria for Seismic Design of ERDA Facilities
PROJECT NUMBER: 600022
PRINCIPAL INVESTIGATOR: Tokarz, F.J.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Brown, Blake P.
TELEPHONE: F233-3133
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$66,000
TECHNOLOGY: FOSSIL FUEL/General (33%);NUCLEAR/General (34%);GEOTHERMAL/General (33%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Design guidelines are needed to provide safe design of ERDA facilities against potential seismic hazards. This study will assist ERDA to develop seismic design guidelines appropriate for both existing and new facilities being evaluated.
APPROACH: (1) Obtain and review all available seismic/tornado related information on all ERDA sites and critical locations. (2) Determine where potential problems and deficiencies exist. (3) Establish appropriate seismic/tornado design criteria. (4) Determine the adequacy of existing critical facilities.
PROJECT MILESTONES: Phase I-through October 1976: (1) Identification of actual seismic risk to each site. (2) Categorization of structures by risk levels. (3) Recommendation of appropriate methods of seismic analysis for each structural category and documented basis for such recommendations. (4) A more definitive overall Phase II. Phase II-Commences in 1977.
KEYWORDS: US ERDA;BUILDINGS;DESIGN;NUCLEAR FACILITIES;SAFETY ENGINEERING;SITE SELECTION;EARTHQUAKES;SEISMIC EFFECTS;TORNADOES;SAFEGUARDS

<083055>
TITLE: Flow Cytogenetics--Biophysics
PROJECT NUMBER: 001955
PRINCIPAL INVESTIGATOR: Gray, J.
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: California Univ., Livermore (USA). Lawrence Livermore Lab.
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ANIMAL CELLS;PLANT CELLS;CYTOLOGY;GENETIC VARIABILITY;CELL FLOW SYSTEMS;MICROSCOPY

<083056>
TITLE: IVEP-Health Effects
PROJECT NUMBER: 2336
PRINCIPAL INVESTIGATOR: Anspaugh, L.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: NOXIOUS GAS (40%);METALS (40%);NOISE, VIBRATION (20%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Imperial Valley, CA
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Study health effects associated with the operation of the Geysers geothermal power plant.
APPROACH: It is planned to work with the California Department of Health and the Imperial Valley Department of Health to (1) examine the available source term data for expected effluents and review literature for health effects, (2) establish a program for reporting health effects in Imperial County, (3) review occupational health problems, and (4) conduct a survey of odor exposure.
RESULTS: Initiation of the review of literature and ranking of pollutants.
PROJECT MILESTONES: (1) Complete review of literature, Jan. 31, 1978. (2) Complete all tasks outlined above, Sept. 30, 1979.
KEYWORDS: EFFLUENTS;EMISSIONS;ANNOYANCE;GEYSERS GEOTHERMAL FIELD;GEOTHERMAL POWER PLANTS;IMPERIAL VALLEY;HEALTH HAZARDS;DATA ACQUISITION;SULFUR COMPOUNDS;HYDROGEN SULFIDES;EPIDEMIOLOGY;POLLUTION;ODOR

<083057>
TITLE: Project Indalo: A Study of Plutonium in the Environment
PROJECT NUMBER: 002335
PRINCIPAL INVESTIGATOR: Dean, P.
ADDRESS: Lawrence Livermore Lab., Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-ENG-48;Agency in-house effort

77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Spain
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Provide assistance and advice to Spanish investigators studying the physiological and ecological behavior of plutonium oxide in a contaminated rural environment.
APPROACH: Provide Spanish investigators with technical advice and information and specialized equipment.
RESULTS: A summary of the data obtained on Project Indalo was prepared by the Spanish investigators.
PROJECT MILESTONES: Annual review of the project and evaluation of equipment requests.
KEYWORDS: PLUTONIUM;ENVIRONMENTAL TRANSPORT;PLUTONIUM OXIDES;TERRESTRIAL ECOSYSTEMS;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;PLANTS;ROOT ABSORPTION;SOILS

<083058>
TITLE: Management and Planning Support for Geothermal Solar Environmental Projects
PROJECT NUMBER: 2650
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview/Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$225,000
TECHNOLOGY: GEOTHERMAL/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Identify environmental issues and information needs, associated with the development of high-priority known geothermal resources areas so that environmental research and assessment plans can be established.
APPROACH: Compile and assess currently available information; set up workshops to bring together representatives of local, state, and federal government agencies, resource developers, power companies, etc., establish what is known and what is needed--formulate plans such that duplication of effort is eliminated.
RESULTS: Reports to be submitted to ERDA Assistant and Administrator for Environment and Safety identifying needed baseline and effects research.
PROJECT MILESTONES: (1) FY 77 Imperial Valley, California. (2) FY 78 The Geysers and Coso Hot Springs, Califcrnia; Raft River and Snake River, Idaho; Roosevelt Hot Springs, Utah; Texas/Louisiani; Hawaii. (3) FY 79 Long Valley, California; Northern Nevada; New Mexico.
KEYWORDS: EFFLUENTS;EMISSIONS;KGRA;DATA ACQUISITION;ENVIRONMENTAL IMPACTS;GEOTHERMAL RESOURCES;GEOTHERMAL ENERGY;SULFUR COMPOUNDS;WASTES;AIR POLLUTION

<083059>
TITLE: IVEP (Imperial Valley Environmental Project) Preplanning Appraisals in KGRAs (Known Geothermal Resource Areas)
PROJECT NUMBER: 2931
PRINCIPAL INVESTIGATOR: Phelps, P.L.
ADDRESS: Lawrence Livermore Laboratory, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: F233-4905
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$240,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (80%);GEOTHERMAL/Geopressurized (20%)
ENERGY CYCLE: EXTRACTION (40%);COMBUSTION OR END USE (40%);ELECTRICITY GENERATION (20%)
POLLUTANTS: NOXIOUS GAS/H2S and others (25%);METALS/Hg;METALS/As;METALS/B;METALS/And others (25%);NOISE, VIBRATION (25%);HEAT, THERMAL (10%);VISUAL AESTHETICS (5%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (10%)
CHARACTER OF STUDY: RESEARCH (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to determine the key environmental issues of inventory available environmental data, make an assessment of available environmental data, and determine what informational gaps exist in present environmental data at 10 known geothermal resource areas assigned high priority for energy development by the Department of Energy's Division of Geothermal Energy.
APPROACH: Some work is being done in-house by the Lawrence Livermore Laboratory (LLL). Part of the work is being contracted out to various university groups by LLL. Workshops are being held to gather information. Publications, reports and personal contacts provide further information.
RESULTS: The product of this project will be 10 plans (one for each of 10 KGRAs) describing the state of environmental information and knowledge at the KGRAs and making recommendations for needed studies and research.
PROJECT MILESTONES: 5/77 Initiation of subcontracts for St. Mary's College, University of California at Davis, United Oregon, University of Utah, University of Texas.
KEYWORDS: EMISSIONS;KGRA;ENVIRONMENTAL IMPACTS;DATA ACQUISITION;ENERGY SOURCE DEVELOPMENT;TRACE AMOUNTS;METALS;PLANTS;ANIMALS;NOISE;GROUND SUBSIDENCE;METEOROLOGY;SULFUR COMPOUNDS;WASTE WATER;PLUMES;GEOTHERMAL RESOURCES;GEOTHERMAL ENERGY

<083061>
TITLE: Assessment of Geothermal Loan Guaranty Applications for Environmental and Safety Concerns
PROJECT NUMBER: 800180
PRINCIPAL INVESTIGATOR: Snoeberger, D.F.
ADDRESS: Lawrence Livermore Laboratory, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas W.
TELEPHONE: F233-5511
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: NOXIOUS GAS (30%);METALS (10%);PARTICULATES (10%);ORGANICS (10%);NOISE, VIBRATION (10%);HEAT, THERMAL (10%);SPECIFIED OTHER POLLUTANTS/Liquid effluents (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Other hydrographic areas Salton Sea Basin
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Identify environmental control technologies to be used in activities for which application is made for a geothermal loan guarantee. Assess these and other environment and safety concerns.
APPROACH: Review applications and environmental impact assessments and statements; as needed request supplemental information and site visits. Draw on appraisals of state-of-the-art of control technology and field experience with its use, in assessing effectiveness and practicability.
RESULTS: Reviews (comment) on demand of low guaranty applications.
PROJECT MILESTONES: Annual report distribution by fiscal years.
KEYWORDS: GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS;SAFETY;LIQUID WASTES;AIR POLLUTION CONTROL;WATER POLLUTION CONTROL;LAND POLLUTION CONTROL;TECHNOLOGY ASSESSMENT;GOVERNMENT POLICIES;FINANCING;GROUND SUBSIDENCE;WASTE MANAGEMENT;SULFUR COMPOUNDS;SEISMIC EFFECTS;FINANCING

<083062>
TITLE: Large-Scale LNG Spill Tests
PROJECT NUMBER: 800230
ADDRESS: Lawrence Livermore Labs., Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Cece, J.M.
TELEPHONE: C(301)353-5486
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (80%);STORAGE (20%)
POLLUTANTS: NOXIOUS GAS (5%);ORGANICS (5%);HEAT, THERMAL (90%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Develop test site criteria, evaluate various test sites, select site, conduct background analyses, prepare test site, conduct tests, analyze data, issue report.
APPROACH: Give consideration to past and on-going LNG programs to determine the criteria of a site for large-scale LNG field tests.
RESULTS: Developed some test site criteria, evaluated some test sites, reviewed LNG Program plan.
PROJECT MILESTONES: 4/78 Select test site.
KEYWORDS: LIQUEFIED NATURAL GAS;GAS SPILLS;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;WATER POLLUTION;TRANSPORT;STORAGE;FRESH WATER;SITE SELECTION;SAFETY;LAND POLLUTION;PLUMES;CRYOGENICS;NATURAL GAS INDUSTRY;ENVIRONMENTAL IMPACTS

<083063>
TITLE: IVEP Control Technology Assessment
PROJECT NUMBER: 800181
PRINCIPAL INVESTIGATOR: Snoeberger, D.
ADDRESS: Lawrence Livermore Laboratory, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas W.
TELEPHONE: F233-5511
TYPE OF FUNDING: Contract No.-RU-02-02;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$46,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);ORGANICS (10%);RADIATION (10%);NOISE, VIBRATION (20%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest;COASTS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To provide identification and assessment of the efficacy and practicability of control measures to be employed by Government-sponsored geothermal energy programs in the Imperial Valley; and to provide a description of the IVEP control technologies for use in preparation of ERDA ER/EIS's for geothermal energy development in the Imperial Valley. A further objective is to confirm performance criteria of control technologies in the Imperial Valley.
APPROACH: (a) Search literature to avoid overlap with prior and ongoing assessments of environmental control

technologies. (b) Identify various environmental control technologies which were used, such as (1) water quality, (2) air quality, (3) subsidence/seismicity, and (4) integrated assessment. (c) The environmental control technologies will be assessed for engineering efficacy and practicability.
;ULTS: Identify and assess IVEP control technologies. Write a final report to include nonelectric and process heat systems in the Imperial Valley which may receive government sponsorship especially for the engineering efficacy and practicability.
PROJECT MILESTONES: Interim report on (b) and (c) (above) to be issued soon and a final report in 1978. An interim report on surveillance of IVEP control technology will be issued in 1978.
KEYWORDS: EFFLUENTS;INTEGRATED ASSESSMENT;IMPERIAL VALLEY;GEOTHERMAL ENERGY;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL EFFECTS;TECHNOLOGY ASSESSMENT;WATER QUALITY;AIR QUALITY;GROUND SUBSIDENCE;SEISMOLOGY;POLLUTION CONTROL;PROCESS HEAT;ENVIRONMENTAL ENGINEERING

<083064>
TITLE: Impacts of Large-Scale Use of Methanol and Methanol-Gasoline Blends as Auto Fuels
PROJECT NUMBER: RPIS No. 2930
PRINCIPAL INVESTIGATOR: Milanovich, F.;Timourian, H.
ADDRESS: Lawrence Livermore Laboratory, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: F233-5349;C(301)353-5349
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: CONSERVATION/End use (100%)
ENERGY CYCLE: COMBUSTION IN SITU (25%);TRANSPORTATION (50%);COMBUSTION OR END USE (25%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (40%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Review of literature and preparation of a suggested program definition for the assessment of environmental, health and safety issues associated with the use of methanol as an alternative fuel.
APPROACH: Review literature and compile bibliography. Identify problem areas requiring investigation and answers, and formulate a recommended R and D program. Prepare a report to sponsoring division for its internal use and guidance in establishing a program which addresses problems and provides needed answers.
RESULTS: Report to be used as source of information on state-of-the-art and for guidance for the development of an assessment program to determine environmental, health and safety problems and issues associated with the wide scale use of methanol or methanol-gasoline blends in automobiles.
PROJECT MILESTONES: Draft report dated July 27, 1977, was prepared by LLL and was submitted to DOE/BER for its review and program use.
KEYWORDS: AUTOMOTIVE FUELS;METHANOL;GASOLINE;MIXING;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;SAFETY;AIR POLLUTION;AEROSOLS;EXHAUST GASES;AUTOMOBILES

<083065>
TITLE: Transuranic Aerosol Monitor
PROJECT NUMBER: RPIS-0046
PRINCIPAL INVESTIGATOR: Kordas, J.
ADDRESS: Lawrence Livermore Laboratory, Univ. of California, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Beck, Harold L.
TELEPHONE: F233-5364
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (80%);WASTE MANAGEMENT (20%)
POLLUTANTS: RADIATION/Plutonium and Related Alpha Emitters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The development of a highly sensitive transuranic aerosol measurement system (TAMS) with pseudo real-time response for measuring transuranic aerosols in stack and in ambient air for the nuclear fuel cycle.
APPROACH: The system utilizes high flow rate air sampling, alpha particle detection by a large surface area solid state detector array enclosed in an evacuated detection chamber which is isolated from the corrosive collection stream; special gating logic, and a decay analysis scheme to differentiate natural alpha-emitting radon daughters from transuranic alpha emitters. The monitor has two windows, one for 238Pu, 239Pu, 240Pu, 241Am and 243Am and the other for 242Cm and 244Cm.
RESULTS: A prototype system completely field tested and evaluated and ready for commercial production, capable of measuring one maximum premissible concentration (MPC-40-hr occupational) of plutonium in 30 minutes with a fractional standard deviation of less than 0.33.
PROJECT MILESTONES: (1) November 1977 Completion of first phase of field testing. (2) May 1978 Evaluation of initial field tests completed and retrofits completed. (3) June 1978 Initiation of final field testing. (4) September 1978 Completion of field tests. (5) May 1979 Completion of modifications indicated by field tests and transfer to commercial producers.
KEYWORDS: TRANSURANIUM ELEMENTS;RADIOACTIVE AEROSOLS;RADIOACTIVITY;RADIATION MONITORING;SURFACE AIR;STACKS;SURFACE CONTAMINATION MONITORS;RADIATION MONITORS;DESIGN;AIR SAMPLERS;RADON;DAUGHTER PRODUCTS;FUEL FABRICATION PLANTS;RADIOACTIVE EFFLUENTS;GASEOUS WASTES;ALPHA DETECTION;PLUTONIUM 238;PLUTONIUM 239;PLUTONIUM 240;AMERICIUM 241;AMERICIUM 243;CURIUM 242;CURIUM 244

<083066>
TITLE: Atmospheric Characterization
PROJECT NUMBER: 002643
PRINCIPAL INVESTIGATOR: Gudiksen, P.
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: California Univ., Livermore (USA). Lawrence Livermore Lab.
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: GEOTHERMAL/General (100%)
KEYWORDS: EARTH ATMOSPHERE;RESEARCH PROGRAMS

<083067>
TITLE: Development of Advanced Air Quality Monitoring Instrumentation
PROJECT NUMBER: 002832
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: California Univ., Livermore (USA). Lawrence Livermore Lab.
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;SURFACE AIR;AIR QUALITY

<083068>
TITLE: ERDA-NGS Vertical Leveling Survey Along the Texas Gulf Coast
PROJECT NUMBER: 002846
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: California Univ., Livermore (USA). Lawrence Livermore Lab.
77 FUNDING: Energy Research and Development Administration FY77:$74,000
TECHNOLOGY: GEOTHERMAL/General (100%)
KEYWORDS: TEXAS;GULF OF MEXICO;COASTAL REGIONS;REGIONAL ANALYSIS;GEOLOGICAL SURVEYS;GEOTHERMAL RESOURCES

<083070>
TITLE: Nationwide Survey
PROJECT NUMBER: 001675
PRINCIPAL INVESTIGATOR: Hampel, V.
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: California Univ., Livermore (USA). Lawrence Livermore Lab.
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<083071>
TITLE: Hittman Task 1: Expansion of the Matrix of Environmental Residuals for Energy Systems Data Bases
PROJECT NUMBER: 002848
PRINCIPAL INVESTIGATOR: none
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: California Univ., Livermore (USA). Lawrence Livermore Lab.
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<083072>
TITLE: Bikini Diet Survey and Encu Garden Studies
PROJECT NUMBER: 002928
PRINCIPAL INVESTIGATOR: undesignated
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: California Univ., Livermore (USA). Lawrence Livermore Lab.
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fission (100%)

Energy Research and Development Administration/Los Alamos Scientific Laboratory

<084001>
TITLE: Life-Shortening Effects as a Function of Dose Rate, Total Dose, and Age at Exposure
PROJECT NUMBER: 000119
PRINCIPAL INVESTIGATOR: Spalding, J.F.
ADDRESS: Mammalian Biology Group (MS880), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$120,000

TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: RADIATION/Gamma rays (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To extend our knowledge of the long-term effects of continuous whole-body exposure to low levels of ionizing radiation by bridging the gap between the effects of dose, dose rate, and age at exposure. The results should allow an intelligent assessment and extrapolation to man.
APPROACH: This study utilizes mice exposed to gamma-ray sources at dose rates as low as 0.7 rad/day and total doses as low as 20 rads. Age at exposure is varied from newborn to 15 months. Exposure times vary from essentially prompt to being continuous over the animal's life span. In addition to the life-shortening analyses, radiation-induced chromosome aberrations are being observed, and histopathological examinations are being performed at death, with particular emphasis being placed upon carcinogenesis as the primary cause of demise.
RESULTS: We expect to obtain chromosomal changes in circulating blood that will be proportional to dose, leading to a quantification of low doses in man. Pathological findings should lead to evaluation of changes that occur in low-dose life-span shortening, including cancer production.
PROJECT MILESTONES: (1) FY 1976 Begin studies of dose rate, total dose, and age at exposure to cobalt-60 gamma rays. (2) FY 1977 Additional replications of same experiment. (3) FY 1978 Begin phasing out program and data analysis. (4) FY 1979 Data analysis and writing.
KEYWORDS: CANCER;IONIZING RADIATIONS;CHRONIC IRRADIATION;LOW DOSE IRRADIATION;WHOLE-BODY IRRADIATION;GAMMA RADIATION;MICE;DOSE RATES;AGE DEPENDENCE;BIOLOGICAL RADIATION EFFECTS;CHROMOSOMAL ABERRATIONS;RADIOINDUCTION;HISTOLOGY;PATHOLOGICAL CHANGES;LIFE SPAN;DOSE-RESPONSE RELATIONSHIPS;AGING;ANIMALS;GAMMA RADIATION;PATHOGENESIS;TISSUES

<084002>
TITLE: Tumorigenic Risk from Particles in Lung and Other Tissues, An Animal Model
PROJECT NUMBER: 000120
PRINCIPAL INVESTIGATOR: Anderson, E.C.
ADDRESS: Health Division (MS881), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$652,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: PARTICULATES/Plutonium and other actinide oxides (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To evaluate the tumorigenic/carcinogenic risk of radioactive particles, particularly actinide oxides, in the lung, especially in comparison with the risk from diffuse distributions of comparable activity.
APPROACH: Animal model experiments in which Syrian hamsters are exposed to known levels of radioactivity in the lungs by administration of uniform microspheres which lodge in the lung capillary bed of solutions which expose the entire lung uniformly.
RESULTS: Dose-response curves for tumorigenesis by the several types of exposures; numerical values for the relative hazards; information on the mechanisms of action and reasons for differences; and confirmation or modification of maximum permissible exposure levels for inhalation of radioactive aerosols.
PROJECT MILESTONES: (1) FY 1976 qualitative demonstration of minimal exposure conditions for the induction of lung tumors by plutonium microspheres in the hamster. (2) FY 1978 dose-response curves for tumorigenesis by microspheres in rodent species. (3) FY 1979 and beyond, identification of reasons for different responses to focal vs. diffuse exposure and better extrapolations to man.
KEYWORDS: CANCER;PLUTONIUM;MICROSPHERES;BIOLOGICAL RADIATION EFFECTS;LUNGS;MAXIMUM PERMISSIBLE EXPOSURE;LABORATORY ANIMALS;CARCINOGENESIS;DOSE-RESPONSE RELATIONSHIPS;AEROSOLS;PARTICLES

<084003>
TITLE: Absorption, Retention, and Excretion of Energy-Related Hazardous Materials
PROJECT NUMBER: 000121
PRINCIPAL INVESTIGATOR: Thomas, R.G.
ADDRESS: Mammalian Biology Group (MS880), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$84,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS/Selenium;METALS/Mercury;METALS/Cadmium;METALS/Cerium;METALS/Beryllium;METALS/Barium (50%);RADIATION/All radionuclides (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine quantitatively the metabolic parameters of certain inorganic substances upon which information is lacking for establishing or revising health protection guidelines and standards.
APPROACH: Multiple species (mice, rats, dogs, and monkeys) are administered radionuclides by various routes. Organ distribution patterns and whole-body retention are quantitated for extrapolation to humans. Radioactive tracers are used not only to follow potential radioactive contaminants but also elements that may prove hazardous in nonradioactive form.
RESULTS: Metabolic patterns from interspecies comparisons are used to extrapolate to man for establishing radiation protection guides.

PROJECT MILESTONES: (1) FY 1976 begin phasing out of larger scale metabolism studies; data analysis and writing up of backlog. (2) FY 1977 reduce experimentation; data analysis; writing. (3) FY 1978 further reduce experimentation for phase-out; continue analysis and writing backlog.
KEYWORDS: MICE;RATS;DOGS;MONKEYS;RADIOISOTOPES;UPTAKE;RETENTION;TISSUE DISTRIBUTION;EXCRETION;ANIMALS;INGESTION;INHALATION;METABOLISM

<084005>
TITLE: Biosynthetic Activity in Synchronized Cells
PROJECT NUMBER: 000123
PRINCIPAL INVESTIGATOR: Tobey, R.A.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$76,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To investigate the mechanisms controlling cell proliferation and conversion to the neoplastic state.
APPROACH: Examine biochemical processes which prepare cells for DNA replication and division in synchronized cultured cell systems; examine agents such as X rays which subvert natural processes.
RESULTS: A ''map'' of biochemical events will be constructed in which preparations for genome replication and cell division are shown to proceed through a complex series of coordinated, sequentially ordered steps.
PROJECT MILESTONES: (1) 7-1-75 Demonstration of cell-cycle-specific variations in chromatin structure. (2) 12-1-75 Demonstration of region and specific amino acid residue phosphorylated in histone f1 at different stages in the cell cycle. (3) 3-1-76 Proposal of correlation between cell-cycle-specific state of chromatin structure and specificity of association between dna-interactive drugs and the genome.
KEYWORDS: ANIMAL CELLS;CELL CULTURES;SYNCHRONOUS CULTURES;CELL PROLIFERATION;DNA REPLICATION;X RADIATION;BIOLOGICAL RADIATION EFFECTS;CELL DIVISION;CELL CYCLE;VARIATIONS;CHROMATIN;MOLECULAR STRUCTURE

<084006>
TITLE: Assessment of Biological Hazards Associated with Exposure to Ionizing Radiations
PROJECT NUMBER: 000124
PRINCIPAL INVESTIGATOR: Walters, R.A.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$72,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: RADIATION/Ionizing (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To describe the interrelationship between radiation-induced changes in chromatin metabolism (and structure) and the ability of the irradiated cell to perform specific metabolic functions.
APPROACH: Parameters to be examined include DNA replication and the effect of radiation on DNA replicon initiation and chain elongation; functional correlation between radiosensitive chromatin histone modification and DNA replication; the influence of radiation-induced alterations in histone modification on chromatin structure and cell morphology; and examination of the ability of the irradiated cell to perform specific synthetic functions as it undergoes the delayed transition from a rapidly dividing state to an arrested state (e.g., reproductive death) and the phase of the cell cycle in which arrest occurs.
RESULTS: It is anticipated that such studies will allow one to identify specific cellular lesions associated with reproductive death of the irradiated cell.
PROJECT MILESTONES: (1) FY 1976 Effects of ionizing radiations on deoxyribonucleoside triphosphate metabolism. (2) 10-1-76 Mechanisms of DNA replication and effects of x irradiation thereon. (3) 2-1-77 Cell-cycle distribution of cells at long times after irradiation and the phase at which cells undergo reproductive death.
KEYWORDS: IONIZING RADIATIONS;BIOLOGICAL RADIATION EFFECTS;ANIMAL CELLS;CELL CYCLE;METABOLISM;CELL KILLING;DNA;BIOSYNTHESIS;RNA;X RADIATION

<084007>
TITLE: RNA and Protein Metabolism in Cultured Mammalian Cells: Analysis of the Effects of Ionizing Radiation
PROJECT NUMBER: 000125
PRINCIPAL INVESTIGATOR: Enger, M.D.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$97,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (60%);WASTE MANAGEMENT (40%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine whether, in an in vitro mammalian cell system free of the secondary stimuli

encountered in vivo, moderate doses of ionizing radiation cause alterations in the metabolism of informational macromolecules of a nature and to an extent that they could be determinants of the observed biological effects of radiation.
APPROACH: The studies have involved an analysis of the synthesis, processing, and function of RNAs in cultured Chinese hamster cells following exposure to 800 rads of x irradiation.
RESULTS: A definition of the biochemical sequelae to a radiation-induced lesion may be of value in assessing accurately the risk and in formulating protective mechanisms.
PROJECT MILESTONES: (1) 10-1-75 Demonstrated effect of ionizing radiation on messenger RNA metabolism. (2) 11-1-75 Began studies of synergistic effects of irradiation and toxic agents produced during fossil fuel processing.
KEYWORDS: RNA;PROTEINS;METABOLISM;ANIMAL CELLS;CELL CULTURES;X RADIATION;BIOLOGICAL RADIATION EFFECTS;RADIATION INJURIES;BIOCHEMISTRY;ANIMAL CELLS;MOLECULAR STRUCTURE

<084008>
TITLE: Effects of Hazardous By-Products of Coal Technology on the Regulation of Cell Proliferation
PROJECT NUMBER: 000127
PRINCIPAL INVESTIGATOR: Gurley, L.R.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/Coal (80%);GENERAL SCIENCE (20%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (80%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers and lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To describe normal histone metabolism and the relationship between histone function and the toxicity of coal-based hazardous substances at the cellular and molecular levels.
APPROACH: Identification of coal technology by-products which interfere with cell proliferation will be initiated, with emphasis initially placed on the effects of cadmium and lanthanum on growth-related histone phosphorylation. These metals are known to be discharged into the environment as a result of coal-based technology, and they are known to interfere with calcium and cyclic-AMP metabolism involved with histone kinase activity, mitotic apparatus formation, and chromosome condensation.
RESULTS: These investigations are expected to determine the processes of damage from such trace metals and will provide a rational basis for designing procedures for amelioration and recovery from the deleterious effects of exposure to such pollutants.
PROJECT MILESTONES: (1) 10-1-76 Commence search for coal-based by-products relevant for investigation. (2) 4-1-77 Initiate dose-response studies of cell proliferation in cultures exposed to hazardous by-products of coal technology. (3) 10-1-77 Initiate studies of histone phosphorylation response to hazardous by-products of coal technology. (4) 10-1-78 Evaluate histone phosphorylation studies.
KEYWORDS: EMISSIONS;PHOSPHOPROTEINS;HISTONES;METABOLISM;ANIMAL CELLS;TOXICITY;COAL;HEALTH HAZARDS;CELL PROLIFERATION;CHROMATIN;PHOSPHORYLATION;DNA;CADMIUM;COMBUSTION PRODUCTS;COAL INDUSTRY

<084009>
TITLE: Properties of the Cell Surface: Interactions of Metallic Pollutants from Coal Combustion with the Extracellular Matrix
PROJECT NUMBER: 000128
PRINCIPAL INVESTIGATOR: Kraemer, P.M.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (10%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine how much lanthanum binds to the cell surface, whether this binding replaces the normal calcium pool of the cell surface, and to determine the consequences of cellular processes of such binding.
APPROACH: The experimental approach will use cultured cells as a model system and begin by quantifying binding per cell under conditions that do or do not affect cellular growth and metabolism of cell-surface constituents (matrix components such as glycoproteins and mucopolysaccharides).
RESULTS: The results hopefully will give insight into the pathogenesis of metal toxicity at the cellular (i.e., general) level of life processes.
PROJECT MILESTONES: (1) 1-10-76 Quantitation of cellular binding of lanthanum. (2) 1-10-77 Determine the effect of lanthanum binding on calcium pool of the cell surface. (3) 1-10-78 Determine the fate of lanthanum binding under nonlethal conditions.
KEYWORDS: EXTRACELLULAR MATRIX;METALS;BIOLOGICAL EFFECTS;ANIMAL CELLS;CELL WALL;LANTHANUM;TOXICITY;CALCIUM;METABOLISM;PATHOLOGICAL CHANGES

<0840l0>
TITLE: Effects of Radiation on Model DNA and Genetic Information Transfer and Maintenance
PROJECT NUMBER: 000130
PRINCIPAL INVESTIGATOR: Hayes, F.N.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$128,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop a precise correlation between chemical changes produced by gamma or x irradiation in nucleic acids and changes observable in their functioning in enzymatic replication, transcription, or repair processes.
APPROACH: Model DNAs whose nucleotide sequences are known are superior to naturally occurring DNAs in studies of this sort because unique results can be obtained, unhampered by the confusion of different nucleotide sequences present in natural material. Model DNAs (polydeoxynucleotides) are synthesized by established organic chemical and enzymatic procedures. Physical characteristics (melting transition, molecular-weight distribution) are established by mathhematical analysis of the results of experimental measurements utilizing computer codes developed in this Laboratory.
RESULTS: Because the sequences are unique, the fidelity of enzymatic transcription or replication processes is determined easily. Changes produced by irradiation on all properties are determined concurrently.
PROJECT MILESTONES: (1) 12-1-76 Anticipated completion of development of methodology for carrying out gel permeation chromatography of irradiated double-strand polynucleotides under denaturing conditions. (2) 12-1-77 Anticipated completion of comprehensive study of irradiated d(A,T)/sub n/ sequences (to include effects on transcription and repair processes).
KEYWORDS: POLYNUCLEOTIDES;GEL PERMEATION CHROMATOGRAPHY;DNA;BIOSYNTHESIS;RADIOSENSITIVITY;GAMMA RADIATION;X RADIATION;MUTAGENESIS;CARCINOGENESIS;BIOLOGICAL RADIATION EFFECTS;COMPUTER CODES;NUCLEOTIDES

<084011>
TITLE: Pollutants and DNA Repair Enzymes
PROJECT NUMBER: 000131
PRINCIPAL INVESTIGATOR: Ratliff, R.L.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$36,000
TECHNOLOGY: FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil Shale (10%);NUCLEAR/General (10%);GENERAL SCIENCE (50%)
POLLUTANTS: METALS (20%);ORGANICS (60%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This program is specifically directed toward repair of DNA damage caused by pollutants connected with coal extraction, processing, and combustion technology, but it will also be pertinent to pollutants associated with coal conversion and oil shale technologies.
APPROACH: The biological consequences of toxic agents which exert their effects because of interactions with DNA can be eliminated or modified if the DNA lesions are recognized by repair endonucleases and undergo subsequent enzymatic steps to remove the lesions and to fill in the excised DNA regions. A precise understanding of the enzymes involved in these repair systems will be required before the biological action of many of these agents will be understood. Purifying specific endonucleases from mammalian tissues depends on developing an assay which can detect damage-specific endonucleases in the presence of nonspecific endonucleases.
RESULTS: Terminal deoxynucleotidyl transferase has been purified from human sources. Following the same procedure, the enzyme was prepared from human leukemic cells supplied by Drs. David Baltimore and Patrick Kung of the Massachusetts Institute of Technology. Drs. Baltimore and Kung are attempting to produce antiserum against human terminal transferase and to develop a radioimmunoassay system for early detection of the enzyme in potential leukemia patients. We have also been supplying terminal transferase from calf thymus glands for recombinant DNA studies being pursued in various laboratories. We feel that the technology developed in recombinant DNA studies is a prerequisite for sequence mapping of isolated homogeneous populations of individual segments of DNA. This will allow the detection of genetic defects and genome mutation caused by ionizing radiation or aromatic hydrocarbons, and it also has the potential of providing a new method by which new, functionally defined sequence of genetic information can be introduced into mammalian cells.
PROJECT MILESTONES: (1) 4/5/76 Endonuclease II of Escherichia coli isolated and purified. (2) 5/3/76 Methylmethanesulfonate and other aromatic hydrocarbons or alkylating agents will be reacted with tritium-labeled d(A)/sub n/ . d(T)/sub n/, d(A-T)/sub n/, d(C)/sub n/ . d(G)/sub n/, and d(C-G)/sub n/ . d(C-G)/sub n/ to determine endonuclease II specificity. (3) 8/2/76 Purification of mammalian endonucleases facilitated by development of a method to measure enzyme activity specific for damage to DNA. (4) 10/4/76 Prepare tritium-labeled sectional block polymers or heteropolymers.
KEYWORDS: POLLUTION;ENZYMES;RNA;HYDROCARBONS;BIOLOGICAL EFFECTS;DNA;BIOLOGICAL REPAIR;POLYMERASES;NUCLEASES;IN VITRO

<084012>
TITLE: Effects of Chemical Carcinogens and Mutagens Derived from Utilization of Carboniferous Energy Supplies on Chromatin Structure and Function
PROJECT NUMBER: 000134
PRINCIPAL INVESTIGATOR: Strniste, G.F.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (30%);FOSSIL FUEL/Oil Shale (20%);SOLAR/General (10%);GENERAL SCIENCE (40%)
ENERGY CYCLE: EXTRACTION (10%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (30%)
POLLUTANTS: NOXIOUS GAS (10%);ORGANICS (40%);RADIATION (10%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To identify aberrations induced in chromatin by selected energy-related chemical by-products, including alkylating and cyclic hydrocarbons, and to relate these lesions to structural and functional changes in mammalian chromatin.
APPROACH: Chromatin, purified nuclei, and cultured cells will be exposed to chemical agents of choice and utilizing various analytical methods of analysis (membrane filter assay, column chromatography, velocity and isopycnic centrifugal techniques, gel electrophoresis). The induction of various classes of lesions in chromatin, including addition-type products and intercomponent crosslinks, will be monitored.
RESULTS: Correlations between the frequency of specific types of lesions induced in chromatin and morphological changes in chromosomes and physiological changes in cells (transformation, death) will be made. Studies concerning the detection and biochemical analysis of repair mechanisms in cells which recognize and react with chromatin aberrations of concern will be initiated.
PROJECT MILESTONES: (1) FY 1977 This project is a continuing effort; however, during this year, we anticipate using various analytical methods we have developed to analyze chromatin, to quantify chemically induced aberrations in chromatin, and to examine cellular capacities to repair such lesions. (2) FY 1978 We anticipate continued studies in defining chromatin lesions induced both in vitro and in vivo and in defining biochemically repaired mechanisms.
KEYWORDS: MUTAGENS;CARCINOGENS;BIOLOGICAL EFFECTS;CHROMATIN;MOLECULAR STRUCTURE;PHYSIOLOGY;ULTRAVIOLET RADIATION;DNA;MUTAGENESIS;CROSS-LINKING

<084013>
TITLE: Applications of High-Speed Cell Analysis and Sorting to Biological Problems
PROJECT NUMBER: 000135
PRINCIPAL INVESTIGATOR: Crissman, H.A.
ADDRESS: Biophysics and Instrumentation Group (MS888), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$338,000
TECHNOLOGY: FOSSIL FUEL/Coal (15%);FOSSIL FUEL/Oil Shale (25%);SOLAR/Direct heat - cool (15%);GENERAL SCIENCE (45%)
ENERGY CYCLE: EXTRACTION (30%);PROCESSING, CONVERSION (30%)
POLLUTANTS: ORGANICS/Not yet established (40%);HEAT, THERMAL/Algae;HEAT, THERMAL/Types and growth (10%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (25%);FULL SCALE DEMONSTRATION (25%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop new preparative and staining methods compatible with analytical systems to provide protocols for quantitative immunofluorescence and fluorescent enzymatic assay, to be coupled with the DNA, protein, cell volume, and light-scatter methodology; to apply flow-systems techniques to study and assess potential biological hazards associated with energy production, particularly those associated with oil extraction from shale (including perturbation of cell growth and proliferation, hematopoietic and immunocompetence); and to apply the flow systems techniques to prescreening and diagnosis of human and animal diseases.
APPROACH: Flow-systems techniques have been used to determine cell proliferation patterns and chlorophyll content of algae, and multiangle light-scattering analysis was used to identify a number of algae types within a mixed population.
RESULTS: Studies completed to date have shown this new application of flow-systems technology to be a feasible approach for life-cycle analysis studies akin to those already performed on mammalian cells. Algae can be used as bio-indicators of freshwater and marine environments. Information relating to specific algae types and growth patterns is useful for determining the immediate and long-term effects of pollutants resulting from energy-related activities such as coal and oil shale extraction and utilization, as well as thermal conditions in various cooling-water systems.
PROJECT MILESTONES: (1) 3-1-77 Evaluate cell dispersal for solid tissues; RNA staining; develop toxicology assay method with WI38 cell line; characterization of model tumor systems. (2) 6-1-77 Environmental effects on the immune system (initial).
KEYWORDS: CYTOLOGY;MEASURING INSTRUMENTS;AUTOMATION;CELL CULTURES;TISSUES;NEOPLASMS;ANIMAL CELLS;BLOOD;DISEASES;DNA;ECOSYSTEMS;IMMUNOLOGY

<084014>
TITLE: Instrument Development for Flow-Systems Cell Analysis
PROJECT NUMBER: 000136
PRINCIPAL INVESTIGATOR: Mullaney, P.F.
ADDRESS: Biophysics and Instrumentation Group (MS888), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$190,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Oil shale dust inhalation (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (70%);DEVELOPMENT/Laboratory scale (30%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop automated systems for separating and characterizing abnormal and normal cells as biological indicators (ERDA-48, Vol. II, p. 103) and to evaluate these systems for their suitability as detectors for pollutant damage assessment in animals.
APPROACH: The approach is to adapt new sensors to existing flow-systems instruments and to explore new techniques.
RESULTS: We expect eventually to develop prototype field instruments for use as biological monitors.
PROJECT MILESTONES: (1) 11-1-76 Cell sorting based on multiangle light scatter. (2) 2-1-77 Characterization of normal hamster lung cells. (3) Continuing: development of new techniques for automated cell analysis.
KEYWORDS: INSTRUMENTATION;ANIMAL CELLS;BIOLOGICAL INDICATORS;AUTOMATION;POLLUTION;BIOLOGICAL EFFECTS;CYTOLOGY;BLOOD;HUMAN POPULATIONS;MEASURING INSTRUMENTS;MEASURING METHODS;LUNGS;MAN

<084015>
TITLE: Applications of Stable Isotopes
PROJECT NUMBER: 000140
PRINCIPAL INVESTIGATOR: Whaley, T.W.
ADDRESS: Organic and Biosynthesis Group (MS890), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$213,000
TECHNOLOGY: MEDICAL APPLICATIONS OF NUCLEAR TECHNOLOGY (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (70%);FULL SCALE DEMONSTRATION (30%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To demonstrate the applications of stable isotopes; and to develop requisite synthetic methods.
APPROACH: Synthesis of labeled compounds and engaging in biochemical and clinical research projects which demonstrate applications of stable isotopes.
RESULTS: Development of new synthetic methods for labeled compounds; biochemical and clinical uses of compounds labeled with stable isotopes.
PROJECT MILESTONES: (1) End of FY 1977 large-scale amino acid separation methodology. (2) Continuing, organic and biosynthetic methodology.
KEYWORDS: STABLE ISOTOPES;LABELLED COMPOUNDS;SYNTHESIS;BIOCHEMISTRY;USES;AMINO ACIDS;BIOMASS;CARBON 13;NITROGEN 15;PLANTS

<084016>
TITLE: Chromosome Structure and Function: Effects of Environmental Pollutants on Karyotype Stability
PROJECT NUMBER: 000219
PRINCIPAL INVESTIGATOR: Deaven, L.L.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$78,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (75%);NUCLEAR/Fission Breeders (25%)
POLLUTANTS: NOXIOUS GAS (35%);METALS (30%);RADIATION (35%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project will contribute to a better understanding of the relationships between chromosome damage and chromosome function.
APPROACH: New methodologies for assessing chromosome damage will be developed and utilized to gain new insights into the ultimate genetic consequences of induced chromosome aberrations. Chromosome analysis is and will continue to be an important monitor of cellular damage from external insults.
RESULTS: This project will attempt to quantitate the relationships between aberration rate and mutation rate and will result in more meaningful interpretations of data on population aberration analysis.
PROJECT MILESTONES: (1) 1-10-76 Evaluate methods for automated karyotype analysis. (2) 1-10-77 Analyze metaphase chromosomes from cells exposed to heavy metals. (3) 1-10-78 Analyze metaphase and interphase cells exposed to toxic energy-related materials as determined by ERDA.
KEYWORDS: CHROMOSOMES;RADIOSENSITIVITY;PLOIDY;BIOCHEMISTRY;CYTOCHEMISTRY;NEOPLASMS;ANIMAL CELLS;PLUTONIUM;X RADIATION;CHROMOSOMAL ABERRATIONS

<084017>
TITLE: Effects of Hazardous By-Products of Non-Nuclear Energy Technology on Regulation of Structural and Functional Organization of Mammalian Chromatin
PROJECT NUMBER: 000220
PRINCIPAL INVESTIGATOR: Hildebrand, C.E.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/General (20%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (40%);FOSSIL FUEL/Oil Shale (20%);GENERAL SCIENCE (20%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (5%);WASTE MANAGEMENT (15%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub 2/ (20%);METALS/Cadmium;METALS/Zinc (copper;METALS/Gallium;METALS/Lanthanum) (60%);ORGANICS/Aromatic hydrocarbons (20%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To obtain quantitative information on the subcellular distribution of agents in treated cells; changes in chromatin organization induced by specific agents; growth-related changes in chromatin and, correspondingly, growth-related differences in susceptibility of chromatin to specific agents; localization of hazardous agents in specific chromatin subfractions; mode of interaction of an applied agent with cellular or nuclear targets and the nature of stable lesions produced by such interactions; reversibility or amelioration of measurable damage which would indicate the preexistence or induction of protective or repair mechanisms.
APPROACH: This program has previously developed methods for measuring growth-related changes in chromatin structure and is continuing to investigate the regulation of structural and functional organization of DNA in using a variety of probes (e.g., nucleases with different specificities and DNA-specific drugs and dyes).
RESULTS: The cultured cell systems employed in previous studies within this activity have afforded the opportunity to study growth-related processes at the cellular, subcellular, and molecular levels. This flexibility will provide an additional advantage in consideration of bioconversion mechanisms in the activation or inactivation of various hazardous substances and their consequent effects on specific subcellular or molecular targets.
PROJECT MILESTONES: (1) 10-1-77 Publication of report on studies of the cellular pathways for metabolism of Cd/sup 2+/ and subcellular fate of this heavy metal. (2) 1-1-78 Publication of report on studies on the molecular basis for cellular dysfunction attributable to Cd/sup 2+/ exposure.
KEYWORDS: FATE;HEAVY METALS;CHROMATIN;PHYSIOLOGY;MOLECULAR STRUCTURE;CELL CULTURES;ANIMAL CELLS;METALS;BIOLOGICAL EFFECTS;BIOLOGICAL LOCALIZATION;TISSUE DISTRIBUTION;CADMIUM;DNA REPLICATION;METABOLISM;IN VITRO

<084018>
TITLE: Radiation and Genetic Information Transfer
PROJECT NUMBER: 000221
PRINCIPAL INVESTIGATOR: Smith, D.A.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$81,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: METALS (40%);ORGANICS (10%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To investigate the processes of genetic information transfer, particularly replication and transcription, and to study the effects of radiation thereon.
APPROACH: Use model nucleic acids of simple base sequence and highly purified enzymes to study replication and transcription in vitro and the effects of radiation and other pollutants.
RESULTS: A better understanding of the mechanisms of replication and transcription at the molecular level and increased knowledge of the effects of base sequence upon radiation damage to DNA.
PROJECT MILESTONES: Irradiation of three isomeric polymers dA/sub n/ . dT/sub n/, d(AT)/sub n/ . d(AT)/sub n/, and d(AAT)/sub n/ . d(ATT)/sub n/; characterization of irradiated polymers by gel chromatography and centrifugation; transcription studies of irradiated polymers; publication of the results; and transcription of Chinese hamster chromatin.
KEYWORDS: IONIZING RADIATIONS;IRRADIATION;DNA;BIOLOGICAL RADIATION EFFECTS;DNA REPLICATION;GENETICS;BIOCHEMISTRY;ENZYMES;MUTAGENESIS;X RADIATION;RNA;IN VITRO

<084021>
TITLE: Effects of Increased Coal Utilization on Nucleic Acids
PROJECT NUMBER: 000242
PRINCIPAL INVESTIGATOR: Saponara, A.G.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.

TELEPHONE: P233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (30%);FOSSIL FUEL/Oil Shale (20%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (25%):PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%):ELECTRICITY GENERATION (25%)
POLLUTANTS: METALS/Arsenic;METALS/Co/sup 2+/;METALS/Ni/sup 2+/;METALS/Sr/sup 2+/;METALS/La/sup 3+/ (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To define the effects of sublethal levels of inorganic ions on RNA metabolism.
APPROACH: Compare the kinetics of formation and steady-state levels of various nucleic acid species in the presence and absence of perturbants.
RESULTS: Quantitative dose-effect relationships and information concerning cellular responses to injury which contribute to altered species or organ sensitivities.
PROJECT MILESTONES: (1) 10-1-77 Establish techniques for the separation of nucleic acid species on the basis of end-group modifications. (2) 10-1-78 Utilize established techniques to examine the effects of perturbants on messenger RNA metabolism.
KEYWORDS: RNA;METABOLISM;IONS;BIOLOGICAL EFFECTS;NUCLEIC ACIDS;MOLECULAR STRUCTURE;BIOCHEMISTRY;ANIMAL CELLS;EMISSION

<084022>
TITLE: Application of Cell Flow Instrumentation to Radiobiological Problems
PROJECT NUMBER: 000243
PRINCIPAL INVESTIGATOR: Raju, M.R.
ADDRESS: Biophysics and Instrumentation Group (MS888), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: P233-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$49,000
TECHNOLOGY: NUCLEAR/Fusion Laser (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (25%);FULL SCALE DEMONSTRATION (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To evaluate and apply the cell flow instrumentation to research problems in radiation biology and to study changes in age distribution of cells after exposure to low and high LET radiations.
APPROACH: Single cells from culture or from biopsies taken from rodents or dogs before and after a given treatment will be stained, and fluorescence and scattering measurements using cell flow instrumentation will be made. Basic radiobiology studies using alpha particles from plutonium will be conducted to improve our understanding on the sensitive sites of cells.
RESULTS: This work covers an important application of cell flow instrumentation to problems in radiobiology and provides basic information relevant to ongoing programs on hot particle and biomedical programs of negative pions and heavy ions.
PROJECT MILESTONES: (1) 3-1-77 Review of results regarding preparation of single-cell suspensions from tissues and scattering and fluorescence measurements to problems in radiation biology. (2) Continuing, work where the application is more effective.
KEYWORDS: CANCER;ALPHA PARTICLES;PLUTONIUM;BIOLOGICAL RADIATION EFFECTS;ANIMAL CELLS;RADIOSENSITIVITY;LET;RADIOBIOLOGY;RADIOTHERAPY;PIONS MINUS;HEAVY IONS;BIOPSY;DNA;X RADIATION

<084023>
TITLE: Determination of Plutonium in Man
PROJECT NUMBER: 000380
PRINCIPAL INVESTIGATOR: Voelz, G.L.
ADDRESS: Health Division (MS690), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: P233-3631
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$264,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES/Plutonium oxide (25%);RADIATION/Plutonium (75%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project will establish statistically significant measurements of the base-line concentrations of environmental plutonium in the general population of geographic areas of interest to ERDA, monitor those areas where the base line has been established to determine if changes have occurred, measure the tissue distributions of plutonium in occupationally exposed workers, determine the particle size distribution of plutonium oxide aerosols in tissues of occupationally exposed workers, and evaluate the histological effects of deposited plutonium on the tissues of exposed workers.
APPROACH: Collect organs of interest from autopsies; record pertinent epidemiological information; analyze quantitatively for plutonium and normalize the results to a concentration value; statistically evaluate the distributions.
RESULTS: Plutonium tissue concentrations for inhabitants of various geographic areas are being determined. Median values for each tissue type will be indicative of base-line levels and will permit statistical comparisons between localities. Each area will be monitored for changes in the base line.
PROJECT MILESTONES: (1) 1-1-77 Statistically significant base lines of plutonium concentrations in general population identified for areas in Colorado, New Mexico, and Pennsylvania. (2) 1-6-77 Complete statistical

evaluation on effects of age, sex, area of residence, etc., on plutonium retention (general population). (3) 1-1-78 Identify particle size distribution and retention in lungs of plutonium in four or more occupationally exposed workers.
KWORDS: PLUTONIUM;TISSUE DISTRIBUTION;PERSONNEL;MAN;RADIOACTIVITY;RADIATION MONITORING;AUTOPSY;EPIDEMIOLOGY;PARTICLE SIZE;INHALATION;LUNGS;PLUTONIUM;TISSUES

<084024>
TITLE: Ecological Investigation of Radioactive Materials in Waste Discharge Areas at Los Alamos
PROJECT NUMBER: 000687
PRINCIPAL INVESTIGATOR: Hakonson, T.E.
ADDRESS: Environmental Studies Group (MS490), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the distribution, biological availability, and transport of plutonium and americium in industrial liquid waste disposal areas.
APPROACH: Permanent plots are sampled periodically to determine the concentrations and relative distribution of radionuclides in soils, plants, and animals.
RESULTS: The results will be applicable to evaluating environmental problems surrounding nuclear energy development.
PROJECT MILESTONES: 1-1-77 Publish six technical articles related to the project subject.
KEYWORDS: RADIOACTIVE MATERIALS;LIQUID WASTES;WASTE DISPOSAL;DISTRIBUTION;PLUTONIUM ISOTOPES;AMERICIUM ISOTOPES;SOILS;PLANTS;ANIMALS;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;RADIOECOLOGICAL CONCENTRATION;CONTAMINATION;ENVIRONMENTAL TRANSPORT;RADIONUCLIDE MIGRATION

<084025>
TITLE: Fine Particle Studies Related to Health and Air-Cleaning Requirements for Energy Systems
PROJECT NUMBER: 000712
PRINCIPAL INVESTIGATOR: Ettinger, H.J.
ADDRESS: Industrial Hygiene Group (MS486), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Divison of Biomedical and Environmental Research
MONITOR: Buttenhoff, Robert L.
TELEPHONE: F233-3213
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (25%);CONSERVATION/General (25%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (10%);PARTICULATES (90%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To determine resuspension parameters, migration of deposited contaminants, and performance of air-cleaning procedures used in nuclear facilities against dense submicron particulates; provide aerosols for toxicology studies related to oil shale processing.
APPROACH: Parameters that govern the resuspension and migration of deposited contaminants with controlled experiments will be obtained utilizing a wind tunnel. These parameters will include (1) saltation rate in terms of mass and number flux, accelerated wind conditions, and surface roughness; (2) the performance of HEPA filters against submicron particles having densities comparable to particulates likely to be encountered in nuclear fuel processing and recovery facilities; and (3) generation and characterization of aerosols for inhalation toxicity studies of materials related to oil shale processing.
RESULTS: Initial studies are directed toward producing aerosols of raw and spent oil shales.
PROJECT MILESTONES: (1) 5-1-76 Generate reproducible aerosols of raw oil shale. (2) 7-1-77 Measure the vertical flux and resuspension rates of micron sized particles with saltating particles of 100 to 300 microns in diameter; measure HEPA filtration efficiency against submicron aerosols having densities varying up to approximately 18. (3) 3-1-78 Carry out resuspension measurements from surfaces of different roughness heights.
KEYWORDS: PARTICLES;AEROSOLS;NUCLEAR POWER PLANTS;OIL SHALE PROCESSING PLANTS;WIND TUNNELS;FILTERS;INHALATION;OIL SHALES;PARTICLE SIZE;ENVIRONMENTAL EFFECTS;AIR POLLUTION;CHEMICAL EFFLUENTS

<084028>
TITLE: Analysis of the Human Health and Ecological Consequences of Plutonium and Other Transuranics
PROJECT NUMBER: 000899
PRINCIPAL INVESTIGATOR: Healy, J.W.
ADDRESS: Health Division (MS690), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond
TELEPHONE: F233-3631
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$119,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)

REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To accumulate data available on the biological and environmental behavior and the effects of the transuranic elements in order to answer specific questions and to allow analysis of potential hazards to health.
APPROACH: Many of the projects are undertaken to answer immediate problems of ERDA, while others are continuing studies of identified issues.
RESULTS: Current studies involve the derivation and justification of a limit to be used in burial of transuranic wastes, a study of the possible importance of plutonium in causing genetic changes, and derivation of methods for estimating costs of reactor accidents, with an emphasis on comparing light water reactors with the LMFBR.
PROJECT MILESTONES: (1) 8-1-76 Review of gonadal dose from plutonium. (2) 1-1-77 Draft of limits for transuranic waste burial.
KEYWORDS: PLUTONIUM;TRANSURANIUM ELEMENTS;PUBLIC HEALTH;DATA;HEALTH HAZARDS;ENVIRONMENTAL EFFECTS;RADIOACTIVE WASTES;LMFBR TYPE REACTORS;GENETIC EFFECTS;REACTOR ACCIDENTS;UNDERGROUND DISPOSAL;SAFETY;GENETIC RADIATION EFFECTS

<084029>
TITLE: Ecological Investigation of Rehabilitation of Uranium Mine Tailings of the Southwestern United States
PROJECT NUMBER: 000926
PRINCIPAL INVESTIGATOR: Wienke, C.L.
ADDRESS: Environmental Studies Group (MS490), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Walters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (90%);DEVELOPMENT/Pilot plant (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To provide a sound ecological basis for rehabilitation of uranium mill tailings in the arid southwestern United States.
APPROACH: Obtain and evaluate ecological data relative to emissions, phytotoxicity, and alternative rehabilitation methodologies.
RESULTS: This study is designed to define the vegetative toxicological and ecological factors to be considered in establishing a program of rehabilitation and/or stabilization alternatives for the 21 inactive uranium mill sites. This will be accomplished by measurement of stable and radioactive elemental analysis of tailings, soils, biota, and surface waters during the initial phases of study. These data will then be evaluated from an ecological perspective to recommend a long-term rehabilitation protocol for each site studied. Several alternative measures are expected to apply to each site because of the diverse environmental situations represented by the 21 sites now available; the anticipated expansion of uranium mining and milling to support increased nuclear fuel-cycle activities will require research results that will apply broadly to management policies and aid in careful selection of priorities in long-range planning exercises.
PROJECT MILESTONES: (1) 12-1-76 Tailings pile characterized. (2) 10-1-77 Tailings pile emissions characterized. (3) 12-1-77 Data report on revegetation trials. (4) 6-1-78 Alternative rehabilitation measures evaluated. (5) 10-1-78 Rehabilitation protocol recommended.
KEYWORDS: URANIUM MINES;MILLING;RESIDUAL FUELS;DATA;EMISSION;ENVIRONMENTAL EFFECTS;LAND RECLAMATION;SPOIL BANKS;STABILIZATION;MANAGEMENT;URANIUM;TOXICITY;TERRESTRIAL ECOSYSTEMS;SOIL MECHANICS;SOIL CHEMISTRY;REVEGETATION;TECHNOLOGY ASSESSMENT;RADIONUCLIDE MIGRATION

<084030>
TITLE: Environmental Research Park Support
PROJECT NUMBER: 000927
PRINCIPAL INVESTIGATOR: Johnson, L.J.
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Los Alamos Scientific Lab., N.Mex. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<084031>
TITLE: Terrain Influences on Low-Level Meteorological Transport
PROJECT NUMBER: 000948
PRINCIPAL INVESTIGATOR: Barr, S.
ADDRESS: Environmental Studies Group (MS490), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.
TELEPHONE: C(301)353-3600
TYPE OF FUNDING: C
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (70%);DEVELOPMENT/Laboratory scale (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To document the major effects of terrain irregularities on the transport, dispersion, and deposition of effluents released to the air.
APPROACH: An integrated program of field experiments and modeling to identify the important physical mechanisms and incorporating them into an objective generic analysis scheme. Most of the major energy

production and related facilities are situated in areas where terrain variations play a vital role in the distributions and effects of airborne effluents. An integrated program of field experiments and modeling is pursued as the only viable method capable of identifying locally important physical mechanisms and incorporating the mechanisms into an objective generic analysis scheme.
SULTS: Transport and diffusion models and appropriate field data, including tracer studies, to evaluate and improve the models. The results should be generally applicable to a wide variety of locations.
PROJECT MILESTONES: (1) Late FY 1976 tracer experiments to document phenomenology. (2) FY 1977 initial model and experiment comparison tests. (3) FY 1978 model upgrade and expansion to larger areas.
KEYWORDS: TERRAIN;GASEOUS WASTES;AIR POLLUTION;DATA;FUNCTIONAL MODELS;DIFFUSION;METEOROLOGY;CLIMATES;AIR

<084034>
TITLE: Ecological Investigation of Alaskan North Slope Oil Field Development
PROJECT NUMBER: 001272
PRINCIPAL INVESTIGATOR: Hanson, W.C.
ADDRESS: Environmental Studies Group (MS490), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: F233-4095
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (90%);PROCESSING, CONVERSION (10%)
POLLUTANTS: NOXIOUS GAS (10%);SPECIFIED OTHER POLLUTANTS/Solid wastes (90%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To monitor and evaluate the ecological consequences of the Trans-Alaska pipeline on the Alaskan north slope by the use of suitable indicator species of biota.
APPROACH: Basic biological studies of Arctic tundra nesting birds, small mammals, moose, caribou, and carnivores in the vicinity of the Trans-Alaska Oil pipeline. Special attention is being given to the dynamics of fox populations.
RESULTS: Ecological research that will describe the ecological consequences of Alaskan North Slope petroleum development in terms that will allow evaluation and possible mitigation of the environmental impact of resource developments.
PROJECT MILESTONES: 1976 initiation of radio telemetry study of tagged Arctic foxes. 1976 initiation of Caribou Range Forage Project. 1976 establishment of field camps at Prudhoe Bay, Franklin Bluffs, and Happy Valley study sites. 1976 second season of winter tagging of Arctic foxes. 1976 collection of samples and data on radionuclide cycling and transmission through the food web of the Anaktuvuk Pass region. 1976 initiation of moose study along the Colville River. 1977 evaluation of rabies epidemic on north slope. 1978 redirection of moose study toward evaluation of range extension. 1978 initiation of Colville River fox study. 1979 completion of second year of fox study on Colville River. 1979 conclusion of small mammal and bird studies at Prudhoe Bay. 1979 completion of caribou winter feeding selectivity studies.
KEYWORDS: ALASKA;ECOLOGY;ALASKA OIL PIPELINE;ENVIRONMENTAL EFFECTS;TERRESTRIAL ECOSYSTEMS;MAMMALS;BIRDS;POPULATION DYNAMICS;PETROLEUM;DISEASES;ARCTIC REGIONS;HUMAN POPULATIONS;TUNDRA

<084035>
TITLE: Radiation Ecology Studies of Northern Alaskan Ecosystems
PROJECT NUMBER: 001273
PRINCIPAL INVESTIGATOR: Hanson, W.C.
ADDRESS: Los Alamos Scientific Laboratory H-8, Los Alamos, NM 87544
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT MILESTONES: Terminated FY 1978. Whole-body counting of Anaktuvuk Pass Eskimos will continue on a semiannual basis in order to document closely their dietary habits as they respond to the combined effects of social changes that result from increased petroleum resource developments in northern Alaska and the serious decline in the western Arctic caribou herd upon which they are dependent for a major food resource. Sampling of soil, lichens, caribou, and carnivores at Anaktuvuk Pass will continue to provide necessary samples to be analyzed for Sr-90, Cs-137, Po-210, Pb-210, transuranic elements, and neutron-activation products. Emphasis will be shifted to evaluation and documentation of ecological aspects of petroleum developments in the region utilizing the extensive data base of radionuclide concentrations and cultural information on the Anaktuvuk Pass people.
KEYWORDS: ALASKA;TERRESTRIAL ECOSYSTEMS;RADIONUCLIDE MIGRATION;STRONTIUM 90;CESIUM 137;POLONIUM 210;LEAD 210;TRANSURANIUM ELEMENTS;FOOD CHAINS;CONTAMINATION;RADIOECOLOGICAL CONCENTRATION;RADIOECOLOGY

<084036>
TITLE: Health of LASL Plutonium Workers
PROJECT NUMBER: 001369
PRINCIPAL INVESTIGATOR: Voelz, G.L.
ADDRESS: Health Division (MS690), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-3631

TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$126,000
TECHNOLOGY: NUCLEAR/General (50%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (90%);WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION/Plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To study possible late deleterious effects of internally deposited plutonium in all current and terminated plutonium workers (2924) at Los Alamos using epidemiologic methods; to investigate the relationship between any medical effects that may be demonstrated and the magnitude of the body burden of plutonium.
APPROACH: The incidence of serious disease and causes of death will be determined in all persons with measurable body burdens of plutonium for comparison with similar medical findings in persons with very low body burdens and those with no exposure.
RESULTS: The results of this study will report comparative disease incidence between exposed groups and those with little or no exposure. The study will help ascertain whether any detectable long-term effects of plutonium are observable in these workers. Such data are considered essential to an improved understanding of the risk of plutonium exposure in humans.
PROJECT MILESTONES: (1) 3-1-77 Current report on 26 Manhattan Project plutonium workers; roster of LASL workers for study completed. (2) 10-1-77 Tracing of morbidity subjects continues; first survey of mortality completed; project transferred to national epidemiology study (LASL F111).
KEYWORDS: LASL;PERSONNEL;EPIDEMIOLOGY;RADIATION DOSES;PLUTONIUM ISOTOPES;OCCUPATIONAL DISEASES;STATISTICS;DELAYED RADIATION EFFECTS;BIOLOGICAL EFFECTS;MAN

<084037>
TITLE: Rocky Mountain Regional Studies
PROJECT NUMBER: 001536
PRINCIPAL INVESTIGATOR: Lohrding, R.K.
ADDRESS: Energy Division (MS574), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/General (40%);SOLAR/General (40%);CONSERVATION/General (20%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To assess the impact of energy-related development in the western United States.
APPROACH: Alternative futures for resource use will be analyzed and evaluated.
RESULTS: Policy makers at all levels will be provided with tools to demonstrate the effects and impacts of various resource utilization strategies.
PROJECT MILESTONES: FY 1977 Semiannual progress reports and several topical reports and site-specific assessments are provided. Thirteen reports (in addition to progress reports) are planned.
KEYWORDS: INFRASTRUCTURE;ROCKY MOUNTAINS;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;DATA ACQUISITION

<084038>
TITLE: Regional Studies Program
PROJECT NUMBER: 001662
PRINCIPAL INVESTIGATOR: Lohrding, R.K.
ADDRESS: Energy Division (MS574), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$445,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To assess the impact of energy-related development in the western United States.
APPROACH: Alternative futures for resource use will be analyzed and evaluated.
RESULTS: Policy makers at all levels will be provided with tools to demonstrate the effects and impacts of various resource utilization strategies.
PROJECT MILESTONES: FY 1977 Semiannual progress reports are provided and several topical reports and site-specific assessments are provided. Thirteen reports (in addition to progress reports) are planned.
KEYWORDS: INFRASTRUCTURE;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;DATA ACQUISITION;ECONOMICS;CHEMICAL EFFLUENTS;REGIONAL ANALYSIS;PLUMES;ENERGY MODELS;COST BENEFIT ANALYSIS;ENERGY POLICY;LAND RECLAMATION

<084039>
TITLE: Regional Studies Program: Data Base
PROJECT NUMBER: 001873
PRINCIPAL INVESTIGATOR: Lohrding, R.K.
ADDRESS: Energy Division (MS574), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631

TYPE OF FUNDING: C
77 FUNDING: Energy Research and Development Administration FY77:$60,000
CHNOLOGY: FOSSIL FUEL/General (50%);SOLAR/General (40%);CONSERVATION/General (10%)
LLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
ARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To assess the impact of energy-related development in the western United States.
APPROACH: Alternative futures for resource use will be analyzed and evaluated.
RESULTS: Policy makers at all levels will be provided with tools to demonstrate the effects and impacts of various resource utilization strategies.
PROJECT MILESTONES: FY 1977 Semiannual progress reports are provided and several topical reports and site-specific assessmerts are provided. Thirteen reports (in addition to progress reports) are planned.
KEYWORDS: INFRASTRUCTURE;ENERGY SOURCES;DATA ACQUISITION;ENVIRONMENTAL EFFECTS;COMPUTERS;ECONOMICS;CHEMICAL EFFLUENTS;PLUMES;AIR POLLUTION;ENERGY POLICY;TERRESTRIAL ECOSYSTEMS;ENERGY SOURCE DEVELOPMENT;COST BENEFIT ANALYSIS;LAND RECLAMATION

<084040>
TITLE: Regional Studies Program: Environmental Assessment
PROJECT NUMBER: 001874
PRINCIPAL INVESTIGATOR: Lohrding, R.K.
ADDRESS: Energy Division (MS574), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (50%);SOLAR/General (30%);CONSERVATION/General (20%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest,1/Rocky Mountain Region
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To assess the impact of energy-related development in the western United States.
APPROACH: Alternative futures for resource use will be analyzed and evaluated.
RESULTS: Policy makers at all levels will be provided with tools to demonstrate the effects and impacts of various resource utilization strategies.
PROJECT MILESTONES: FY 1977 Semiannual progress reports and several topical reports and site-specific assessments are provided. Thirteen reports (in addition to progress reports) are planned.
KEYWORDS: INFRASTRUCTURE;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;REGIONAL ANALYSIS;DATA ACQUISITION SYSTEMS;ECONOMICS;CHEMICAL EFFLUENTS;PLUMES;COST BENEFIT ANALYSIS;ENERGY SOURCE DEVELOPMENT;LAND RECLAMATION

<084041>
TITLE: Ecological Investigation of Waste Discharge Areas at Los Alamos
PROJECT NUMBER: 001875
PRINCIPAL INVESTIGATOR: Hakonson, T.E.
ADDRESS: Environmental Studies Group (MS490), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: C
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/Coal (35%);NUCLEAR/General (35%);GENERAL SCIENCE (30%)
ENERGY CYCLE: EXTRACTION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To characterize the distribution of mercury and uranium in LASL ecosystems and to determine pathways and rates of transfer between ecosystem components.
APPROACH: Permanent plots are sampled periodically to determine the concentrations and relative distributions of elements in soils, plants, and animals.
RESULTS: Results are to be applied to the definition and solution of environmental problems associated with energy development.
PROJECT MILESTONES: 1-1-76 Completion of two technical publications dealing with project results.
KEYWORDS: LASL;MERCURY;URANIUM;ECOSYSTEMS;SOILS;PLANTS;ANIMALS;ENVIRONMENT;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;POLLUTION;DISTRIBUTION;ENVIRONMENTAL TRANSPORT;RADIONUCLIDE MIGRATION;FOSSIL-FUEL POWER PLANTS;URANIUM MINES;TOXICITY;MINING

<084042>
TITLE: Interactions of Coal-Related Pollutants and Nucleic Acids
PROJECT NUMBER: 001876
PRINCIPAL INVESTIGATOR: Smith, D.A.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Energy Research and Development Administration FY77:$66,000
TECHNOLOGY: FOSSIL FUEL/General (30%);FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil Shale (30%);GENERAL SCIENCE (10%)
POLLUTANTS: NOXIOUS GAS (30%);ORGANICS (70%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To evaluate the interactions of pollutants connected with coal extraction, processing, and combustion with DNA. These studies will also be relevant to the coal conversion and oil shale technologies.
APPROACH: Using the defined model DNAs we have prepared and activated intermediates of selected pollutants, we will determine which intermediates and which pollutants interact with DNA, what the effect is on the physical-chemical properties of the DNA, what exact chemical sites are attacked, what the dose-response relationships are, and what sequence effects are evident. Other parallel studies will evaluate the effects of such interactions on the fidelity with which DNA is copied by nucleic acid polymerases (mutagenesis) and evaluate which lesions are recognized by DNA repair enzymes.
RESULTS: We propose to investigate how pollutant-DNA interactions are influenced by several factors, including the presence of chromatin proteins, and how interactions at one DNA site influence properties of other DNA regions. Results of this work will be important in evaluation of the dangers of different pollutants and in determination of which types of damage might be repaired.
PROJECT MILESTONES: (1) 8-1-76 Complete literature search and decide which pollutants to use in initial experiments. (2) 10-1-76 Begin synthesis of required activated intermediates. (3) 11-1-76 Begin studies of interaction of pollutants and DNA, conduct dose-response studies, chemico-physical analysis. (4) 11-1-77 Reevaluate program to decide upon most productive future approaches.
KEYWORDS: METALS;MUTAGENS;GENETICS;DNA;BIOSYNTHESIS;ENZYMES;IN VITRO;POLLUTION;RNA;POLYMERASES;BIOLOGICAL EFFECTS;COAL INDUSTRY;COAL MINING;PROCESSING;COMBUSTION PRODUCTS;COAL GASIFICATION;HEALTH HAZARDS;MUTAGENESIS;ENZYMES

<0840043>
TITLE: Isolation of Life-Cycle Traverse Mutants of the Mammalian Cell Line CHO
PROJECT NUMBER: 001877
PRINCIPAL INVESTIGATOR: Barnhart, B.J.
ADDRESS: Cellular and Molecular Biology Group (MS886), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS (20%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To pursue a genetic approach to analyzing the eucaryotic cell life cycle and to use in vitro genetic systems to assess mutagenicity of classes of compounds derived from the coal gasification process.
APPROACH: Conditional-lethal, temperature-sensitive, life-cycle mutants in mutagenized cultures of the hamster cell line CHO have been derived. A collection of mutants will be phenotypically characterized for temperature-sensitive blocks in life-cycle traverse using flow microfluorometry. Genotypic characterization will involve cell-to-cell hybridization to determine if mutations affecting specific phases of the life cycle are complementary and recessive or dominant. The temperature-sensitive collection will be used to assess the potential mutagenicity of by-products of coal gasification.
RESULTS: In addition to genetic analysis of the eucaryotic cell life cycle, this program includes a very promising project using cell-membrane mutants to elucidate the biochemistry of cell-to-substratum attachment. Results of this collaborative effort suggest that one of the complex carbohydrates, hyaluronic acid (HA), acts as a modulator of cell-to-substratum adhesion. A mutant unable to synthesize HA exhibits resistance to substratum detachment with trypsin or EDTA, while a mutant with excess HA is very readily detached.
PROJECT MILESTONES: (1) 11-1-76 Phenotypic characterization of temperature-sensitive life-cycle mutants of CHO cells. (2) 2-1-77 Usable in vitro mutagen-activation system of hamster embryo cells. (3) 9-1-77 Genotypic analysis of life-cycle mutants; establish reversion frequencies of temperature-sensitive mutants on activation system. (4) 5-1-78 Classes of potential mutagens assessed as inducing stable genetic revertants. (5) 9-30-78 Coal gasification by-products classed as mutagens or nonmutagens.
KEYWORDS: ANIMAL CELLS;MUTANTS;GENETICS;LIFE CYCLE;CELL MEMBRANES;BIOCHEMISTRY;HAMSTERS;TEMPERATURE DEPENDENCE;MUTATIONS;IN VITRO;SOMATIC MUTATIONS

<0840044>
TITLE: Stable-Isotope-Labeled Compounds for Environmental and Ecological Tracing
PROJECT NUMBER: 001878
PRINCIPAL INVESTIGATOR: Whaley, T.W.
ADDRESS: Organic and Biosynthesis Group (MS890), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W. W.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (70%);FULL SCALE DEMONSTRATION (30%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To synthesize compounds labeled with stable isotopes so that they are available to various ERDA investigators.
APPROACH: Projects within this group are the use of stable isotopes as probes for elucidating the mode of action of carcinogens and the assessment of effects of energy-related pollutants on enzymes.

RESULTS: A National Stable Isotopes Resource has been established at Los Alamos by the National Institutes of Health.
PROJECT MILESTONES: FY 1977 initial studies of carcinogenic metabolites and effects of pollutants on enzymes.
EYWORDS: STABLE ISOTOPES;LABELLED COMPOUNDS;TRACER TECHNIQUES;ECOLOGY;ENVIRONMENT;CARCINOGENS;ENZYMES;CARBON 13;NITROGEN 15;SYNTHESIS

<084045>
TITLE: Epidemiologic Study of Plutonium Workers
PROJECT NUMBER: 001879
PRINCIPAL INVESTIGATOR: Voelz, G.L.
ADDRESS: Health Division (MS690), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-3631
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$195,000
TECHNOLOGY: NUCLEAR/General (50%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (90%);WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION/Plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To study possible late deleterious effects of internally deposited plutonium in all current and terminated plutonium workers in ERDA-contractor plants in this country using epidemiologic methods. The incidence of serious disease and the causes of death will be determined in all persons with measurable body burdens of plutonium for comparison with similar medical findings in persons with very low body burdens and with no exposure. To investigate the relationship between any medical effects that may be demonstrated and the magnitude of the body burden of plutonium.
APPROACH: Persons to be studied will first be selected from contractor health physics and personnel records. The study will ultimately involve about 16,000 subjects, of which about 7200 have had detectable plutonium depositions. The others will serve as controls. This list of persons will be surveyed periodically for causes of mortality. A subset of about 5000 persons will also be surveyed annually with questionnaires in a prospective morbidity study.
RESULTS: Reports will compare the disease incidence and mortality between exposed groups and little and no exposure groups. The study will help ascertain whether any detectable long-term effects of plutonium are observable in these workers.
PROJECT MILESTONES: (1) 6-1-77 Initial data processing systems design operational. (2) 10-1-77 Initial morbidity data collection completed; selection of Rocky Flats study subjects completed. (3) 3-1-78 Selection of subjects at all ERDA plants completed. (4) 7-1-78 First mortality check on all subjects initiated.
KEYWORDS: PLUTONIUM;DELAYED RADIATION EFFECTS;EPIDEMIOLOGY;PERSONNEL;BODY BURDEN;MAN

<084046>
TITLE: Lower Stratospheric (Airstream) Data and Field Support
PROJECT NUMBER: 001883
PRINCIPAL INVESTIGATOR: Guthals, P.R.
ADDRESS: Nuclear Chemistry Group (MS514), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Gross, Thomas J.
TELEPHONE: F233-5586
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: NUCLEAR/Fission (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (40%);ORGANICS (20%);RADIATION (40%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (75%);FULL SCALE DEMONSTRATION (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Stratospheric monitoring, modeling, and atmospheric transport studies using radionuclide and chemical analysis as basic tools for investigation.
APPROACH: Whole-air and particulate samples are collected by an aircraft flying in the lower stratosphere. These samples are analyzed to determine the fate of selected radionuclides and certain nonactive atmospheric chemical constituents. These substances collected, in general, are man-made in origin; however, they do react and interact with the natural atmospheric component.
RESULTS: The immediate end results of this portion of the Airstream program are to supervise the sample collection activities while obtaining satisfactory samples for subsequent analysis.
PROJECT MILESTONES: Milestones are established for each sample collection period. Typically, the sampling periods are established during each April, July, and October.
KEYWORDS: STRATOSPHERE;AIR POLLUTION;AEROSOL MONITORING;EARTH ATMOSPHERE;RADIONUCLIDE MIGRATION;ENVIRONMENTAL TRANSPORT;CHEMICAL EFFLUENTS;RADIOACTIVE EFFLUENTS;WEATHER;RADIOISOTOPES;TRACER TECHNIQUES;SAMPLING

<084047>
TITLE: Ecological Investigation of Dry Geothermal Energy Demonstration
PROJECT NUMBER: 002153
PRINCIPAL INVESTIGATOR: Rea, K.H.
ADDRESS: Environmental Studies Group (MS490), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: F233-4905
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$140,000
TECHNOLOGY: GEOTHERMAL/Hot dry rock (100%)

ENERGY CYCLE: EXTRACTION (80%);ELECTRICITY GENERATION (20%)
POLLUTANTS: NOXIOUS GAS (5%);PARTICULATES (20%);HEAT, THERMAL (50%);VISUAL AESTHETICS (25%)
CHARACTER OF STUDY: RESEARCH/Applied (40%);DEVELOPMENT/Pilot plant (40%);FULL SCALE DEMONSTRATION (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To establish biotic and abiotic inventories; identify key ecosystem components; and study the environmental consequences of off-site effluents.
APPROACH: Seasonally sample the various communities and identify any agents responsible for community change and identify the mechanisms by which they operate.
RESULTS: Results of this investigation will lead to refined procedures for the mitigation of ecological imports due to development of hot, dry-rock geothermal resources. Many questions regarding the bioenvironmental consequences of such installations will be answered, and comparisons will be able to be made between the ecological impacts of this and other energy-producing systems.
PROJECT MILESTONES: (1) 9-1-76 First integrated report of flora, fauna, and climatological parameters. (2) 9-1-77 First predictions as to rates of change. (3) 5-1-78 Implementation of fully automated weather monitoring equipment.
KEYWORDS: GEOTHERMAL FIELDS;CHEMICAL EFFLUENTS;ENVIRONMENTAL EFFECTS;TERRESTRIAL ECOSYSTEMS;PLANTS;ANIMALS;GEOTHERMAL ENERGY;CLIMATES;WEATHER;HOT-DRY-ROCK SYSTEMS;HYDROLOGY

<084048>
TITLE: Heavy Methane Atmospheric Tracer Experiments
PROJECT NUMBER: 002440
PRINCIPAL INVESTIGATOR: Cowan, G.A.
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Los Alamos Scientific Lab., N.Mex. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: SURFACE AIR;ENVIRONMENTAL TRANSPORT;AIR POLLUTION;AEROSOLS;TRACER TECHNIQUES;METHANE;LABELLED COMPOUNDS

<084050>
TITLE: Environmental Policy, Los Alamos Scientific Laboratory
PROJECT NUMBER: 002227
PRINCIPAL INVESTIGATOR: Lohrding, R.K.
ADDRESS: Director's Office (MS254), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Nash, Joe
TELEPHONE: F233-3034;C(301)353-3034
TYPE OF FUNDING: Contract No.-W-7405-ENG-36
77 FUNDING: Energy Research and Development Administration FY77:$311,000
TECHNOLOGY: FOSSIL FUEL/General (70%);NUCLEAR/General (30%)
ENERGY CYCLE: EXTRACTION (30%);PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (20%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Water pollutants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Policy analysis on water for energy uses.
APPROACH: Conduct specific studies on the availability of western water for energy, legal and institutional barriers to water use for energy, consumptive use of water in energy production processers, potential tradeoffs for water use between agriculture and energy, and impacts of visibility clauses of the Clean Air Act on western energy development.
RESULTS: Periodic reports on topical issues; monthly progress reports.
KEYWORDS: WESTERN;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;COMPARATIVE EVALUATIONS;ECONOMICS;SOCIOLOGY;SYNTHETIC FUELS;WATER;ENERGY POLICY

<084061>
TITLE: Respirator Research and Development
PROJECT NUMBER: 600014
PRINCIPAL INVESTIGATOR: Ettinger, H.J.
ADDRESS: Industrial Hygiene Group (MS486), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Ross, Donald M.
TELEPHONE: F233-3331
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (35%);NUCLEAR/Fission (35%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (75%)
CHARACTER OF STUDY: RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To evaluate on request of ERDA, DOS, non-NIOSH approved respiratory equipment, determine efficiency of equipment, and recommend continued use or suspension of use of the equipment; and determine the effect of respirators on human physiology during respirator use.
APPROACH: Review and test ERDA-contractor respiratory equipment and physiologically monitor persons wearing respirators.
RESULTS: Respiratory equipment used by ERDA to be NIOSH-approved or equivalent. Medical criteria for evaluation of respirator users to be developed.
PROJECT MILESTONES: (1) 10-1-76 Initiate tests on ERDA contractor respirators; plan for stress testing with air purifying respirators. (2) 11-1-76 Submit medical protocol, recruit subjects, and perform physicals. (3) 1-1-77 Send report to LASL Respirator Advisory Committee; initiate tests on second ERDA contractor

respirator. (4) 2-1-77 Begin stress testing. (5) 8-1-77 Finish testing. (6) 9-1-77 Write report. (7) 4-1-77 Advisory Committee meeting regarding respirator test reports. (8) 6-1-77 Advise DSSC of committee decisions; initiate tests on third ERDA contractor respirator. (9) 9-1-77 Send results to committee.
KWORDS: RESPIRATORS;RADIATION PROTECTION;MONITORING;MAN;STANDARDS;BIOLOGICAL EFFECTS;AEROSOLS;INHALATION;RESPIRATION

<084062>
TITLE: Aerosol Sampling and Characterization for Hazard Evaluation
PROJECT NUMBER: 600015
PRINCIPAL INVESTIGATOR: Ettinger, H.J.
ADDRESS: Industrial Hygiene Group (MS486), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Ross, Donald M.
TELEPHONE: F233-3331
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (35%);NUCLEAR/Fission (40%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (10%);PARTICULATES (90%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (85%);DEVELOPMENT/Laboratory scale (15%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To evaluate air sampling procedures utilized in plutonium work areas; to develop air sampling strategies that provide the best estimate of worker exposure at a reasonable cost; to develop sampling procedures for plutonium that provide estimates of particle size and solubility; and to develop a course in air sampling methods for persons responsible for ensuring healthful work environments in ERDA facilities.
APPROACH: Determine correlations between air sampling data and bioassay data; evaluate current air sampling procedures and determine validity of current procedures for determination of inhalation hazards; and develop and evaluate air sampling instruments for determination of particle size and solubility.
RESULTS: Provide instrumentation and procedures that give reasonable estimates of inhalation hazards in work areas with potential releases of radioactive particulates.
PROJECT MILESTONES: (1) 6-1-76 Complete study of ventilated patterns in plutonium areas. (2) 12-1-76 Relate plutonium solubility to particle size. (3) 9-1-77 Develop recommended sampling strategies. (4) 6-1-78 Develop criteria for central sampling systems. (5) Continuing aerosol training.
KEYWORDS: AIR SAMPLERS;SPECIFICATIONS;PLUTONIUM ISOTOPES;INHALATION;DATA;BIOASSAY;HAZARDS;PARTICLE SIZE;RADIOACTIVE AEROSOLS;OCCUPATIONS;AIR POLLUTION;RADIOACTIVE EFFLUENTS;EMISSION;SAMPLING

<084063>
TITLE: Ventilation Systems Analysis under Tornado Conditions
PROJECT NUMBER: 600019
PRINCIPAL INVESTIGATOR: Gregory, W.S.
ADDRESS: WX-8 (MS928), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Brown, Blake P.
TELEPHONE: F233-3133
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);DEVELOPMENT/Laboratory scale (80%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To establish the capability of predicting the air flow in the ventilation system of a plutonium reprocessing facility due to tornado accident conditions.
APPROACH: Existing analytical methods of determining flow of air through ventilation system components will be utilized in development of a computer code.
RESULTS: A suitably accurate computer code for flow prediction will be available to the user so that the effects of tornado depressurization upon the ventilation system can be evaluated.
PROJECT MILESTONES: (1) 3-1-75 Interim Report, Los Alamos Scientific Laboratory LA-5894-PR. (2) 11-1-75 Interim Report, Los Alamos Scientific Laboratory LA-6120-PR. (3) 4-1-76 Interim Report, Los Alamos Scientific Laboratory LA-6293-PR.
KEYWORDS: FUEL REPROCESSING PLANTS;VENTILATION;TORNADOES;COMPUTER CODES;FORECASTING;DEPRESSURIZATION;RADIOACTIVE AEROSOLS;RADIONUCLIDE MIGRATION;PLUTONIUM;RADIATION PROTECTION

<084066>
TITLE: Contamination Limits for Property
PROJECT NUMBER: 600088
PRINCIPAL INVESTIGATOR: Healy, J.W.
ADDRESS: LASL-Health Division MS 690, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Baker, K.R.
TELEPHONE: F233-5615
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY

PROJECT DESCRIPTION: To derive methods for obtaining rational limits for radioactive contamination on or in property to be disposed of to the public.
APPROACH: Derivation and justification of a guide for U and Ra in soils of land to be returned to the public and the study of a rational method for deriving guides for surface contamination of items to be released to the public.
RESULTS: Guidelines for U and Ra in soils. Continued effort on methodology for assessing risk from surface contamination.
PROJECT MILESTONES: FY77, review literature on Ra and U.
KEYWORDS: RADIOACTIVITY;CONTAMINATION;PUBLIC HEALTH;URANIUM;RADON;SOILS;INGESTION;INHALATION

<084068>
TITLE: Plutonium-Induced Mutation Frequency in Mammalian Cells
PROJECT NUMBER: 2438
PRINCIPAL INVESTIGATOR: Barnhart, B.J.
ADDRESS: Los Alamos Scientific Laboratory, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Somatic cell mutagenesis provides the basis for a relatively short-term (16- to 26-day) assessment of the mutagenic activity of physical and chemical agents. The availability of a simple, clean, and easy source of high LET radiation (i.e., plutonium alpha particles) developed at LASL permits the irradiation of large numbers of mammalian cells in culture.
APPROACH: A collection of temperature-sensitive (ts) mutants (ts with respect to growth) isolate in the Laboratory (Schedule 189 No. P330, RPIS No. 001877N) from Chinese hamster cell lines offers a realistic means for assessing the mutagenicity of high LET alpha radiation from a stabilized Pu-238 source. In addition to measuring the reversion frequencies of ts to wildtype, we plan to quantitate the reversion rates of glycine-requiring auxotrophs and forward mutations rates at the HGPRTase locus as a function of exposure to either low or high LET radiation.
RESULTS: In the next 6 to 12 months, we expect to obtain (1) a comparison of the relative effectiveness of 250-KVP x rays and plutonium on mutation frequency in revertant and forward mutation systems and (2) the general shape of the mutation frequency vs LET curve. These observations are of importance because they provide an experimental basis for judging the hazard associated with plutonium deposited in tissues with special reference to the gonads.
KEYWORDS: PLUTONIUM;TOXICITY;MUTATIONS;MUTAGENESIS;BIOLOGICAL MODELS;ALPHA PARTICLES;X RADIATION;BIOLOGICAL ACCUMULATION;RADIONUCLIDE KINETICS;PLUTONIUM 238;HAMSTERS

<084070>
TITLE: Development of Computer Analysis Methods
PROJECT NUMBER: 800044
PRINCIPAL INVESTIGATOR: Neudecker, J.W.
ADDRESS: Los Alamos Scientific Laboratory, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology, Transportation Branch
MONITOR: Sisler, James A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-W-7405-Eng-36;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This project is directed toward the promotion of a better understanding of the impact phenomena and the development of better techniques of evaluating the behavior of Type B packages subjected to impact loading. The study will address the milestone topics.
APPROACH: Calculational techniques to different mathematical models using a range of material properties. Specifically: (1) evaluate existing analysis methods for each specific load configuration; (2) identify material property needs; and (3) select procedures and develop analysis techniques for application to particular needs.
RESULTS: Expand the safety and integrity features of shipping containers that can be proven by analysis, rather than test.
KEYWORDS: CASKS;CONTAINERS;SPENT FUEL CASKS;TRANSPORT;MECHANICAL PROPERTIES;COMPUTER CALCULATIONS;PACKAGING;RADIOACTIVE MATERIALS;MATHEMATICAL MODELS;IMPACT STRENGTH;SAFETY

<084071>
TITLE: Trace Elements Characterization and Removal/Recovery from Coal and Coal Wastes
OJECT NUMBER: 800059
INCIPAL INVESTIGATOR: Wewerka, E.M.
ADDRESS: Physical Chemistry and Metallurgy Group (MS734), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Los Alamos Scientific Lab., N.Mex. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency FY77:$1,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objective of this investigation is to assess the potential for environmental pollution from trace or minor elements which are discharged or emitted from stored coals or coal processing wastes and to begin to identify suitable environmental control measures, should they be needed. In addition, effluents from raw and cleaned coals will be examined for evidence of contamination by organic components.
APPROACH: To accomplish the program objectives, both laboratory and field investigations are being conducted. Appropriate coals, coal wastes, and climatic and storage conditions have been identified, and representative samples have been collected from the field. The trace elements, minerals, and organic matter of these materials are being characterized, and a preliminary identification of the components of potential concern will be made. In addition, the effects of weathering and aqueous leaching on the trace elements in the various coals and coal wastes are now being investigated in the field and under simulated environmental conditions in the laboratory.
RESULTS: This information will be used to delineate both the character and extent of specific environmental problems from the trace elements associated with coals and coal processing wastes. The latter stages of the program will be directed to identifying methods for controlling or preventing contamination from the trace elements and organic matter in coals and coal wastes. Finally, methods will be evaluated for economically recovering useful minerals or trace elements from coal refuse materials.
PROJECT MILESTONES: (1) FY 1976-FY 1976T Coal types, storage conditions, and environmental parameters identified. (2) FY 1977 Laboratory studies of weathering and leaching of selected coals conducted and field studies initiated. (3) FY 1978 Feasibility studies to be started.
KEYWORDS: COAL;STORAGE;ENVIRONMENTAL IMPACTS;POLLUTION CONTROL;TRACE AMOUNTS;ORGANIC COMPOUNDS;WEATHER;LEACHING;OXIDATION;STORAGE;CLIMATES;MATERIALS RECOVERY;ZINC;PROCESS CONTROL;ECONOMICS;ALUMINIUM;IRON;COBALT;MANGANESE;WASTE MANAGEMENT

<084074>
TITLE: Toxicity of Oil Shale Products, Including Metabolism and Carcinogenicity
PROJECT NUMBER: 002525
PRINCIPAL INVESTIGATOR: Holland, L.M.
ADDRESS: Mammalian Biology Group, Los Alamos Scientific Laboratory, Los Alamos, NM
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, M.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (40%);PROCESSING, CONVERSION (40%);WASTE MANAGEMENT (20%)
POLLUTANTS: PARTICULATES/Raw and spent shale (50%);ORGANICS/PAH;ORGANICS/Shale oil vapor (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Green River Formation
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The long-term goals of this relatively new program may be summarized as follows: (1) obtain samples of the potentially hazardous materials associated with oil shale mining and various processing stages and prepare them in a form suitable for exposure of small laboratory animals; (2) expose the animals by the relevant routes and study both nonlethal and lethal toxic effects; (3) determine by chemical analysis the tissue distribution of the applied substances, possibly including their metabolic products; (4) observe tissues microscopically and biochemically to determine the site and mode of toxic action, including tumor formation; and (5) assess the results in terms of existing or proposed acceptable exposure limits for the workers and the population. The description of the detailed program will follow this order of scientific progression.
APPROACH: Inhalation exposures of Syrian hamsters to both raw and spent shale were begun in mid-1976. Aerosol concentrations ranged from 13 mg/cubic m to 150 mg/cubic m respirable mass, and exposure times varied from a few hours to several weeks. Aerosols were generated from a Wright dust feed after material obtained from the Laramie Energy Research Center (LERC) was reduced to a fine dust by ball-milling. In an effort to deliver more precise doses and to enhance the response, several groups of animals were also exposed to suspensions of the same aerosolized shale material by intratracheal installation. Experiments involving intestinal tract exposure and skin and eye irritation will also be initiated. Fibrogenesis and carcinogenesis are the biomedical end points of primary interest in this program and will be studied by standard methods (e.g., histopathology, histochemistry, hematology, and blood chemistry). Immunological competence will also be tested. Except for those sacrificed for specific studies, most animals in these early groups are still alive, and definitive results cannot be reported. Early histopathology observations on the inhalation animals have shown a minimal response to oil shale, with a slight increase in macrophage activity being the only change noted. When the material is given in large amounts by direct tracheal intubation, macrophage response is more pronounced. One arimal
KEYWORDS: EFFLUENTS;EMISSIONS;FATE;OIL SHALES;OIL SHALE MINING;OIL SHALE INDUSTRY;LABORATORY ANIMALS;HEALTH HAZARDS;TOXICITY;CHEMICAL ANALYSIS;TISSUE DISTRIBUTION;NEOPLASMS;PERSONNEL;HUMAN POPULATIONS;DOSE LIMITS;HAMSTERS;INHALATION;AEROSOLS;DUSTS;GASTROINTESTINAL TRACT;SKIN;EYES;CARCINOGENESIS;IMMUNITY;POLLUTION;HYDROCARBONS;IN VIVO;SYNTHETIC FUELS

<084075>
TITLE: Critical Review and Assessment of Hydrogen Energy Economy Transportation Safety Problems
PROJECT NUMBER: 800128
PRINCIPAL INVESTIGATOR: Edeskuty, F.
ADDRESS: LASL, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Counts, J.
TELEPHONE: F233-5438
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: CONSERVATION/General (50%);CONSERVATION/Energy storage (50%)
ENERGY CYCLE: TRANSPORTATION (75%);STORAGE (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Project summary: The many desirable uses for hydrogen as a fuel all involve hydrogen safety problems. This project is designed to assist in evaluating the possibility of a hydrogen economy by performing a detailed review and study of all factors leading to transportation safety problems. Thus, the overall objective of the project is to define thoroughly the transportation safety problems and to recommend analytical and experimental problems that will lead to satisfactory solutions.
APPROACH: A working relationship will be established with organizations in government and industry competent in the handling and transportation of hydrogen gas and lithium hydride. The safety problems associated with any new materials and construction techniques will be identified and assessed.
RESULTS: The transportation safety problems leading to effective solutions will be recommended. A comprehensive report will be issued that identifies hydrogen transportation safety problems and recommends future analytical and experimental programs for their solution.
KEYWORDS: HYDROGEN FUELS;TRANSPORT;SAFETY

<084076>
TITLE: Environmental Control Technology Implications of Magnetic Fields
PROJECT NUMBER: 800191
PRINCIPAL INVESTIGATOR: Hassenzahl, W.V.
ADDRESS: Q-10 MS 764, Los Alamos Scientific Lab., Los Alamos, NM 87544
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas
TELEPHONE: F233-5587
TYPE OF FUNDING: Contract No.-A591
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/Fusion Magnetic (30%);CONSERVATION/Energy storage (40%)
ENERGY CYCLE: STORAGE (40%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (30%)
POLLUTANTS: RADIATION (80%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Several advanced technologies are being developed which are applicable as alternatives to existing energy system components. Among these technologies are nuclear fusion using magnetic confinement, magnetohydrodynamics for power generation, and superconducting magnets for energy storage. The magnets associated with these technologies are unshielded and, for the superconducting types, fields up to 10 Tesla can be generated (1 Tesla = 10,000 Gauss). This program will assess ways of controlling or limiting the magnetic fields beyond the site boundaries.
APPROACH: We will first establish magnetic field levels as a function of distance from various energy related devices including SMES magnets, MHD power sources, and fusion reactors. After this is completed we plan to determine types of control technologies which may be used to limit the fields. These technologies will include but not be restricted to: (a) shield coils, (b) ferromagnetic materials, and (c) fence placement.
RESULTS: We will estimate the cost of shielding the various devices described above to acceptable levels. As the acceptable level is not known, this task must be done in the form of tables and graphs in which the acceptable field is a variable.
PROJECT MILESTONES: A final report will be prepared by October 31, 1977.
KEYWORDS: MAGNETIC FIELDS;ELECTROMAGNETIC RADIATION;ENVIRONMENTAL IMPACTS;CONTROL;AIR POLLUTION CONTROL;LAND POLLUTION CONTROL;TECHNOLOGY ASSESSMENT;MAGNETOHYDRODYNAMICS;SHIELDING;SUPERCONDUCTING MAGNETS;MAGNETIC SHIELDING;POWER GENERATION;ECONOMICS;THERMONUCLEAR REACTIONS;SAFETY

<084077>
TITLE: Transport of Toxic Solar Energy Working Fluids Released to the Atmosphere: Information Requirements
PROJECT NUMBER: 002567
PRINCIPAL INVESTIGATOR: Barr, S.
ADDRESS: P.O. Box 1663, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research, Environmental Programs
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-W-7405-ENG-36;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$13,000
TECHNOLOGY: SOLAR/Direct heat - cool (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The purpose of this study is to determine the magnitude and nature of hazards resulting from the accidental release of solar heating and cooling working fluids.

APPROACH: A review of installations, materials, properties and toxicities, and possible release events will be conducted.
RESULTS: The results will identify the hazards to humans and to the environment resulting from releases of solar working fluids and will indicate information needs.
KWORDS: WORKING FLUIDS;ACCIDENTS;HAZARDS;SOLAR HEATING;ENVIRONMENTAL EFFECTS;AIR POLLUTION;ECOSYSTEMS

<084078>
TITLE: Potential Effects of Solar System Working Fluids as Ecosystem Contaminants
PROJECT NUMBER: 002568
PRINCIPAL INVESTIGATOR: Wilson, D.
ADDRESS: P.O. Box 1663, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-W-7405-ENG-36;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$38,000
TECHNOLOGY: SOLAR/Direct heat - cool (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to test working fluids used in solar heating and cooling for their toxicity to vegetation and microflora and for their potential to enter ground water.
APPROACH: Experimental studies using different plant species and soil types will be employed.
RESULTS: The results should identify the working fluids which are toxic and the pathways of movement of these substances in the environment.
KEYWORDS: WORKING FLUIDS;SOLAR HEATING;TOXICITY;PLANTS;POLLUTION;GROUND WATER;SOILS;WASTES

Energy Research and Development Administration/Oak Ridge National Laboratory

<085002>
TITLE: Late Effects of Single, Fractionated and Protracted Exposures to Fission Neutrons and Gamma Rays
PROJECT NUMBER: 000143
PRINCIPAL INVESTIGATOR: Ullrich, R.L.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$350,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to examine the effects of dose, dose-rate and radiation quality in the development of late somatic effect, particularly neoplastic development, as well as their mechanistic basis in order to provide information necessary for the establishment of risk estimates in man for exposures to ionizing radiation.
APPROACH: In these experiments emphasis is being placed on the evaluation of the dose and dose rate relationships for carcinogenesis with high LET radiation and the ability of the host to respond to, modify, and/or repair the radiocarcinogenic injury induced. The host factors to be considered include cell killing, changes in cell kinetics, intercellular and intracellular repair, as well as the influence of the immune system on host-tumor interactions.
RESULTS: These experiments will provide important information necessary for the establishment of reasonable and reliable human risk estimates.
PROJECT MILESTONES: (1) Jan. 30, 1977 Report on dose response relationships for lung tumor induction with neutrons and the influence of repair on induction. (2) Jan. 30, 1977 Report on influence of dose and dose rate on neoplastic development in Balb/c mice, decide systems to examine in detail. (3) June 30, 1977 Report influence of radiation on host tumor interactions. (4) Jan. 30, 1978 Report influence of dose rate on lung tumor development after neutron irradiation. (5) Jan. 30, 1978 Report influence of dose rate on thymic lymphoma induction and importance of cell killing, cell kinetics and repair on induction. (6) June 30, 1978 Report on components of immune system involved in host-tumor interactions.
KEYWORDS: CANCER;FISSION NEUTRONS;GAMMA RADIATION;ACUTE IRRADIATION;CHRONIC IRRADIATION;FRACTIONATED IRRADIATION;DOSE RATES;DOSE-RESPONSE RELATIONSHIPS;RADIATION QUALITY;DELAYED RADIATION EFFECTS;NEOPLASMS;RADIOINDUCTION;CARCINOGENESIS;BIOLOGICAL REPAIR;IMMUNE REACTIONS;LUNGS;THYMUS;IMMUNOLOGY;PATHOGENESIS;TISSUES;LET

<085003>
TITLE: RNA Tumor Virus, Environmental Carcinogen Oncogenesis
PROJECT NUMBER: 000145
PRINCIPAL INVESTIGATOR: Tennant, R.W.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$139,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);NUCLEAR/General (50%)

POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The principal somatic hazard of chemicals (polycyclic hydrocarbons, nitrosamines, etc.) and radiation, as products of energy generation and utilization, is of course, cancer. This research program is concerned with the induction of cancer by these environmental hazards as they relate to endogenous RNA tumor viruses, which can also act alone as a carcinogen. It is important to determine if chemicals and radiation act as carcinogens primarily through interaction with endogenous RNA tumor viruses, and to determine the mechanisms by which such interactions may occur. It has been difficult to directly implicate endogenous viruses in radiation-chemical carcinogenesis because these viruses are regulated by normal cell control mechanisms. Therefore, whether the carcinogenic potential of chemicals or radiation is due to one or several mechanisms, the role of the endogenous viruses and cellular controls must be considered as interacting factors. The nature and mechanism(s) of these complex interactions form the basis of this proposal.
APPROACH: The research program is divided into three complementary approaches: (1) the mechanism of radiation and chemical activation of endogenous tumor viruses in cells culture; (2) the potential role of endogenous RNA tumor virus activation by chemical carcinogens in cell culture transformation, and (3) the mechanism of cellular control over RNA tumor virus expression and tumorigenesis.
RESULTS: We believe that extension of these studies in FY 1978 will contribute to understanding the control of viral tumorigenesis.
PROJECT MILESTONES: October 1978 Complete Phase II objectives.
KEYWORDS: CANCER;HYDROCARBONS;ORGANIC NITROGEN COMPOUNDS;HEALTH HAZARDS;MAN;VIRUSES;CARCINOGENESIS;IONIZING RADIATIONS;CELL CULTURES;CARCINOGENS;BIOASSAY;GAMMA RADIATION;ANIMAL CELLS;GENETICS;VIRUSES

<085004>
TITLE: Mechanisms of Radiation Carcinogenesis and Life Shortening
PROJECT NUMBER: 000146
PRINCIPAL INVESTIGATOR: Holland, J.M.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$330,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (20%);GENERAL SCIENCE (40%)
POLLUTANTS: ORGANICS (20%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To define quantitative dose response relationships for tumor induction or acceleration in mice exposed topically and systemically to carcinogenic hydrocarbons applied singly and in combination. To establish the physiologic basis for differences in sensitivity between inbred mouse strains as a means of estimating the range of expected human response variation.
APPROACH: Using the well characterized, sensitive and precise mouse skin bioassay, pure carcinogenic hydrocarbons will be tested at various concentrations to establish the form of the relationship between dose and response. Dose variables will include total dose, dose rate and exposure interval. Response variables will include strain and sex differences as well as tumor induction time (latency), tumor type and biological behavior. Interaction between specific hydrocarbons will be assessed by comparing the response obtained using equimolar mixture and that obtained over the same concentration range from each compound separately.
RESULTS: Knowledge of the mathematical relationship between dose and response combined with information concerning the physiologic basis for differences in response threshold will contribute to defining the risk potential associated with an increase, either in the number of persons exposed to the same or similar compounds or to an increase in the concentrations of compounds to which a smaller, occupationally exposed population might conceivably be exposed.
PROJECT MILESTONES: (1) July 1976 Report on importance of the ovary as a modifier of chronic radiation effects. (2) Aug. 1976 Report defining interaction between a chemical mutagen and x-rays. (3) Nov. 1976 Report on strain differences in absolute sensitivity to ovarian tumorigenesis. (4) July 1977 Report on carcinogenic interaction between DEN and x-rays. (5) Aug. 1977 Report on health effects of surface exposure to epoxy resins. (6) Nov. 1977 Define the high dose region of the hydrocarbon dose response curve. (7) June 1978 Preliminary information on the hydrocarbon dose response curve.
KEYWORDS: CANCER;IONIZING RADIATIONS;ACUTE IRRADIATION;PARTIAL BODY IRRADIATION;WHOLE-BODY IRRADIATION;BIOLOGICAL RADIATION EFFECTS;LIVER;KIDNEYS;OVARIES;AGE DEPENDENCE;SEX;GENETICS;NEOPLASMS;RADIOINDUCTION;MICE;CARCINOGENESIS;AGING;ANIMALS;CARCINOGENS;GENETICS;HORMONES

<085005>
TITLE: Pathology; Physiology, General
PROJECT NUMBER: 000147
PRINCIPAL INVESTIGATOR: Cosgrove, G.E.;Gude, W.D.;Odell, T.T.;Clapp, N.K.;Tyndall, R.L.;Davidson, K.A.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$451,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS: ORGANICS (35%);RADIATION (65%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project includes a variety of investigations concerned with effects of chemicals and ionizing radiation on animals. The interaction of radiation and carcinogenic chemicals, as well as the effects of chemical modifiers on the induction of tumors in mice is the subject of one investigation. Another deals with alterations in esterases as the basis for an assay of potential carcinogenic chemicals. Another is concerned with the effects of ionizing radiation on very early stages of mouse embryos.

APPROACH: The test systems are inbred strains of mice in most cases. Mice are exposed to gamma or neutron irradiation, or are treated with chemicals by injection or by addition to their drinking water or food. Exposure to radiation is usually acute in these particular experiments while exposure to chemicals is for a period of a week to several months.
RESULTS: These studies are all directed toward providing information in animal models that will enlarge our understanding of the health effects of environmental pollutants. They may also provide useful assay systems, and also suggest means of ameliorating deleterious effects of various environmental agents.
PROJECT MILESTONES: (1) June 30, 1977 Data on the effect of the antioxidant BHT on life shortening, leukemogenesis and tumorigenesis induced by DEN and x-rays will be reported. (2) June 30, 1977 Report of additional data on the use of plasma esterase changes as an assay for organic pollutants of the environment. (3) September 30, 1977 Report on effects of ionizing radiation and organics on endocrine and immune systems.
KEYWORDS: CANCER;IONIZING RADIATIONS;CARCINOGENS;BIOLOGICAL RADIATION EFFECTS;EMBRYOS;MICE;ESTERASES;BIOLOGICAL EFFECTS;NEOPLASMS;RADIOINDUCTION;BIOLOGICAL LOCALIZATION;DISEASES;ENZYMES

<085006>
TITLE: Medium (Low) Level, Long-Term Effects of Radiation
PROJECT NUMBER: 000148
PRINCIPAL INVESTIGATOR: Cosgrove, G.E.;Storer, J.B.;Ullrich, R.L.;Odell, T.T.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$215,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective is to investigate the late somatic effects (tumor induction, degenerative diseases, life shortening) of gamma irradiation delivered at low and high dose rates in inbred mice, and to determine to what degree gamma irradiation is less effective when delivered at a low dose rate.
APPROACH: RFM and Balb/c mice have been exposed to a Cs-137 gamma source acutely or at rates as low as 1 rad/day to a cumulative dose of up to 300 rads. Gross autopsies are done when the mice are moribund or at death. Slides are prepared of various organs and tissues and histopathologic examinations are made.
RESULTS: Data on tumor incidence, degenerative diseases and life shortening will be collected and analyzed. These results are important in the establishment of risk estimates for human exposures to ionizing radiation.
PROJECT MILESTONES: (1) November 30, 1976 Report on the dose-response relationship for reticular tissue neoplasms. (2) June 30, 1977 Report on pathogenic effects of gamma rays delivered to mice at 8.3 rads/day. (3) October 30, 1977 Report on the interactions between radiation and ovariectomy in the production of late somatic effects by gamma radiation.
KEYWORDS: CANCER;GAMMA RADIATION;LOW DOSE IRRADIATION;DOSE RATES;MICE;DELAYED RADIATION EFFECTS;NEOPLASMS;RADIOINDUCTION;LIFE SPAN;ANIMALS;PATHOGENESIS;SOMATIC MUTATIONS

<085007>
TITLE: Physiology of Blood Platelets
PROJECT NUMBER: 000151
PRINCIPAL INVESTIGATOR: Odell, T.T.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$152,000
TECHNOLOGY: NUCLEAR/General (10%);GENERAL SCIENCE (90%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The central objective of this project is to gain a more thorough understanding of both the maturation and the regulation of rapidly-proliferating cells of the blood-forming tissues. We have concentrated our efforts on the megakaryocyte-platelet system. Knowledge of this system will strengthen our understanding of normal control of cell growth and differentiation. In addition, it may provide insight needed to promote recovery when the system is malfunctioning, and to understand the pathogenesis of diseases of the blood-forming system.
APPROACH: These studies of megakaryocytopoiesis and platelet production are carried out in rats and in mice. In some experiments animals are injected with antiplatelet serum to produce thrombocytopenia so that the manner in which the system responds to a need for platelets can be studied. In other experiments tritiated thymidine is injected to determine which cells of the maturing megakaryocyte population are undergoing synthesis of DNA. The effects of presumptive thrombopoietic agents on maturation steps in megakaryocytopoiesis will be studied.
RESULTS: Expect to have data relating to the regulation of megakaryocytopoiesis, and to the response of megakaryocytopoiesis in altered physiologic conditions.
PROJECT MILESTONES: (1) July 30, 1976 Completion of a manuscript on the effects of thrombocytopenia on the endomitotic index of mouse megakaryocytes. (2) September 30, 1976 Completion of data collection on an exploratory experiment on the effects of a presumptive thrombopoietic agent on the endomitotic index of mouse megakaryocytes. (3) November 30, 1976 Results of preliminary tests of effects of plasma from platelet poor donors on the megakaryocytopoiesis of rats.
KEYWORDS: REGULATION;HEMIC DISEASES;PATHOGENESIS;BLOOD PLATELETS;PHYSIOLOGY;BLOOD FORMATION;MICE;RATS;BONE MARROW CELLS;MITOTIC INDEX;ANIMALS;BLOOD;IN VIVO;HEMATOLOGY

<085008>
TITLE: Developmental Biochemistry
PROJECT NUMBER: 000154
PRINCIPAL INVESTIGATOR: Finamore, F.J.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To isolate, identify, and study the mode of action of organic neurotoxins involved in energy production.
APPROACH: The toxins will be isolated by high pressure liquid chromatography, identified by gas chromatography or gas chromatography-mass spectroscopy, and their mode of action studied using biochemical techniques.
RESULTS: We expect to find some substituted phenols much more neurotoxic than phenol itself, and some chlorinated phenols that will tend to persist in organisms, perhaps also in man. If acetylcholinesterase inhibition is involved, it should be possible to set up an assay for human toxicity in vitro. We also expect to determine the effect of chlorination on fish pheromones, as it would occur in cooling waters.
PROJECT MILESTONES: (1) Sept. 1, 1977 Isolation of toxic pheromone analog from tung oil. (2) Sept. 1, 1977 Confirmation or rejection of hypothesis that the mode of action of neurotoxic phenols acts through acetylcholinesterase inhibition.
KEYWORDS: PHENOLS;ENERGY CONVERSION;HEALTH HAZARDS;CHLORINE;BIOCHEMISTRY;ORGANIC CHLORINE COMPOUNDS;COOLING;FISHES;MAN;BIOCHEMICAL REACTION KINETICS

<085010>
TITLE: Growth and Regeneration
PROJECT NUMBER: 000158
PRINCIPAL INVESTIGATOR: Skinner, D.M.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$135,000
TECHNOLOGY: CONSERVATION/General (20%);GENERAL SCIENCE (80%)
POLLUTANTS: RADIATION (80%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Radiation and other environmental insults not only have genetic and long-term effects on living creatures but also affect their development. Crustacea comprise more than 70% of marine plankton and are, in freshwater as well as in the ocean, an important link in the food chain. In addition they are in themselves an important edible species for humans in some parts of the world. With our new methods of triggering, stopping and reinitiating precocious, apparently completely normal molts, the growth cycle of Crustacea is now under the experimenter's control, making these animals useful objects for biological, biochemical, biophysical and ecological experiments. The research of the Growth and Regeneration group is specifically directed towards: (1) determination of the biological role of crustacean satellite DNAs, (2) control of molting and attendant phenomena in crustaceans and (3) the study of degeneration and regeneration of crustacean limbs.
APPROACH: The sequences of satellite DNAs are being studied by degrading primary RNA transcripts of the separated strands and identifying the oligo- and mononucleotide products. The biological role of satellites (i.e., the interaction of the separated strands of satellites) with double stranded DNAs is being explored by centrifugation of various types of gradients. The interaction between molting and regeneration studies are being pursued using parabiotic animals triggered to undergo precocious molts by limb autotomy.
RESULTS: The L-(light) strand of the hermit crab (Pagurus pollicaris) satellite II is composed of 33% C, 29% G, 27% A, and 12% T. Preliminary evidence indicates that a major sequence (58%) is GAC; other data indicate that this trimer is preceded by TC. H-(heavy) strand RNA transcripts so far analyzed (happily) have the complementary sequences. The H- and L-strands of guinea pig alpha-satellite associate with all naturally occurring double-stranded DNAs thus far studied.
PROJECT MILESTONES: The L-(light) strand of the hermit crab (Pagurus pollicaris) satellite II is composed of 33 percent C, 29 percent G, 27 percent A, and 12 percent T. Preliminary evidence indicates that a major sequence (58 percent) is GAC; other data indicate that this trimer is preceded by TC. H-(heavy) strand RNA transcripts so far analyzed (happily) have the complementary sequences. The H- and L-strands of guinea pig alpha-satellite associate with all naturally occurring double-strand DNAs thus far studied. (1) By 1977 the primary sequence of several satellites should have been determined and published. (2) The type of association observed between the separated single-strands of guinea pig and possibly mouse satellites and double-stranded DNAs should have been determined and published by 1977. (3) By using parabiotic crabs, we should be able to definitively establish whether the interaction between regeneration and molting is hormonally controlled. This should be completed by 1977.
KEYWORDS: CRUSTACEANS;BIOLOGICAL REGENERATION;GROWTH;DNA;RNA;BIOCHEMISTRY;GUINEA PIGS;MICE;HORMONES;INVERTEBRATES

<085011>
TITLE: Biostatistics and Biomathematics
PROJECT NUMBER: 000159
PRINCIPAL INVESTIGATOR: Gardiner, D.A.
ADDRESS: Union Carbide Corp., Nuclear Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To improve research programs in the Biology, Environmental Sciences, and Health Physics Divisions of ORNL through collaboration with our statisticians and mathematicians. (2) To conduct research in statistics and mathematics on basic principles and on problems arising in our collaboration.
APPROACH: Life scientists are given assistance in planning, conducting, analyzing and interpreting their investigations. This is accomplished by the application of a broad spectrum of statistical and mathematical methods and theory to their experiments and surveys. The research is accomplished through the independent and joint efforts of our professional staff to improve existing methodology and to discover new methods and principles. Computers are used effectively to aid both applied and basic research.
RESULTS: The use of appropriate statistical principles in design and planning will result in the completion of investigations in the life sciences with a maximum of valid information at a minimum cost of labor, materials and facilities. Statistical and mathematical analyses will result in extracting and quantifying information from investigations. The statistical and mathematical research will continue to produce publications and applications.
PROJECT MILESTONES: Mathematics and Statistics Research Department Annual Reports 7-1-76, 7-1-77. Biology Division Annual Reports 12-31-76, 12-31-77. Environmental Sciences Division Annual Reports 9-30-76, 9-30-77. Health Physics Division Annual Reports 7-31-76, 7-31-77
KEYWORDS: RISK;BIOLOGY;ENVIRONMENT;RADIATION PROTECTION;STATISTICS;MATHEMATICS;RESEARCH PROGRAMS;CARCINOGENS;CHEMICAL EFFLUENTS;MUTAGENESIS

<085012>
TITLE: Radiation Biophysics
PROJECT NUMBER: 000162
PRINCIPAL INVESTIGATOR: Cook, J.S.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The proposed investigation is directed toward understanding the biochemical basis for death of ultraviolet (UV) irradiated Escherichia coli and the mechanisms that cells use to repair damaged DNA. The work on cell death is based on the hypothesis that radiation causes derepression of operons and leads to irreversible physiological changes such as cessation of respiration. The biochemical steps leading to these changes and the control processes involved are being studied. The molecular basis of DNA repair, which may be closely coupled to irreversible physiological changes such as mutation and cell death is being studied in order to determine (a) the roles of various damage-specific endonucleases in DNA repair, (b) identification of enzymes involved in the excision of damaged DNA regions and (c) the role of various DNA polymerases in resynthesizing the excised region without introduction of mutations.
APPROACH: Column chromatography, including DNA cellulose affinity columns, will be used to purify enzymes (from E. coli and M. luteus) responsible for recognition of damage introduced by ultraviolet and gamma irradiation. The substrate specificity of these enzymes will be determined. In vitro systems (permeabilized E. coli cells and a T7 DNA replication system) will be used to study steps in repair of DNA subsequent to incision. The requirements of various enzymes and cofactors in the resynthesis step will be determined. Affinity chromatography techniques will be used to isolate altered pyridine nucleotide binding proteins from irradiated cells. We shall search for a radiation-induced enzyme that causes these alterations. With mutants deficient in cyclic AMP metabolism the respiratory control system will be studied.
RESULTS: Our product is fundamental information about how DNA is repaired and why cells die after being irradiated. We anticipate that the concepts emerging from this work will be applicable to radiation work on higher organisms and may lead to a rational basis for cancer radiation therapy, and to the understanding of the molecular basis of mutation caused by deleterious environmental hazards.
PROJECT MILESTONES: 9/77 Clarification of the role of cyclic AMP in radiation cell death by use of mutants deficient in cyclic AMP metabolism. Partial purification of enzymes involved in recognition of DNA damage. Determination of the role of various DNA polymerases in the resynthesis step of repair by the use of a model in vitro repair system. Comparison of the ability of live and dead cells separated from irradiated cultures to perform repair synthesis and postreplicational repair.
KEYWORDS: ULTRAVIOLET RADIATION;IRRADIATION;DNA;ESCHERICHIA COLI;RESPIRATION;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL REPAIR;AMP;ENZYMES;GENETICS;ANIMAL CELLS;CELL MEMBRANES;BACTERIA;NEOPLASMS;METABOLISM

<085014>
TITLE: Enzymology (Development of New or Improved Methods for the Isolation, Purification, Molecular Characterization and Mechanism of Action of Lymphokines)
PROJECT NUMBER: 000164
PRINCIPAL INVESTIGATOR: Novelli, G.D.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5€68
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$575,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We are trying to develop new and improved methods for the isolation, fractionation and purification of tumor-specific transfer factors, our collaborators in San Francisco identify donors for the preparation of TF by checking the lymphocytes of household contacts of the patient with the disease to see if any of the contacts have specific cytotoxic lymphocytes directed against a human tumor cell line of the same histological type as that of the patient's tumor. They then prepare a crude TF from a positive donor by a modification of the Lawrence procedure. They then ship the material to Oak Ridge where we attempt to purify it by various types of column chromatographic procedures. We are also trying to produce tumor specific TF in vitro by using a human lymphobastoid cell line that we obtained from Dr. Dimitri Viza that is reported to produce a specific TF when it is induced with a tumor specific TF.
APPROACH: We are taking advantage of the separations expertise that we developed during the past 10 to 12 years for the separation of amino acid specific transfer RNA, to guide our selection of the type of chromatographic columns and the operating parameters to purify TF and/or immune RNA. We have the cytotoxic assays set up in our own lab, that allows us to follow our fractionation procedures. Our own assays are confirmed independently in San Francisco, because we always ship them some of the fractionated material in order to compare results.
RESULTS: We expect to prepare several tumor-specific TF preparations in a high state of purity. At this point we hope to interest clinicians to use TF as another therapeutic modality to treat selected patients. It is also generally known that when lymphocytes are activated, they produce a variety of substances, called lymphokines, that have effects on other cells that are involved in the overall in vivo cellular immune response. If our in vitro system using the human lymphoblastoid cell line can be shown to act as reported, we expect to prepare a number of lymphokines in a high state of purity, which will be made available to the immunology community at large. Hopefully the availability of such materials for many immunologists might be useful in breaking down some of the clouds of mysticism that surround the field of cellular immunity.
PROJECT MILESTONES: (1) Jan. 15, 1977 Proof of relationship of transfer factor to immune RNA. (2) Sept. 15, 1977 Start large scale production of cancer specific transfer factor. (3) Jan. 15, 1978 Start production of one or more lymphokines of interest to the immunology community.
KEYWORDS: CANCER;GUINEA PIGS;TUMOR CELLS;IMMUNITY;RNA;PURIFICATION;CHROMATOGRAPHY;SOLVENT EXTRACTION;LYMPHOCYTES;NEOPLASMS;THERAPY;ENZYMES;BIOCHEMISTRY;IMMUNOLOGY;IN VITRO;IN VIVO

<085015>
TITLE: Nucleic Acid Enzymology of Normal and Viral-Infected Systems
PROJECT NUMBER: 000165
PRINCIPAL INVESTIGATOR: Volkin, E.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$425,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Studies of the enzymology of nucleic acids, particularly those of replication and transcription, are crucial to the elucidation of cellular control mechanisms operating in normal and viral-infected systems. Investigations are in progress using enzymes and mutants of both prokaryotic and eukaryotic systems. An understanding of replication and transcription processes is essential to the elucidation of the mechanisms of mutagenesis and carcinogenesis in relation to cellular regulatory systems.
APPROACH: DNA replication upon T5-phage infection is being studied by characterization of phage-induced DNA polymerase and other proteins. Knowledge gained is being applied to the eukaryote yeast. DNA replication during M13 phage infection, that closely resembles RNA tumor virus multiplication, is being intensively studied. Isolation and characterization of promoter regions in viral DNAs, that are involved in initiation of transcription and replication, are being actively pursued.
RESULTS: Protein factors involved in T5 DNA synthesis will be characterized to determine whether they are initiation or elongation factors. Their origin, whether host or phage induced, will be determined. Interaction of factors with primer-template DNA and with the polymerase will be studied in hopes of reconstituting the DNA replication system in vitro. The studies on dnaC, DNA ligase, 5' exonuclease and other host functions on M13 DNA replication sould be completed. An in vitro rolling circle system for M13 ss DNA synthesis would be developed. Studies with in vitro or semi in vitro system for SV40 or adenovirus DNA and RNA synthesis would be initiated. Further studies on human cell DNAases, particularly those possibly involved in restriction of foreign DNA, and DNA damaged after radiation and chemical insults, would be carried out. Studies of promoter and other active regions of single-stranded M13 DNA should be completed, providing a clearer picture of the functional topology of the M13 genome. Similar results are expected from studies with animal viral DNA. The hope to set up in vitro system for late T4 mRNA synthesis. The purified modified RNA polymerase will be used together with vegetative DNA from T4-infected cells. Other possible necessary factors, furnished by adding small amounts of a supernatant fraction from infected cells, will be characterized. By using various RNA tumor virus systems, we hope to learn more about the specificity of potential tRNAs and other RNAs as primers for viral RNA replication.
PROJECT MILESTONES: (1) T5 replication: Reconstitution of in vitro system 9-30-77. (2) Isolation of proteins

involved in yeast replication 9-30-78. (3) Host functions in M13 replication 6-30-77. (4) Setting up in vitro systems for SV40 replication and transcription 9-30-77. (5) In vitro system for late T4 synthesis 9-30-77. (6) Identification of primer molecules for tumor viral RNA replication 6-30-78.
YWORDS: NUCLEIC ACIDS;ENZYMES;MUTAGENESIS;CARCINOGENESIS;DNA;BIOSYNTHESIS;BACTERIOPHAGES;POLYMERASES;PROTEINS;HOMEOSTASIS; EASTS;BIOCHEMICAL REACTION KINETICS;NEOPLASMS;RNA;VIRUSES

<085016>
TITLE: Energy Transfer in Biosystems
PROJECT NUMBER: 000166
PRINCIPAL INVESTIGATOR: Pearlstein, R.M.
ADDRESS: Chemistry Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (5%);NUCLEAR/General (5%);SOLAR/Biomass (50%);GENERAL SCIENCE (40%)
ENERGY CYCLE: STORAGE (25%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (5%)
POLLUTANTS: METALS (2%);ORGANICS (5%);RADIATION (3%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Understanding excitation energy transfer in nucleic acids and photosynthetic lamellae.
APPROACH: For photosynthetic systems the approach includes: (1) the study of chlorophyll fluorescence in plants to get information about the first step in photosynthesis; (2) studies of fluorescence depolarization and other optical anisotropies involving photosynthetic pigments in oriented lamellar systems to determine orientational correlations of pigment molecules in vivo; (3) construction of refined theoretical models of excitation transfer among pigment molecules to determine whether the simple antenna-reaction center dichotomy holds for green plants; (4) isolation of green-plant chlorophyll-proteins and other photosynthetic membrane particles for photochemical and biochemical studies. Our approaches to the problems of singlet and triplet excitation transfer in nucleic acids include: (1) sensitized fluorescence and phosphorescence kinetic studies of nucleic acids with intercalated dyes; (2) fluorescence depolarization studies of nucleic acids; (3) calculation of fluorescence and phosphorescence quenching kinetics in one-dimensional model systems; (4) experimental studies of laser-excited absorption and fluorescence, and their theoretical interpretation.
RESULTS: Contributions to the development of (1) technologies for the conversion and storage of solar energy, and (2) new biophysical methods for measuring the effects of certain pollutants on the conformations of native nucleic-acid-containing structures such as chromosomes.
KEYWORDS: ENERGY MODELS;ENERGY CONVERSION;PLANTS;PHOTOSYNTHESIS;CHLOROPHYLL;PIGMENTS;MOLECULAR BIOLOGY;BIOCHEMISTRY;PROTEINS;PHOTOLUMINESCENCE;PHOTOCHEMISTRY;BIOCHEMICAL REACTION KINETICS;VISIBLE RADIATION;BIOMASS;MOLECULAR STRUCTURE;RNA;DNA;PLANT CELLS

<085017>
TITLE: Theoretical and Applied Cryobiology
PROJECT NUMBER: 000167
PRINCIPAL INVESTIGATOR: Mazur, P.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P. O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C. E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$263,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To develop quantitative understanding of responses of cells to freezing and thawing. (2) To determine mechanisms of freezing injury. (3) To measure cell osmotic and membrane properties. (4) To devise methods for the preservation in the frozen state of cells and tissues of biological, ecological, clinical, and agricultural interest.
APPROACH: (1) Determine survival as function of major cryobiological variables, such as cooling rate. (2) Characterize the physical state of the cell and its surroundings during freezing. (3) Combine experimental and theoretical approaches to determining the permeability of cells to critical solutes.
RESULTS: Completion of research and submission of papers on: (1) Permeability of mouse embryos to solutes and water. (2) Relationship between permeation and ability of embryos to survive freezing. (3) Significance of nucleation temperature in cryobiology. (4) Theoretical and quantitative optimization of dilution procedures for cells. (5) Analysis of cryobiological factors affecting survival of frozen-thawed fetal pancreases; insulin secretion by frozen-thawed pancreases. (6) Freezing of carp eggs for use in testing pollutants.
PROJECT MILESTONES: Completion of research and submission of papers on: (1) Permeability of mouse embryos to solutes and water. (2) Relationship between permeation and ability of embryos to survive freezing. (3) Significance of nucleation temperature in cryobiology. (4) Theoretical and quantitative optimization of dilution procedures for cells. (5) Analysis of cryobiological factors affecting survival of frozen-thawed fetal pancreases; insulin secretion by frozen-thawed pancreases. (6) Freezing of carp eggs for use in testing pollutants.
EYWORDS: CRYOBIOLOGY;ANIMAL CELLS;CRYOGENICS;FREEZING;OSMOSIS;CELL MEMBRANES;TISSUES;PRESERVATION;SURVIVAL TIME;PERMEABILITY;MICE;EMBRYOS;GENETICS;WATER;FOOD

<085019>
TITLE: Enzyme Regulation
PROJECT NUMBER: 000169
PRINCIPAL INVESTIGATOR: Jacobson, K.B.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$197,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (70%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Enzyme regulation is being studied from three points of view. One is to determine how certain enzymes that have undergone an alteration through mutation can be restored in their catalytic activity by a suppressor mutation. The second is to use hemoglobin and serum albumin as model proteins to study the mutagenic effect of x-rays and other mutagens. The third is to develop assays and procedures that will use enzymes to monitor the process of cancer initiation and development.
APPROACH: The suppressor mutation is presumed to exert its influence on four target genes in Drosophila melanogaster, through transfer RNA. The tRNAs of the suppressor mutant are being compared to those of wild type. In addition the biochemical abnormalities of each target gene is being studied. The mechanism of radiation mutagenesis in the mouse is being studied through changes that occur in hemoglobin and serum albumin. The mechanism of carcinogenesis will be studied through specific enzymes that are controlled by genes on the x-chromosome of the mouse. Three different enzymes are under study to determine their suitability for this purpose.
RESULTS: In the suppressor mutant I expect to find chromatographic and chemical differences between one of the tRNAs of suppressor mutant and wild type. In the study on mutagenic effects of x-rays I expect to find altered forms of hemoglobin and serum albumin at a frequency of 1/500 to 1/25,000. I also expect that such altered hemoglobin and serum albumin mutants will be useful as models of human hereditary abnormalities. The preparation of enzyme tools to study the carcinogenic process will result in a more detailed understanding of the three enzymes, alpha-galactosidase, glucose-6-phosphate dehydrogenase, and ornithine transcarbamylase, and in the production of mutants that have abnormal forms of these enzymes. These enzyme tools will allow us to determine whether a cancer originates in a single cell alteration or a change in many cells in the tissue affected.
PROJECT MILESTONES: Publish results of research in biochemical literature. (1) Tyrosyl-tRNA Synthetase: the basis for its specificity for tRNA Isoacceptors, Dec. 1976. (2) Alpha-galactosidase of the mouse: characteristics of the two electrophoretic forms, Dec. 1976. (3) Isolation and characterization of pteridines from heads of Drosophila melanogaster by a modified thin layer chromatography procedure, Sept. 1976. (4) Mechanism of suppression in Drosophila. V. Localization of the purple mutant of Drosophila melanogaster in the pteridine biosynthetic pathway, Sept. 1976. (5) Rapid, high resolution electrophoresis of hemoglobin on starch gel, Dec. 1976. (6) Mechanism of suppression in Drosophila, VI. Specificity and properties of tyrosyl-tRNA synthetase, July 1976. (7) A nonspecific inhibitory effect of tRNA on the activity of 3-deoxy-D-arabino-heptulosonate-7-phosphate synthase from Saccharomyces cerevisiae, Sept. 1976.
KEYWORDS: ENZYMES;METABOLISM;CATALYSIS;MUTATIONS;X RADIATION;BIOLOGICAL RADIATION EFFECTS;MUTAGENS;BIOLOGICAL EFFECTS;DROSOPHILA;RNA;MICE;HEMOGLOBIN;ALBUMINS;CARCINOGENESIS;GENES;RADIOINDUCTION;NEOPLASMS;GENETICS;BIOCHEMISTRY

<085020>
TITLE: ORCHIS, Extension for Environmental Information and Data
PROJECT NUMBER: 000170
PRINCIPAL INVESTIGATOR: Brooks, A.A.
ADDRESS: Union Carbide Corporation, Nuclear Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Albert, Ted M.
TELEPHONE: F233-3311
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To maintain the Oak Ridge Computerized Hierarchical Information System, the purpose of which is to provide general information support of R and D projects for the processing, analysis, retrieval and display of mixed alphanumeric information and numerical data.
APPROACH: Computerized processing of hierarchical data structure.
RESULTS: Computer software
KEYWORDS: INFORMATION PROCESSING;INFORMATION ANALYSIS;ENVIRONMENT;RADIOACTIVE EFFLUENTS;CHEMICAL EFFLUENTS;ENVIRONMENTAL EFFECTS;DIFFUSION;COMPUTER GRAPHICS;COMPUTER CODES;O CODES;INFORMATION

<085021>
TITLE: Mammalian Biochemical Genetics
PROJECT NUMBER: 000173
PRINCIPAL INVESTIGATOR: Popp, R.A.;Hirsch, G.P.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: A-W-7404-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: NUCLEAR/General (75%);GENERAL SCIENCE (25%)
POLLUTANTS: ORGANICS/Mutagens;ORGANICS/Chemotherapeutic agents (75%);RADIATION/X-ray (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: (1) Studies are being done to determine the quality and frequency of various kinds of genetic damage induced by x-rays at the hemoglobin loci in germinal cells of mice. This should provide a better understanding of the types and frequencies of events that are likely to be associated with mutations at the 7 specific loci extensively studied by W. L. russell. (2) Studies are being done to determine the influence of specific alleles on the general physiology of congenic strains of mice. (3) Methods are being developed to evaluate the mutational, toxic and physiological side effects of chemicals, such as immunosuppressant drugs. Mutations produce aberrant cells that may become cancerous and the incidence of tumors increases following treatment with immunosuppressant drugs, yet the inherent mutagenicity of many of these compounds has never been tested.
APPROACH: (1) Hemoglobins from mice that express x-ray induced mutations are being analyzed chemically to identify amino acid substitutions or complete absence of gene products resulting from nucleotide substitutions, frame shifts or deletion of genes at the hemoglobin loci. (2) Congenic strains of mice differ from one another at very restricted regions of the mouse genome; therefore, congenic mice are useful to study the effect of specific alleles on immunology, cellular differentiation and function, ageing, viral infection and pathological diseases. (3) Tests are being made to determine whether the mutagenicity of immunosuppressant compounds can be measured in vivo by analyzing the frequency of induced HGPRT/sup -/ colony forming stem cells in bone marrow. Depressed cellularity and stem cell survival, as well as measurements of recovery, are used to assess toxicity.
RESULTS: These studies will define the nature of x-ray and chemically induced mutations at restricted regions of the mouse genome in both germinal and somatic cells. The data will also permit comparisons of the effects of x-rays with various chemicals in somatic and germinal cells. If somatic cells reliably indicate the quality and extent of hazard of similar insults to germinal cells, then somatic cell mutational assays should be used more extensively for screening purposes because costs for somatic cell testing are considerably less than for germinal cell testing. Direct tests for the mutagenicity of a number of compounds already being used in humans should make us aware of the balance between the benefits and hazards of many chemicals that have not been adequately tested.
PROJECT MILESTONES: The chemical definition of the x-ray induced mouse hemoglobin mutants will be completed. Studies will proceed to determine whether the deficiency of expression of the alpha-chain gene product is due to gene inactivation or true deletion of the gene. These studies are being done in collaboration with Dr. French Anderson, NIHL. The effects of immunosuppressant drugs as potential mutagens on the hematopoietic stem cells will be studied.
KEYWORDS: GENETICS;X RADIATION;HEMOGLOBIN;MICE;GERM CELLS;MUTATIONS;RADIOINDUCTION;STEM CELLS;BIOLOGICAL RADIATION EFFECTS;BIOCHEMISTRY;SOMATIC MUTATIONS;GENETICS;IMMUNOLOGY;MUTAGENESIS

<085022>
TITLE: Mammalian Genetics
PROJECT NUMBER: 000174
PRINCIPAL INVESTIGATOR: Russell, W.L.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$1,300,000
TECHNOLOGY: NUCLEAR/General (80%);GENERAL SCIENCE (20%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Provision of fundamental information for the estimation of the genetic hazards of exposure of human beings to ionizing radiation.
APPROACH: Since none of the human data, not even the Hiroshima and Nagasaki studies, have provided information adequate for the estimation of genetic risks, the approach has been to do experimental work with mice. This long-term project is providing the most extensive set of data in the world on gene-mutation induction by radiation in mammals. The other major category of genetic damage, chromosomal aberrations, is also being extensively studied. Complementing these studies on specific types of genetic damage is an approach to measure the induction by radiation of a whole class of congenital abnormalities.
RESULTS: Completion of the data necessary for a full understanding of the influence on mutation frequency of such physical factors as dose, dose rate, dose fractionation and radiation quality, and such biological factors as sex, cell stage, age, and interval between irradiation and fertilization. Determination of the nature, extent and persistence of the actual anatomical and physiological damage expressed in descendants of irradiated populations.
PROJECT MILESTONES: Four of the milestones to be aimed for in the near future are: (1) Completion of experiments to collect more data on the lowest dose rate feasible in mouse experiments, in order to gain a better evaluation of the risk at low levels of radiation in man. (2) Collection of new data on mutation induction in female mice involving germ cell stages that may be more comparable to the cell stage primarily at risk in women. (3) Determination of the frequency and nature of radiation-induced congenital skeletal defects as an example of part of the overall damage to be expected in descendants of irradiated populations. (4) Initial results on gene mutation induction by plutonium in mice.
KEYWORDS: MICE;GENETICS;DATA ACQUISITION;MUTATIONS;RADIOINDUCTION;CHROMOSOMAL ABERRATIONS;MUTATION FREQUENCY;FRACTIONATED IRRADIATION;IONIZING RADIATIONS;HAZARDS;ANIMALS;GENETICS;GAMMA RADIATION;MUTAGENESIS;X RADIATION

<085024>
TITLE: Drosophila Cytology and Genetics
PROJECT NUMBER: 000177
PRINCIPAL INVESTIGATOR: Grell, E.H.
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NITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$194,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (20%);RADIATION (30%);HEAT, THERMAL (50%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Events occurring during meiosis determine the viability or nonviability of the progeny. Recombination and chromosome distribution are the two meiotic processes of prime importance in this regard but many aspects of both remain ill defined. We are attempting to (1) more precisely establish the time of recombination in relation to other events in the meiotic cycle, (2) elucidate the biochemical mechanism of its operaion, (3) define the role of the synaptonemal complex in the process, (4) clarify the dependency of subsequent events, particularly correct chromosome distribution on recombination and (5) evaluate the way in which mutations and perturbations by heat and radiation act to modify the normal course of meiosis.
APPROACH: Our studies include genetic, biochemical and electron microscopic approaches to these problems. We have mutagenized approximately 20,000 third chromosomes with EMS and recovered 20 new mutants representing two closely linked loci which are defective in recombination. Each mutant is being characterized genetically, biochemically, and at the EM level for a correlation of its effect on recombination, enzyme activity and the synaptonemal complex. We are developing ways to isolate and examine enzymes involved in the recombination process. When the gene coding for such an enzyme is located on the genetic map, mutants which affect its catalytic activity and ones affecting recombination may be induced. Temperature studies are being pursued to mark the time of crossing-over of specific genes. Thermal effects on recombination frequency and interference patterns are so great that they are of special interest in themselves.
RESULTS: Electromicrographic studies of certain of the recombinationless mutants are revealing structures resembling synaptonemal complexes lying in the cytoplasm rather than within the nucleus and exhibiting characteristic morphology from mutant to mutant. Genetic studies of two different alleles at the other rec/sup -/ locus show polarized reductions in exchange with the greatest effects distally or proximally, depending on the allele. A third allele exhibits temperature sensitivity which will be of great value for localizing the recombination event more precisely. For the first time loci for DNase enzymes are being mapped. One gene product which acts on native DNA has been precisely located and a mutant has been induced at this locus. The other loci specify DNases acting on denatured DNA. One has been mapped precisely and the other localized to a chromosome arm by analysis of melanogaster-sinulans hybrids. Their roles in genetic recombination are being examined.
PROJECT MILESTONES: (1) Aug 1976 Electron microscopic study of the aberrant synoptonemal complex material within the cytoplasm of 15 new C(3)G mutants. (2) Oct. 1976 Genetic and biochemical studies of DNase I. (3) Dec. 1976 Distributive pairing between chromosomes 2 and 4. (4) Mar. 1977 Correlation of crossing-over in region of histone genes. (5) June 1977 Study of alleles at the new rec/sup -/ locus. (6) Aug. 1977 Pattern of heat and interchromosomal effects on recombination. (7) July 1978 Study of serial reconstruction of normal and rec/sup -/ oocyte nuclei labeled with /sup 3/H thymidine. (8) Sept. 1978 Report on DNase II and III genes polymerase genes. (9) Dec. 1978 Report on electromicroscopic studies of heterozygously inverted genomes.
KEYWORDS: DROSOPHILA;CYTOLOGY;GENETICS;GENE RECOMBINATION;MEIOSIS;MUTATIONS;ELECTRON MICROSCOPY;EMS;TEMPERATURE EFFECTS;MUTANTS;DNA;CHROMOSOMES;GENETIC EFFECTS;HEAT;RADIOINDUCTION;BIOLOGICAL RADIATION EFFECTS;ANIMALS;ENZYMES;HUMAN POPULATIONS;REPRODUCTION

<085025>
TITLE: Yeast Mutagenesis
PROJECT NUMBER: 000178
PRINCIPAL INVESTIGATOR: Lemontt, J.F.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$114,000
TECHNOLOGY: FOSSIL FUEL/General (25%);GENERAL SCIENCE (75%)
POLLUTANTS: ORGANICS/Various compounds (50%);RADIATION/Ultraviolet;RADIATION/Ionizing (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our work is concerned with the mechanisms by which eukaryotic cells undergo mutagenesis induced by ultraviolet light, ionizing radiation (e.g. gamma rays) and certain chemical mutagens (e.g. hydrazine). With standard genetic and biochemical techniques, we hope to gain considerable insight into the cellular processes responsible for mutation fixation, as well as eventual mutational expression as mutant gene product. Of particular interest is the underlying molecular basis of the relationship between mutagenesis and repair mechanisms.
APPROACH: We are using the yeast Saccharomyces cerevisiae and to a more limited extent the yeast-like unicellular fungus Ustilago maydis as model eukaryotic microorganisms with which it shall be possible to coordinate genetic and biochemical approaches to studies of mutation pathways. UV and chemical mutagenesis are being investigated with special emphasis on genetic modification of mutation potential, through use of various mutants that confer mutation sensitivity or mutation resistance. Many experiments are designed to investigate the dependence of induced mutability on post-treatment growth in complete media. Another approach concerns the use of an in vivo enzyme assay (nitrate reductase) in Ustilago that can detect mutational events in cells at the level of active gene product rather than at the level of mutant colony.
RESULTS: Genetic analysis and preliminary characterization of ultraviolet mutation resistant (umr) mutants of yeast have been completed. Effects on UV-induced forward and reverse mutation, on UV sensitivity, and on sporulation ability have been studied. We have found that the chemical, hydrazine, is mutagenic in yeast. The effect on forward mutation at CAN1 is strongly dependent upon post-treatment cell division, suggesting a possible mechanism involving mispairing of an altered DNA base at chromosome replication. The in vivo assay for nitrate reductase enzyme in Ustilago has been used successfully to monitor the appearance and frequency of mutant gene product (active enzyme) after mutagenic treatment with gamma rays. We conclude that radiation-induced mutagenesis can occur in nonviable cells under nongrowth conditions with equal frequency as among surviving cells, suggesting that error-prone repair processes may be constitutive in this eukaryote rather than inducible by the radiation.
PROJECT MILESTONES: (1) 1 Nov. 1976 Hydrazine mutagenesis of yeast: Loss of mutability during growth inhibition. Publication to be prepared. (2) 1 Jan. 1977 Genetic control of hydrazine mutagenesis investigated. (3) 1 June 1977 UV, chemical mutagenesis of Ustilago.
KEYWORDS: SACCHAROMYCES CEREVISIAE;USTILAGO;GENETICS;MUTAGENESIS;GAMMA RADIATION;BIOLOGICAL RADIATION EFFECTS;ULTRAVIOLET RADIATION;MUTAGENS;MUTATIONS;ENZYMES;HYDRAZINE;DNA;RADIOINDUCTION;GENETIC EFFECTS;MUTAGENESIS;YEASTS;BIOLOGICAL REPAIR

<085026>
TITLE: Microbial Radiation Biology and Cell Division
PROJECT NUMBER: 000179
PRINCIPAL INVESTIGATOR: Adler, H.I.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$185,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION/Effects on DNA (20%);HEAT, THERMAL/Effects on DNA (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This work will emphasize two closely related themes. One is the use of several species of bacteria in the evaluation of mutagenic events induced by chemical and physical agents, and the other is a detailed study of those mutagenic events which specifically affect the ability to accomplish cell division. Because of the rapidity and relative simplicity of the individual experiments which must be conducted, it is realistic to pursue both themes with a small research group. As a result of activities included in the first theme, we hope to provide a better understanding of the details of chemical mutagenesis and a greater appreciation of the extent to which the result of mutagenesis studies in microorganisms can be extrapolated to higher organisms. Work accomplished under the second theme should lead to a better understanding of the genetic and biochemical events involved in normal and abnormal cell division. This, in turn, may contribute to an appreciation of the differences between normal and cancerous cells.
APPROACH: The electron microscope is the primary tool used for investigation. Currently methacrylate compounds with free reactive groups (hydroxyl and carboxyl) are being tested as possible substrates for attachment of antibody molecules. To accomplish these goals, use will be made of a variety of bacteriological and biochemical techniques. Most of these are already well established, but it is anticipated that some novel ones will have to be developed. For most of the work, standard laboratory equipment and reagents will be suitable. Some specialized equipment may be required for time lapse cinematographic studies.
RESULTS: The results of this work will be communicated in the form of open literature scientific publications and by oral communication with investigators in ORNL and elsewhere. These results should influence the interpretations put on the results of mutagenic assays done by other groups and should increase our knowledge of the basic events involved in normal and abnormal cell division.
PROJECT MILESTONES: (1) Development of a mutagenic assay system in bacterium not previously used for such studies, July 1, 1977. (2) Establishment of an assay system for cell extracts that stimulate cell division, July 1, 1977. (3) Mutagen assay system used on energy-related pollutants and results compared to results obtained with Escherichia coli and Salmonella system, July 1, 1978. (4) Attempts to isolate cell division promoting extracts from organisms other than E. coli will have been made, July 1, 1978.
KEYWORDS: VIRUSES;INFECTIVITY;ELECTRON MICROSCOPY;DNA;BIOSYNTHESIS;METHACRYLATES;BACTERIOPHAGES;ANTIBODIES;CELL DIVISION;RADIOBIOLOGY;MUTAGENESIS;MOLECULAR STRUCTURE;IN VITRO

<085027>
TITLE: Mammalian Cytogenetics
PROJECT NUMBER: 000181
PRINCIPAL INVESTIGATOR: Brewen, J.G.;Preston, R.J.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$360,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (10%);ORGANICS (30%);RADIATION (60%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The primary objective of the Mammalian Cytogenetics program is to establish baseline data for estimating human genetic risk from acute and chronic high and low dose radiation and putative chemical mutagens.
APPROACH: Chromosome damage is quantitatively analyzed after either in vivo or in vitro exposures of mammalian, including human, cells. The cells of principal interest are circulating immature lymphocytes and all maturing stages of male and female germ cells. Cross species comparisons are made in the in vitro studies and existing quantitative differences are used to correlate human germ cell hazards from those experimentally determined in the mouse and marmoset. The radiation treatments range in dose rates of 100 rad/minute to 0.001 rad per minute, the data from the latter dose rate being vital to estimate hazards from environmental, and reactor introduced, radiations. Similar approaches are being used to generate baseline data for estimating risk from chemical mutagens. At the moment known mutagens are being used. These are triethylenemelamine, cytosine arabinoside, and myleran.
RESULTS: The low dose rate experiments with the mouse are designed to test the suggestion that there will be no difference between acute and chronic exposures with low LET radiations at low doses (<50 rad). The dose response curve for reciprocal translocations induced in spermatogonia of the marmoset will be studied in great detail at low acute doses. The marmoset appears to be a suitable model for the human as far as translocation induction and recovery are concerned. Using the information from the mouse on the relationship between chronic and acute exposures at low doses, it should be feasible by back extrapolation of the marmoset dose response curve to estimate the genetic hazard from reciprocal translocations to man for environmental level chronic radiation exposures.
PROJECT MILESTONES: Precise human vs. mouse cytogenetically based comparison of radiosensitivity (June 1977).

Determination of female mouse radiosensitivity to X ray-induced chromosome damage as function of oocyte maturation (Sept. 1977).
KEYWORDS: LOW DOSE IRRADIATION;ANIMAL CELLS;LYMPHOCYTES;GERM CELLS;RADIATION DOSES;MICE;HAZARDS;DOSE RATES;MUTAGENS;DOSE-RESPONSE RELATIONSHIPS;BIOLOGICAL RADIATION EFFECTS;GENETICS;MAN;MICE;ANIMALS;MUTAGENESIS;IN VIVO

<085028>
TITLE: Automated Analyses for Biochemical Indicators of Genetic Differences
PROJECT NUMBER: 182
PRINCIPAL INVESTIGATOR: Mrochek, J.E.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$145,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale (60%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop automated instrumentation and methodologies for blood sample preparation, identification of mutant proteins therein, and the assessment of their rates of occurrence in human populations.
APPROACH: Automated preparation of whole blood samples yielding plasma washed erythrocyte, and red cell hemolysate fractions for screening for mutant proteins. Investigate high-resolution chromatographic separation and direct measurement of isoenzymes; and heat denaturation and chemical activation or denaturation, differential kinetic assay, and mathematical deconvolution methods for detection and quantification of mutant proteins by kinetic assay on the Centrifugal Fast Analyzer.
RESULTS: Automated system for the fractionation of whole blood into plasma washed erythrocyte and red cell hemolysate fractions; and the transfer of these fractions into cryovials for storage at ultralow temperatures. Develop methodologies and instrumentation for the screening of human populations to assess rates of genetic mutation caused by chemical or energy source perturbations in the natural environment.
PROJECT MILESTONES: (1) Fabrication of a complex prototype blood preparation (BP) system and verification of its design properties. (2) Evaluation of the BP system in the Human Genetics Laboratory, University of Michigan. (3) Development and successful testing of fast kinetic procedures on the prototype portable Centrifugal Fast Analyzer. (4) Development of a high-resolution chromatographic system complete with detection system capable of separating and quantifying isoenzyme systems such as lactate dehydrogenase and creatine phosphokinase.
KEYWORDS: BLOOD;PROTEINS;QUANTITATIVE CHEMICAL ANALYSIS;MUTANTS;GENETIC VARIABILITY;SAMPLE PREPARATION;HUMAN POPULATIONS;AUTOMATION;BIOCHEMICAL REACTION KINETICS;ISOENZYMES;SEPARATION PROCESSES;CHROMATOGRAPHY

<085029>
TITLE: Mammalian Gametogenesis
PROJECT NUMBER: 000183
PRINCIPAL INVESTIGATOR: Oakberg, E.F.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our studies on gametogenesis of the mouse are designed to provide information required for interpretation of experiments on the genetic effects of radiation, chemicals and other agents, and to provide guidelines for extrapolation of these results to man. This involves the assessment of cell survival after different doses and agents, and the demonstration of changes in the cell populations surviving different treatments (differential cell survival) as modifying factors in the mutational response. Our precise timing of spermatogenesis allows relation of genetic effects to specific cell stages at time of treatment. We should like to obtain similar information for the female in order positively to identify the oocyte stages at which number of mutations induced by radiation shifts from a low to high frequency. These results are relevant to evaluating the significance of genetic effects in the mouse oocyte for the estimation of hazards to the human female.
APPROACH: Our present data suggest that once formation of the zona pellucida has begun, the follicle and its contained oocyte progresses at a rate unaffected by pregnancy or irradiation. However, rate of recruitment from earlier oocyte stages may be altered. There also is a possibility that a few of these earlier stages contribute to ovulations in the 6-7 week interval of high radiation-induced mutation frequency. Since N(acetyl-H-3)D-glucosamine cannot be used to time development of oocytes prior to zona formation, H-3-thymidine will be used as a label to study growth kinetics of early follicles. Spermatogonial stem cell survival gives a linear fit over the 100-1000 R acute exposure range. However, cells surviving both a single 1000 R exposure and 1000 R given as two 500 R fractions 24 h apart differ qualitatively from those surviving doses of 100-600 R. Furthermore, there is a difference in the cell populations surviving the two 100 R doses. Multiple injections of H-3-thymidine will be given prior to irradiation in order to label a large proportion of the stem cell population. Frequency of labeled stem cells then will be determined at intervals giving minimal cell counts in order to further determine the possible role of differential cell survival in observed mutation frequencies.
PROJECT MILESTONES: We should complete a study on response of spermatogonial stem cells of the mouse to acute X-ray exposure and a test for differential cell survival as affected by dose and dose fractionation by January 1, 1977. By July 1977 we should have a precise estimate of the stage at which radiation

sensitivity of the mouse oocyte shifts from very low to high. This then will allow study of the changes in the oocyte associated with the shift in mutational response.
WORDS: GAMETOGENESIS;MICE;GENETIC RADIATION EFFECTS;MUTAGENS;ANIMAL CELLS;SURVIVAL TIME;SPERMATOGENESIS;MUTATIONS;OOCYTES;MUTATION FREQUENCY;OVARIES;OOGENESIS;X RADIATION;BIOLOGICAL RADIATION EFFECTS;RADIOINDUCTION;GENETICS;MUTAGENESIS;REPRODUCTION;TISSUES

<085030>
TITLE: Cytogenetic Studies of Special Chromosome Aberrations in Mice: Genetic Causes of Fertility Impairment
PROJECT NUMBER: 000184
PRINCIPAL INVESTIGATOR: Russell, L.B.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$84,000
TECHNOLOGY: FOSSIL FUEL/Coal (15%);NUCLEAR/General (25%);GENERAL SCIENCE (60%)
POLLUTANTS: ORGANICS (40%);RADIATION (40%);SPECIFIED OTHER POLLUTANTS/Miscellaneous chemicals (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Chromosome aberrations present a genetic risk to human populations snce they are induced and transmitted with relative ease from mutagenic exposure of certain gametogenic stages of mammals. Various chromosomal conditions can lead to complete male sterility or to severe disturbances in fertility. One set of objectives of this project is to study the relation of such chromosomal conditions to the circumstances of exposure and to investigate the basic cytogenetic causes of disturbances in male fertility. (2) Another objective of this project is to develop the use of certain chromosome aberrations as tools in basic cytogenetics and in the detection and measurement of other types of mutations, including point mutations. Such methods are being tested for their value in providing information on mammalian mutagenesis that is supplementary to that obtained in specific-locus studies.
APPROACH: For most of the studies in this project, we utilize chromosomal aberrations in the mouse that are being induced and recovered in the course of mutagenesis studies elsewhere in the Mammalian Genetics Section, ORNL. Such studies are performed with a variety of mutagens on different gametogenic stages. In portions of the project dealing with male fertility, those sons of mutagen-treated mice that show fertility impairments are studied morphologically, histologically, and cytologically (using recently developed banding analyses). The effectiveness of chemical and genetic therapy for infertility is also being explored. In other portions of the project, we use genetically characterized deficiencies as tools to search for new lethal, subvital, and visible mutations within the chromosomal segments involved in such deficiencies. We also carry out cytogenetic investigations of special chromosome aberrations (e.g., tandem duplication, pericentric inversion) to explore their possible use as tools in future mutagenesis studies.
RESULTS: The types of chromosomal conditions affecting male fertility will be identified, and common pathways may become apparent in the etiology for sterilities caused by different chromosomal conditions. Information will become available on the types of mutagenic exposures that cause fertility impairment in male progeny. Other experiments in this project will provide information on the relative numbers of lethal, subvital, and visible mutations that occur within a given segment of the mouse genome.
PROJECT MILESTONES: (1) July 1977 Completion of histological and cytological study of sterile sons of male mice treated with each of three chemical mutagens in each of several postspermatogonial stages. (2) July 1977 Mutagen treatment for new experiment to detect mutations in given segment of Chr 7. (3) December 1977 Completion of study on sterile sons of male mice exposed continuously to sodium bisulfite (a metabolite of SO/sub 2/). (4) December 1977 Completion of preliminary study on possible genetic therapy for genetically caused male sterilities. (5) December 1977 Completion of first experiment to detect new mutations in a given segment of Chr 9. (6) December 1977 Completion of preliminary phase of investigations on a tandem duplication and a pericentric inversion. (7) July 1978 Completion of preliminary exploration of the meiosis-to-first-cleavage interval for the study of specific aberrations.
KEYWORDS: MICE;CHROMOSOMAL ABERRATIONS;STERILITY;GENETICS;HAZARDS;HUMAN POPULATIONS;FERTILITY;MUTATIONS;MUTAGENS;THERAPY;GENETIC EFFECTS;ANIMALS;MUTAGENESIS;IN VIVO

<085032>
TITLE: Radiation Immunology (Radiation, Immune Competence and Carcinogenesis)
PROJECT NUMBER: 000190
PRINCIPAL INVESTIGATOR: Perkins, E.H.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$105,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To define the role of radiation induced immunodepression in the mechanisms of radiation carcinogenesis and life shortening.
APPROACH: The extensively studied murine model is being utilized. To determine the effect of acute, intermittent and protracted immunodepression on the rate of tumor induction and metastatic spread, immunological parameters of humoral (T, B and stem cell proliferation, antibody response) and cell-mediated immunity (GVHR, delayed type hypersensitivity, cellulose cytotoxicity, T-cell mitogenesis) are monitored at intervals following irradiation over the entire lifespan of the animal as many tumors have long latent periods, immune capacity declines with age and radiation-induced immunodepression reoccurs late in life although initial recovery is observed. By correlating the immune competence of non-irradiated control, irradiated, and irradited immunologically reconstituted animals with specific patholcgy, tumor incidence, metastatic and mean lifespan, the significance of a sub-optimal immune system in radiation-induced oncogenesis and life shortening can be determined.
RESULTS: It is expected that radiation immunosuppressive forces can be segregated from inductive forces and their significance assessed in radiation carcinogenesis and life shortening, although it is recognized

that immunodepression may be an integral part of the inductive mechanism.
PROJECT MILESTONES: (1) Compilation of mortality curves from single and intermittent acute exposure and immunological recovery assessment (January 1977). (2) Pathological assessments of tumor incidence (July 1977).
KEYWORDS: CANCER;IMMUNE REACTIONS;RADIOINDUCTION;LIFE SPAN;MICE;BIOLOGICAL MODELS;NEOPLASMS;STEM CELLS;CELL PROLIFERATION;CARCINOGENESIS;BIOLOGICAL RADIATION EFFECTS;AGING;IMMUNOLOGY;PATHOGENESIS;SOMATIC MUTATIONS;X RADIATION

<085033>
TITLE: Experimental Hematology
PROJECT NUMBER: 000191
PRINCIPAL INVESTIGATOR: Goodman, J.W.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37804
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$285,000
TECHNOLOGY: NUCLEAR/General (10%);GENERAL SCIENCE (90%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To elucidate cellular control mechanisms in hemopoietic systems with the long range objective of contributing to the understanding of the basis of disease states (such as leukemia) in man.
APPROACH: Highly inbred (genetically defined with respect to MHR, major histocompatibility region) mouse strains are used as donors and irradiated recipients in bone marrow transplantation studies. Lymphocytic cells have been taken from various sources (e.g. thymus, peritoneum, lymph nodes) to be transplanted along with marrow stem cells in order to examine effects of cellular interactions on the hemopoietic process.
RESULTS: Experimental results are expected to contribute significantly to our understanding of the contribution of cellular interactions to control of cell division.
PROJECT MILESTONES: It is anticipated that results pertaining to a CFU-S amplification will be completely collected by September, 1976, and the paper will be written, edited and submitted for publication by January, 1977. Experiments in colony site are more tedious and the microscopic work time-consuming. Data will be compiled by January, 1977, and submitted for publication by June, 1977. Experiments with Dr. Marusic will be completed by April, 1977, and submitted by July, 1977.
KEYWORDS: CELLULAR INTERACTIONS;HEMATOPOIETIC SYSTEM;MICE;BONE MARROW;TRANSPLANTS;LYMPHOCYTES;HEMATOLOGY;STEM CELLS;BLOOD FORMATION;BIOLOGICAL RADIATION EFFECTS;CELL DIVISION;CONTROL;ANIMAL CELLS;TISSUES

<085034>
TITLE: Biochemistry of Cell Differentiation
PROJECT NUMBER: 000232
PRINCIPAL INVESTIGATOR: Papaconstantinou, J.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$134,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study the regulation of differentiation in eukaryotic cells. Emphasis is placed on the mechanism of gene expression. The projects include: (1) to study the mechanism of repression-derepression of globin genes and alpha-fetoprotein genes; (2) the fidelity of the sequence of genome replication from one cell cycle to the next; (3) the temporal relationship between the replication of a specific gene and its transcription.
APPROACH: Analysis of DNA synthesis and transcription in synchronized cells in tissue culture. Isolation of specific polysomes and mRNA (globin, albumin alpha FP). Isolation of specific genes (globin, albumin, alpha FP).
RESULTS: To understand the mechanism of gene expression. To define by physicochemical and biochemical techniques the proteins and nucleic acids involved in the regulation of gene expression. To dissociate and reassociate the components of a recognized gene in vitro.
PROJECT MILESTONES: (1) Isolation of serum albumin mRNA (24-5-76). (2) Isolation (partial) of phenylalanyl-tRNA genes (24-5-76). (3) Isolation of albumin and alpha-fetoprotein polysomes (24-5-76). (4) Inhibition of hemoglobin synthesis by hydrocortisone (24-5-76).
KEYWORDS: CELL DIFFERENTIATION;BIOCHEMISTRY;GENES;PROTEINS;GLOBIN;BIOSYNTHESIS;DNA;TISSUE CULTURES;RNA;TISSUES;MOLECULAR STRUCTURE

<085035>
TITLE: Control, Regulation and Aberrancy in Protein Biosynthesis
PROJECT NUMBER: 000233
PRINCIPAL INVESTIGATOR: Stulberg, M.P.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The goal is to identify abnormal protein synthesis components resulting from

bioalterations and to correlate them with the inducer of the phenomena. We anticipate and are applying the results of these studies towards solving abnormalities in the control and regulation of protein synthesis as manifested in aging, mutation, radiation and pollution phenomena. Complementary to these studies is the elucidation of factors that contribute to the regulation of translation of tumor viral and messenger nucleic acids (MIZNAS) in protein biosynthesis.
APPROACH: Our main test system is an in vitro protein synthesis system produced from ascites tumor cells propagated in C57 B1 mice and in RNA produced from encephalomyocarditis virus propagated in the tumor cells. After depleting the system of individual components, we test the suspected components for rate, extent and especially fidelity of protein synthesis. If abnormal effects are discovered, we analyze the components for alterations at the molecular level. Ancillary systems derived from E. coli are used to study the role of nucleic acid modification reactions on control of protein synthesis, and will be applied to mammalian systems in the future.
RESULTS: We intend to test protein synthesis components from abnormal cells and tissues for their ability to support fidelity of protein synthesis. We have stored tissues from abnormal mice and will obtain others from experimental studies of others. We will be in a position in the future to determine precisely whether insults of aging, mutation, radiation, etc. to mice can affect the fidelity of protein synthesis and by what mechanism it occurs. Analogously we intend to elucidate factors that either inhibit or stimulate the functional activity of mRNAs depending on whether the mRNA is homologous or heterologous to the test system from ascites tumor cells. We intend to elucidate the role of nucleic acid modification reactions on the control of protein biosynthesis.
PROJECT MILESTONES: We hope to elucidate, at the molecular level, the mechanisms by which syndromes of aging, mutation, viral carcinogenesis and radiation can contribute to a loss of fidelity of protein biosynthesis.
KEYWORDS: IN VITRO;PROTEIN BIOSYNTHESIS;PROTEINS;BIOSYNTHESIS;MUTATIONS;POLLUTION;RADIATIONS;NUCLEIC ACIDS;ASCITES TUMOR CELLS;MICE;RNA;VIRUSES;ESCHERICHIA COLI;BIOLOGICAL EFFECTS;BIOCHEMISTRY;AGE DEPENDENCE

<085036>
TITLE: (Nucleotide Metabolism) Ribonucleotide Reductase in Euglena gracilis
PROJECT NUMBER: 000234
PRINCIPAL INVESTIGATOR: Hamilton, P.D.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$54,000
TECHNOLOGY: SOLAR/Biomass (25%);GENERAL SCIENCE (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The principal goals of the research project described below are to determine what proteins are involved in the reduction of ribonucleotides in Euglena gracilis, to delineate the function of these proteins, and to determine if the enzyme ribonucleotide reductase exists within Euglena as a complex, associated with other catalytic or structural proteins. Ribonucleotide reductase catalyzes the reduction of ribonucleotides and is a very important enzyme in the DNA biosynthetic pathway. This enzyme has been suggested as a potential control point for the regulation of DNA synthesis since its activity fluctuates during the cell cycle and is detectable only in the S period of the cycle. In bacterial cells, ribonucleotide reduction has been shown to involve two other proteins, in addition to the reductase. These proteins, thioredoxin and thioredoxin reductase, facilitate transfer of hydrogen from NADPH to the enzyme for reduction of the 2' carbon of the sugar in the nucleotide.
APPROACH: Biochemical methods and techniques will be used to identify enzyme involved with ribonucleotide reduction in Euglena.
RESULTS: Now that the Euglena ribonucleotide reductase has been isolated as a different and larger molecular species, it is necessary to reinvestigate the allosteric regulation of this ''new'' enzyme by deoxyribonucleoside triphosphates to determine if the pattern of regulation of enzyme activity is different from that determined previously. Purified enzyme will be obtained by the most recently described protocol and kinetic analysis will be made of the effect of deoxyribonucleotides on the reduction of the four common ribonucleotide substrates. In addition, we will continue to monitor our fractions for DNA polymerase activity to determine if this enzyme co-purifies with ribonucleotide reductase. Preliminary experiments indicate that the enzyme at 50-fold purification contains both ribonucleotide reductase activity and DNA polymerase activity. I also expect to obtain a clearer role of the additional proteins in Euglena which are required to couple NADPH oxidation to ribonucleotide reduction. These studies will be performed by isolating similar proteins with known functions from bacterial cells and determining if they perform similar functions when coupled to the ribonucleotide reductase reaction, using the Euglena reductase.
KEYWORDS: EUGLENA;NUCLEOTIDES;OXIDOREDUCTASES;PROTEINS;METABOLISM;CATALYSIS;DNA;BIOSYNTHESIS;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;ENZYMES;RNA

<085037>
TITLE: Mammalian Somatic Cell Genetics and Biochemistry
PROJECT NUMBER: 000237
PRINCIPAL INVESTIGATOR: Hsie, A.W.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);NUCLEAR/General (50%);SOLAR/Biomass (10%)
POLLUTANTS: ORGANICS (70%);RADIATION (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study quantitative mammalian cell mutation as a means of estimating the genetic

hazards of energy-related environmental agents to humans and to investigate the role of mutation in chemical carcinogenesis.
APPROACH: To employ mammalian cell specific gene mutational assays to study quantitative specific gene mutagenesis of mammalian cells by chemical mutagens and carcinogens, radiation, and by the interaction of chemicals and radiation. Pilot experiments on studying the role of mutation in chemical carcinogenesis using mammalian cell system have just begun.
RESULTS: We expect to validate the mammalian cell gene mutational assay through quantitative studies of gene mutation by X-ray, ultraviolet, and prototype alkylating mutagens and polycyclic hydrocarbons. Meanwhile, a small-scale screening for the mutagenicity of energy-related environmental agents is being explored.
PROJECT MILESTONES: We expect that validation of the mammalian cell mutational system will be largely concluded by the middle of FY 1978. Such activity should furnish information on chemical structure-mammalian mutagenicity relationship of various chemicals including prototype environmental agents screened. Studies on the correlation between mutagenesis and carcinogenesis are expected to be well underway by the end of FY 1977 and expanded during FY 1978 and thereafter.
KEYWORDS: SOMATIC CELLS;GENETICS;BIOCHEMISTRY;MUTATIONS;HAZARDS;CARCINOGENESIS;ENERGY SOURCES;CARCINOGENS;MUTAGENS;X RADIATION;BIOLOGICAL RADIATION EFFECTS;ULTRAVIOLET RADIATION;HYDROCARBONS;BIOLOGICAL EFFECTS;RADIOINDUCTION;SOMATIC MUTATIONS;MUTAGENESIS;ANIMAL CELLS;NEOPLASMS

<085038>
TITLE: Biomedical and Environmental Applications of Bio- and Chemiluminescence
PROJECT NUMBER: 000279
PRINCIPAL INVESTIGATOR: Totter, J.R.
ADDRESS: Biology Division, Oak Ridge National Laboratory P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$114,000
TECHNOLOGY: CONSERVATION/General (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Sensitive chemiluminescence and bioluminescent methods are being developed for various pollutants or adapted for determinations of both metals and organics. The methods generally depend on the influence trace metals have on chain reactions which in turn lead to chemiluminescence. In the case of bioluminescence organics may be converted to a compound which is either a chain initiator or is required for luminescence in an enzymatic system.
APPROACH: Methods for quantitatively trapping ozone as an ozonide are being investigated. Aldehyde obtained by hydrolysis of the ozonide will be measured by means of a bioluminescent system derived from bacteria.
RESULTS: Most chemical methods for ozone do not distinguish this compound from NO/sub x/. The method under development should be both highly sensitive and highly specific for ozone.
KEYWORDS: CHEMILUMINESCENCE;OXIDATION;REDUCTION;ORGANIC COMPOUNDS;ENZYMES;OXYGEN;METABOLISM;METALS;OZONE;IN VITRO

<085039>
TITLE: Ionizing Radiation Biophysics
PROJECT NUMBER: 000281
PRINCIPAL INVESTIGATOR: Randolph, M.L.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$73,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Quantitative and qualitative understandings of the molecular products resulting from exposure of cells and biochemicals to radiations, especially ionizing radiations, and cellular responses thereto.
APPROACH: Statistical correlations and fitting to theoretical mechanistically based models, concurrently developed, of measured biological end points and physical parameters. Use of electron spin resonance techniques. Calculation of ratios of neutron doses to neutron flux, especially at low energies, using evaluated nuclear data files and taking into account all energetically possible nuclear interactions and product energy domains.
RESULTS: LET dependence of DNA strand breaking repair, DNA degradation and colony forming ability of bacteria cells using particle beams. Better values of neutron dose to flux for typical materials and tissues at low neutron energies. Determination and characterization of radiation-induced chemical species.
PROJECT MILESTONES: Irradiation of cellular and DNA preparations with ion beam in ORIC (cyclotron). Completion of dose to flux calculations for low energy neutrons.
KEYWORDS: BIOPHYSICS;ANIMAL CELLS;BIOLOGICAL MODELS;ELECTRON SPIN RESONANCE;NEUTRONS;RADIATION DOSES;NEUTRON FLUX;LET;DNA;STRAND BREAKS;BACTERIA;IONIZING RADIATIONS;CFU;PARTICLE BEAMS;BIOLOGICAL RADIATION EFFECTS;MOLECULAR STRUCTURE

<085040>
TITLE: Photophysics of Proteins and Molecular Immunology
PROJECT NUMBER: 000282
PRINCIPAL INVESTIGATOR: Longworth, J.W.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$128,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To apply UV dye laser to investigation of protein luminescence particular time dependent behavior of singlet and triplet states. The high resolution capability of tunable UV dye lasers will also be used to acquire high resolution phosphorescence spectra at both low and high temperatures relying on the photoselection of individual sites with highly monochromatic excitation.
APPROACH: A tunable UV dye laser of N/sub 2/ pumped type will be operated from liquid N/sub 2/ boil-off to provide long-term capability. High speed photo-multipliers, coupled to NIM MCA which will be interfaced by GPIB system to a muP graphic terminal, tektronix 4051, will provide a powerful and versatile data acquisition system. A SPEX single photon counting spectrometer, using monochromators with low stray light features will also become available.
RESULTS: Time-dependent fluorescence anisotropy spectra of proteins and nucleic acids will be determined. By cross beam procedures transient triplet-triplet absorption spectra will be measurable from 2 ns time resolution, initially at a single wavelength, later at all wavelengths by use of an optical MCA and spectrograph. High resolution phosphorescence spectra of proteins will be determined using monochromatic site photoselection methods. High temperature phosphorescence spectra and kinetics of proteins will be determined.
PROJECT MILESTONES: (1) Autumn 1976 Begin construction of UV dye laser coincidence spectrometer. (2) Winter 1976 Begin implementation of interface of NIM MCA to muP video terminal. (3) Spring 1977 Collect time-dependent fluorescence anisotropy data with UV dye laser pulse source. (4) Summer 1977 Collect triplet transient absorption spectra of proteins with UV dye laser pulse source as pump. (5) Autumn 1977 Collect anisotropy relaxation data on fluorescence labeled membranes of human tissue cultured cells. (6) Winter 1977 Collect spectra of room temperature phosphorescence of protein with SPEX single photon counting spectrometer. (7) Spring 1978 Collect kinetic decay of room temperature phosphorescence of protein with UV dye laser system.
KEYWORDS: INSTRUMENTATION;PROTEINS;FLUORESCENCE;SPECTRA;ENERGY TRANSFER;ELECTRONS;LUMINESCENCE;PHOSPHORESCENCE;THERMODYNAMICS;STATISTICS;IMMUNE REACTIONS;BIOCHEMISTRY;COMPUTER CODES;DNA;HORMONES;IMMUNOLOGY;ULTRAVIOLET RADIATION

<085041>
TITLE: Environmental Insults to DNA
PROJECT NUMBER: 000283
PRINCIPAL INVESTIGATOR: Rahn, R.O.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (30%);ORGANICS (30%);RADIATION (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To apply basic knowledge of DNA physical chemistry to the development of methods for detecting low levels of damage to DNA.
APPROACH: Development of analytical techniques which will avoid the use of prelabeled DNA. Work out methodology for purifying DNA from alkaline sucrose gradients; detection of DNA using spectroscopic or postlabeling techniques.
RESULTS: (1) Ethidium bromide fluorescence enhancement and (2) I-125 labeling of cytosine residues (Commerford method) have been applied to this problem with limited success. Further refinements are required in order to make these approaches feasible on a routine basis. The perfection of these techniques will allow analysis to be made of damage and repair processes in a large number of cellular systems which heretofore have been inaccessible to investigation because of inability to prelabel the DNA.
PROJECT MILESTONES: (1) Analysis of 35 ml alkaline sucrose gradients using I-125 labeling and ethidium bromide fluorescence as applied to human cells (nondividing) December 31, 1976. (2) Application of centrifugal fast analyzer to the detection of fluorescence associated with DNA purified from sucrose gradients July 1, 1977.
KEYWORDS: DNA;STRAND BREAKS;IODINE 125;FLUORESCENCE;ENZYMES;BIOLOGICAL REPAIR;ANIMAL CELLS;BIOCHEMISTRY;LABELLING;SACCHAROSE;MAN;ULTRAVIOLET RADIATION;MOLECULAR STRUCTURE

<085042>
TITLE: Chromosome Chemistry
PROJECT NUMBER: 000284
PRINCIPAL INVESTIGATOR: Olins, D.E.
ADDRESS: Box Y, Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Tennessee Univ., Oak Ridge (USA). Graduate School of Biomedical Sciences
ITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$81,000
TECHNOLOGY: GENERAL SCIENCE (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the macromolecular structure of eukaryotic chromatin. To describe the hierarchy of chromosomal organization from the DNA level to the chromatid level.
APPROACH: Biochemical and biophysical techniques: large scale isolation of chromosomes and chromosomal constituents; hydrodynamic and spectroscopic measurements; ultrastructural observations; molecular model building.
RESULTS: (1) A description of the various levels of DNA packaging. (2) Ascribing different chromosomal proteins to the different levels--as determinants or regulators of the structure. (3) The effects of chemical perturbants on each level of structure.
PROJECT MILESTONES: (1) January 1, 1977 Isolation of large scale quantities of mitotic chromosomes. (2) September 1, 1977 Completed studies on response of mitotic chromosomes to solvent changes. (3) January 1, 1978 Biophysical data on chromosomal states.
KEYWORDS: CHROMOSOMES;CHROMATIN;MOLECULAR STRUCTURE;DNA;ELECTRON MICROSCOPY;SPECTROSCOPY;HYDRODYNAMICS;PROTEINS;CELL NUCLEI;BIOCHEMISTRY

<085043>
TITLE: Studies on Mutation Induction in Haemophilus Influenzae
PROJECT NUMBER: 000286
PRINCIPAL INVESTIGATOR: Kimball, R.F.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$208,000
TECHNOLOGY: FOSSIL FUEL/General (25%);FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (75%);COMBUSTION OR END USE (25%)
POLLUTANTS: ORGANICS (75%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective is to obtain as full an understanding as possible of the way in which mutagens, including especially those of concern for the energy program, cause mutations in DNA. Such understanding is important for judging the applicability to humans of the results of laboratory test procedures.
APPROACH: The bacterium Haenophilus influenzae is used because it is one of the few species in which DNA can be readily taken out of and put back in cell (transformation) to test for mutation, thus allowing a more precise analysis of the events leading to mutation. Bacteria are tested with the mutagen for a brief time and mutations are detected quantitatively either in the progeny of the treated cells or in the cells DNA by transformation. Mutant strains are used to alter DNA repair and replication. Biophysical and biochemical techniques are used to detect changes in the DNA.
RESULTS: The approach is expected to establish for each major class of mutagens what the molecular processes are that cause the initial damage to DNA to be converted to final mutation.
PROJECT MILESTONES: (1) 30/9/77 Completion of survey of mutagens. Choice of those to study further. (2) 30/9/77 Completion of initial phases of study of polyaromatic hydrocarbons (PAH's) and other fossil fuel related pollutants. (3) 30/9/78 Work on role of repair and nature of mutation fixation for PAH's and other mutagens well advanced.
KEYWORDS: HAEMOPHILUS;MUTATIONS;MUTAGENS;DNA;BIOLOGICAL REPAIR;BIOCHEMISTRY;BIOPHYSICS;BIOLOGICAL EFFECTS;BACTERIA;GENETICS;MUTAGENESIS;VIRUSES

<085044>
TITLE: Medical and Molecular Genetics
PROJECT NUMBER: 000287
PRINCIPAL INVESTIGATOR: Regan, J.D.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$87,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The primary objective of the Medical and Molecular Genetics Group is to elucidate the molecular events in human cells when cellular macromolecules such as DNA are damaged by radiation or chemical agents. We study and characterize (1) the sequence of DNA repair events, (2) the various modalities of repair, (3) the genetic inhibition of repair due to mutation, and (4) the physiological inhibition of repair due to biochemical inhibitors.
APPROACH: Our technological capacities reside in the several very sensitive, rapid and informative experimental techniques we have developed for the assay of DNA repair in all of its facets. Examples are: (1) bromodeoxyuridine photolysis, (2) radiochromatography, (3) molecular weight analyses. Our ultimate goals are: (1) to isolate and analyze the repair component of the mutagenic and/or carcinogenic event in human cells, (2) to elucidate the magnitude and significance of this repair component as it impinges on the practical problems of human radiation or exposure to actual or potential chemical mutagens and carcinogens.
RESULTS: We expect to be able to fully characterize the forms of DNA repair in human cells, and the nature of the damage produced by the various physical and chemical environmental agents which are capable of damaging human DNA. This characterization will be in terms of the structure of the agent, its interaction with the DNA molecule, the kinds of damage-monitoring systems in the cell and the precise molecular events

of the repair process.
PROJECT MILESTONES: Publication of comprehensive report on DNA damage and repair induced by selected chemical and physical environmental agents with regard to human risk.
KEYWORDS: FOSSIL FUELS;NUCLEAR POWER;DNA;ANIMAL CELLS;BIOLOGICAL REPAIR;CARCINOGENS;HYDROCARBONS;BIOLOGICAL EFFECTS;POLLUTION;INJURIES;GENETICS;MAN;MUTAGENESIS;ULTRAVIOLET RADIATION

<085045>
TITLE: Molecular Genetics
PROJECT NUMBER: 000288
PRINCIPAL INVESTIGATOR: Volkin, E.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F235-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/General (30%);GENERAL SCIENCE (70%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (A) All activities of eucaryotic cells are dependent upon intra-cellular organelles for energy or ATP. These organelles contain their own genetic (DNA) apparatus complete with transcription and translation. Thus any consideration of the potential hazard of any environmental insult must take into consideration the genetic system of organelles. Our objective in this project is directed toward understanding the molecular genetics or molecular biology of cellular organelles. (B) The other activity in which we are involved concerns the development of convenient and rapid methods for partial purification and characterization of the mammalian liver enzymes used in mutagen activation of coal conversion products and by-products.
APPROACH: (A) Using neurospora, euglena and HeLa cells as model systems we are characterizing the translational apparatus of mitochondria and chloroplasts with emphasis on the genetic origin of its components and their relationship to their cytoplasmic counterparts. (B) We are attempting to develop affinity column chromatography techniques to permit one step purification of the enzymes from induced rat livers which are used by our Comparative Mutagenesis Unit.
RESULTS: (A) We will have purified to homogeneity the met tRNAs of mitochondria, chloroplasts and cytoplasm from neurospora and euglena for sequencing. We will have purified the phe-tRNA synthetases from organelle and cytoplasm for characterization and sequencing. (B) We will have developed a one step procedure using Cibracon Blue affinity chromatograph for the large scale purification of mutagens activating enzymes.
PROJECT MILESTONES: (1) Dec. 6, 1976 The technique of purification of mutagen activating enzymes will be completed. (2) Feb. 14, 1977 The met tRNAs from organelles and cytoplasm will have been purified to homogeneity. (3) August 10, 1977 The synthetase from organelles will have been purified to homogeneity.
KEYWORDS: CHLOROPLASTS;ALGAE;CELL NUCLEI;BIOLOGICAL EVOLUTION;RNA;BIOSYNTHESIS;ANIMAL CELLS;PLANT CELLS;CARCINOGENS;METABOLISM;MOLECULAR STRUCTURE;TISSUES;IN VITRO

<085046>
TITLE: Effects of Radiation and Energy Related Pollutants on Aquatic Ecosystems
PROJECT NUMBER: 000604
PRINCIPAL INVESTIGATOR: Blaylock, B.G.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George W.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$85,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: METALS/Chromium (10%);RADIATION/Cobalt;RADIATION/Cesium;RADIATION/Plutonium;RADIATION/Uranium;RADIATION/H-3 (85%);HEAT, THERMAL/Synergistic (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas Small lake
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the effects of chronic low-level irradiation on the fitness of natural and laboratory population of aquatic organisms, examine potential interactions between ionizing radiation and environmental toxicants, examine the uptake and effect of transuranic elements on aquatic organisms, and relate the concentration of radionuclide by aquatic organisms to radiation doses and biological effects.
APPROACH: Continue long-term studies on natural populations of aquatic organisms from White Oak Lake to determine the effects of chronic low-level radiation of the fitness and genetic structure of natural populations. Conduct laboratory studies on the chronic effects of radiation and on the synergistic effects of radiation and environmental pollutants on aquatic organisms. Investigate the radiological and chemical toxicity of uranium and plutonium on developing fish embryos.
RESULTS: Results from our ongoing and proposed research help fulfill ERDA's obligations to determine the effects of radiation on aquatic ecosystems. Our previous studies have been used in evaluations of both planned and accidental releases of radionuclides to aquatic environments. Our research on long-term effects of chronic low-level radiation exposure has provided some of the few data available in this area.
PROJECT MILESTONES: Determine the uptake distribution and dose effect of transuranium radionuclides on developing fish eggs. Complete experiments to determine whether Gambusia from White Oak Lake carry a higher frequency of recessive lethals than Gambusia from nonirradiated populations. Determine the biological effectiveness (RBE) for the production of chromosome aberrations in Chironomus by alpha radiation for incorporated transuranic radionuclides.
KEYWORDS: IONIZING RADIATIONS;CHRONIC IRRADIATION;LOW DOSE IRRADIATION;AQUATIC ECOSYSTEMS;BIOLOGICAL RADIATION EFFECTS;AQUATIC ORGANISMS;RADIOECOLOGICAL CONCENTRATION;TRANSURANIUM ELEMENTS;UPTAKE;POLLUTION;SYNERGISM;URANIUM;PLUTONIUM;TOXICITY;FISHES;SOMATIC MUTATIONS;CHROMOSOMAL ABERRATIONS;TERATOGENESIS;RADIONUCLIDE MIGRATION;GENETIC RADIATION EFFECTS;DELAYED RADIATION EFFECTS

<085047>
TITLE: Radionuclide Cycling in Terrestrial Environments
PROJECT NUMBER: 000605
PRINCIPAL INVESTIGATOR: Francis, C.W.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (25%);RADIATION (75%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives of the project are to delineate which processes in the terrestrial environment that dominate the transport of radionuclides may be released from nuclear fuel cycles.
APPROACH: To properly assess these processes the research is divided into three major areas: (1) transport of radionuclides in soils, (2) radionuclide uptake in plants and (3) radionuclide movement through terrestrial food chains. Soil thin layer chromatographs are being used to evaluate the influence of various soil properties on the movement of radionuclides (Pu, Sr, Cs, I, U, Np and others) in soil. The role mycorrhizal fungi have on plant uptake of radionuclides and the distribution of bound tritium in various trophic levels of the biological food chain are also being determined.
RESULTS: The results of these investigations will be presented to special symposia and will be published in open literature scientific journals.
PROJECT MILESTONES: (1) Determine the influence of soil pH, organic matter, cation exchange capacity and base saturation on movement of radionuclides using soil thin layer chromatographs 1/3/77. (2) Determine the influence of mycorrhizal fungi on plant uptake of radionuclides 1/3/77.
KEYWORDS: WASTE;TERRESTRIAL ECOSYSTEMS;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;SOILS;PLANTS;FOOD CHAINS;SAMPLING;PLUTONIUM ISOTOPES;STRONTIUM ISOTOPES;CESIUM ISOTOPES;IODINE ISOTOPES;URANIUM ISOTOPES;NEPTUNIUM ISOTOPES;TRITIUM;CHEMICAL COMPOSITION;ROOT ABSORPTION;MATHEMATICAL MODELS;THIN-LAYER CHROMATOGRAPHY;MEASURING METHODS;RADIATION MONITORING;ENVIRONMENT;DIFFUSION;BACTERIA;WATER;SOIL CHEMISTRY;SOIL MECHANICS

<085048>
TITLE: Radionuclide Cycling in Aquatic Ecosystems
PROJECT NUMBER: 000606
PRINCIPAL INVESTIGATOR: Blaylock, B.G.;Elwood, J.W.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratories, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George W.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: METALS/Chromium (10%);RADIATION/Cobalt;RADIATION/Iodine;RADIATION/Cesium;RADIATION/Hydrogen-3 (90%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas Small lakes, reservoirs
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the distributional patterns of important dose-contributing radionuclides such as Co, I, and Cs in biotic and abiotic components of aquatic environments. To examine mechanisms which govern the mobility of radionulcides in aquatic systems. To investigate food-chain kinetics in aquatic communities and their influence on concentrations of radionuclides at higher trophic levels.
APPROACH: Conduct field and laboratory studies to determine the significance of sediment contribution to radionuclide concentration in aquatic food chains. Provide experimental data needed to test and refine a dynamic model which has been developed at ORNL to simulate movement through aquatic pathways. Determine the specific activities of selected radionuclides and stable chromium in food chains in White Oak Lake.
RESULTS: Provide experimental data needed to test and refine (AQUAMOD) a model which has been developed at ORNL for radiological assessment of dose to man and for predicting the fate of radionuclides in aquatic environments from planned and accidental releases.
PROJECT MILESTONES: Complete laboratory experiments for determining the contribution from various sediment fractions to the concentration of select radionuclide in fish. Development and refinement of (AQUAMOD) based on experimental data which will more realistically predict the movement of radionulides in aquatic environments.
KEYWORDS: AQUATIC ECOSYSTEMS;ENVIRONMENT;RADIATION MONITORING;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;FOOD CHAINS;AQUATIC ORGANISMS;SEDIMENTS;RETENTION;BIOLOGICAL MODELS;MATHEMATICAL MODELS;CHROMIUM;COBALT ISOTOPES;IODINE ISOTOPES;CESIUM ISOTOPES;DIFFUSION;COMPUTER CALCULATIONS;COMPUTER CODES;A CODES;FRESH WATER;FISHES

<085049>
TITLE: Development of Ecological Modeling
PROJECT NUMBER: 000607
PRINCIPAL INVESTIGATOR: O'Neill, R.V.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$85,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To advance the basic methodology and theory underlying applied environmental modeling and develop techniques having high potential applicability to programmatic objectives.
APPROACH: By the development of new mathematical techniques and methodologies and their application to ecological problems.
RESULTS: New analytical tools in frequency response analysis, nonlinear analysis, and new methodologies for determining prediction error in ecological models.
PROJECT MILESTONES: (1) Apply model validation theory to Walker Branch Watershed model and data by end of third quarter FY 77. (2) Development of nonlinear analysis techniques for population effects by end of second quarter FY 77. (3) Control theory applications to ecosystem management by mid FY 77. (4) Estimation theory applications to water chemistry data by end of FY 77. (5) Time series analysis of forest community dynamics by end of FY 77.
KEYWORDS: AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;MATHEMATICAL MODELS;COMPUTER CALCULATIONS;AQUATIC ORGANISMS;POPULATION DYNAMICS;MANAGEMENT

<085050>
TITLE: Walker Branch Watershed, Cycling and Transport of Contaminants
PROJECT NUMBER: 000608
PRINCIPAL INVESTIGATOR: Harris, W.F.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Franklin, Ralph E.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$278,000
TECHNOLOGY: FOSSIL FUEL/Coal (80%);GENERAL SCIENCE (20%)
ENERGY CYCLE: COMBUSTION OR END USE (80%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (30%);METALS/Cadmium;METALS/Lead;METALS/Zinc;METALS/Copper;METALS/Mercury (25%);PARTICULATES/Aerosols;PARTICULATES/Fly ash (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Site specific East Tenn.;HYDROGRAPHIC AREAS/Other hydrographic areas Tenn. River Basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this study is to investigate biogeochemical cycles of forest ecosystems such that the fate of chemical releases to the environment can be quantitatively related to biotic and abiotic processes influencing: (1) atmospheric deposition, (2) storage within ecosystem components, (3) biological responses to perturbations, and (4) eventual release from the landscape system to groundwater and aquatic ecosystems.
APPROACH: Three modes of research are employed: (1) monitoring of atmospheric inputs, stream outputs and concentration levels in biota and soils; (2) detailed research to elucidate mechanisms controlling biogeochemical cycles and how these mechanisms are affected by chemical perturbations; and (3) development of mathematical models of element transport as a means to summarize complex data, to design relevant future research and eventually to apply research results to other landscape systems.
RESULTS: Analysis of the sulfur cycle (distribution in biota and soils, annual transfers, input, accumulation, and export) for Walker Branch Watershed will be completed. From this study, major mechanisms controlling sulfur cycling will be identified; impacts of accelerated sulfur inputs will be evaluated. Storm events are being studied to determine their role as a mechanism controlling trace metal transport from the land. The role of hydrologic source areas on water quantity and quality is being determined. Studies are under way to validate a physically based simulation model of plant-soil-water relationships. Monitoring activities are ongoing in order to quantify input/output relationships and evaluate long-term trends in atmospheric chemistry and steam water quality.
PROJECT MILESTONES: (1) Summarize and report revised sulfur cycle September 1977, (2) review sulfur lysimeter experiment for continuation revision or termination September 1978, (3) review experiments on sulfur impacts under varying soil fertility levels for revision or termination December 1978, (4) assess need for experiments on relative mobilities of S components based on deep profile measurements February 1978, (5) conceptual model and hydrologic source area behavior developed September 1977, (6) evaluation of source area model with FY 1978 field data September 1978, (7) review storm event stress chemistry results for future research direction February 1978.
KEYWORDS: FORESTS;TERRESTRIAL ECOSYSTEMS;MONITORING;POLLUTION;LEAD;CADMIUM;ZINC;SOILS;SULFUR COMPOUNDS;MATHEMATICAL MODELS

<085051>
TITLE: Thermal Effects Studies
PROJECT NUMBER: 000609
PRINCIPAL INVESTIGATOR: Coutant, C.C.
ADDRESS: Bldg. 2001, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Ecological Sciences
MONITOR: Hamilton, D. Heyward
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$310,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Other hydrographic areas Reservoirs, rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this program is to develop knowledge for predicting the impacts of power plant cooling systems on warm water fisheries. Condenser cooling systems of nuclear power plants increase temperatures in the cooling water and in the waters which receive the effluents. There can be directly localized effects and broad-scale effects, both in geographic extent and in ecological ramifications. A major scientific challenge at the present time lies in relating increments of direct biological change (lethality; changes in growth, fecundity or behavior, etc.) to responses in populations and ecosystems. A second major challenge is to identify ecological limitations for thermal discharges that can provide acceptable engineering designs and siting criteria.
APPROACH: We plan to accentuate the study of temperature as it affects the dynamics and interactions of populations. Studies of the physiological and behavioral responses of individual organisms to temperature will be studied specifically as they relate to questions derived from the population or community levels. At the same time, it is expected that some of these studies of individuals will generate information valuable in setting preliminary limits on power plant siting, design and operation. Because no single power plant site represents an ideal system to analyze, we plan to integrate field experiments at two local power stations (Bull Run and Kingston) and in the nearby Clinch and Tennessee Rivers with artificial environmental and laboratory studies that will best elucidate the important ecological questions for warm water reservoirs. We also anticipate continuing and expanding cooperative studies of other sites such as Par Pond on ERDA's Savannah River Plant. A major effort will be expended on cooperative studies with the Tennessee Valley Authority and other Oak Ridge environmental programs on fish and benthic populations of Watts Bar Reservoir which receives cooling water from the Kingston Steam Plant.
RESULTS: (1) Data on thermal requirements of aquatic organisms that can be used in (a) water temperature criteria for setting water temperature standards, (b) environmental impact analyses of thermal discharges, and (c) design criteria for new power plant cooling systems (open cycle and cooling reservoirs). (2) Concepts in thermal responses of aquatic systems that will allow long-range planning for power plant cooling on a continental (or even world-wide) scale.
PROJECT MILESTONES: Applicable only at level of subprojects, for which milestones (Critical Objectives) are listed in form 189.
KEYWORDS: POWER PLANTS;COOLING SYSTEMS;ENVIRONMENTAL EFFECTS;THERMAL EFFLUENTS;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;BIOLOGICAL EFFECTS;PHYSIOLOGY;BEHAVIOR;TEMPERATURE DEPENDENCE;FISHES;INVERTEBRATES;WATER

<085052>
TITLE: Eastern Deciduous Forest Biome Program
PROJECT NUMBER: 000611
PRINCIPAL INVESTIGATOR: Burgess, R.L.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osburn, William S.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;COASTS/Southeast;HYDROGRAPHIC AREAS/Great Lakes;HYDROGRAPHIC AREAS/Other hydrographic areas Inland waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To test hypotheses of ecosystem function through the application of systems analysis and related techniques in the deciduous forest biome region of the U.S. To manage research activities involving large numbers of institutions and researchers, to provide for modeling and analysis, and to develop and maintain a numeric information system.
APPROACH: The integrated, multidisciplinary team approach to ecosystem analysis is used. Experimental techniques are used to investigate system processes and parameters. Data are integrated through modeling and simulations evaluate the effects of ecosystem level stress on functional attributes.
RESULTS: Numerous papers in professional journals, resulting in advanced understanding of ecosystem dynamics and behavior.
PROJECT MILESTONES: Complete syntheses of data on ecosystem structure and function in the eastern U.S., August 31, 1977.
KEYWORDS: FORESTS;ECOSYSTEMS;SYSTEMS ANALYSIS;MATHEMATICAL MODELS;DATA;ANIMALS;BIOMASS;LAKES

<085053>
TITLE: CUEX: Guides for Controlling Population Exposure from Releases of Radioactivity to the Environment
PROJECT NUMBER: 000613
PRINCIPAL INVESTIGATOR: Kaye, S.V.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Ray
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Any site
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Develop and implement formulations of a Cumulative Exposure Index (CUEX) which relate radioactivity measured at a monitoring station to the applicable dose limit when all exposure pathways are considered.
APPROACH: Develop and maintain models, computer implementations, and data bases for predicting the time dependent movement of released radioactivity through environmental pathways to man and for estimating the doses to individuals and populations from the resulting internal and and external exposure.
RESULTS: Documents describing and illustrating the index (CUEX) and the application of it. This includes not only details concerning calculation of the index, but also the details of computational capabilities and data bases inherent to the environmental transport and dosimetry aspects of the CUEX methodology. Development and documentation of CUEX is important because the methodology continues to be used extensively in the preparation of radiological sections of environmental impact statements for all segments of the various nuclear fuel cycles, and for other safety assessments involving environmental radioactivity.
PROJECT MILESTONES: (1) 1-2-77 Report documenting new computer implementation of TERMOD. (2) 4-1-77 Report documenting computer implementation of AQUAMOD. (3) 7-1-77 Report describing the AIRDOS code with the CUEX module. (4) 10-1-77 Report documenting literature search on soil infiltration by radionuclides. (5) 4-1-78 Report documenting the radionuclide soil-infiltration model and its implementation. (6) 10-1-78 Report describing the regional application of the CUEX methodology to the Tennessee Valley.
KEYWORDS: MAN;DOSE LIMITS;HUMAN POPULATIONS;RADIATION DOSES;RADIOACTIVITY;ENVIRONMENT;INTERNAL IRRADIATION;EXTERNAL IRRADIATION;DOSIMETRY;COMPUTER CODES;TERRESTRIAL ECOSYSTEMS;RADIOACTIVE EFFLUENTS;RADIOISOTOPES;SAFETY

<085054>
TITLE: Toxicant Formation in Condenser Cooling Systems
PROJECT NUMBER: 000679
PRINCIPAL INVESTIGATOR: Mattice, J.
ADDRESS: P. O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D. Heyward
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS/Chlorinated (75%);SPECIFIED OTHER POLLUTANTS/Chlorine, chromium (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this research is to assess and predict the reactive products, effects, and ultimate fate of biocides in aquatic environments. Emphasis is placed on persistence, degradation, and effects of chronic low level doses of chlorinated organics on aquatic biota. Investigations to elucidate the kinetics of chlorination of natural waters to develop predictive capabilities concerning formation of chlorinated organics continue.
APPROACH: Laboratory investigations designed to elucidate microbial degradation, photolysis and hydrolysis, sedimentation and ecological effects (using short lived species and weak links in life cycles) are conducted. Collection of water, concentration, and coupling of GC, IC, and MS for identification of chlorinated organics.
RESULTS: Predictability for formation, persistence, and effects of chlorinated organics in aquatic environments so that the magnitude of the potential problem associated with chlorination of waters can be assessed.
PROJECT MILESTONES: (1) Persistence of chlorinated purines and pyrimidines in natural waters II QT FY77, manuscript. (2) Interactive toxic effects of major classes of chlorinated organics IV QT FY 77, data collected. (3) Examine effects of important chemical parameters on reaction yield and products IV QT FY 77, data collected.
KEYWORDS: FATE;AQUATIC ECOSYSTEMS;CHLORINE COMPOUNDS;TOXICITY;AQUATIC ORGANISMS;BIOLOGICAL EFFECTS;POWER PLANTS;COOLING SYSTEMS;ENVIRONMENTAL EFFECTS;MORTALITY;PURINES;PYRIMIDINES;WATER QUALITY;WATER POLLUTION;FISHES;INVERTEBRATES;WATER

<085055>
TITLE: Population Effects of Reduced Recruitment
PROJECT NUMBER: 000680
PRINCIPAL INVESTIGATOR: Van Winkle, W.
ADDRESS: Bldg. 2001, ORNL, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, Heyward D.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Entrainment and impingement (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;CCASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this research program is to develop and apply models and statistical methodologies for fish populations that will be of value: (a) in evaluating the consequences of man-made stresses, (b) in placing previously qualitative statements into a quantitative framework, and (c) in defining issues where field and laboratory research are essential for more accurate estimates of impacts.
APPROACH: Two interrelated approaches are used in our computer simulation modeling of fish populations. First, a population transport model is developed in cases where it is important to consider spatial phenomena in addition to temporal phenomena. Such population transport models serve to estimate short-term impacts, such as the yearly reduction, due to entrainment and impingement mortality, in the number of fish that survive their period of susceptibility to power plants. Second, an age-dependent, life-cycle population model is developed to estimate the long-term impact of increased mortality in a given age class on the size and age structure of the total population and, where appropriate, on the yield to the fishery.
RESULTS: Results expected include testimony and ORNL reports to be used in forthcoming hearings for EPA, NRC, and/or FPC, as well as open literature publications.
PROJECT MILESTONES: (1) Investigate the potential for compensatory mechanisms offsetting the effects of man-induced mortality on young-of-the-year striped bass through development and application of a completely mixed young-of-the-year cohort model. (2) Perform a sensitivity analysis of those functions and variables in the ORNL tidal-averaged, one-dimensional transport model which are not spatially dependent and do not directly depend on transport phenomena. (3) Examine the problem of validation of completely mixed models and transport models by comparing simulated and observed temporal and spatial distributions of the various life stages. (4) Develop a methodology for predicting and determining the minimum statistically detectable difference between fish population levels.
KEYWORDS: AQUATIC ECOSYSTEMS;FISHES;POPULATION DYNAMICS;COMPUTER CALCULATIONS;MATHEMATICAL MODELS;ENVIRONMENTAL EFFECTS;POWER PLANTS;ENTRAINMENT;IMPINGEMENT;MORTALITY;AGE DEPENDENCE;COOLING SYSTEMS;COMPUTER CODES

<085056>
TITLE: Environmental Effects of Cooling Tower Drift
PROJECT NUMBER: 000681
PRINCIPAL INVESTIGATOR: Taylor, P.G.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (40%);ELECTRICITY GENERATION (40%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (60%);PARTICULATES (20%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The key objective is to develop knowledge necessary to assess the impacts of cooling tower operation on terrestrial ecosystems. Primary tasks are directed to obtaining a predictive capability of drift transport, deposition, interception and retention by vegetation and soil, and the effects of trace contaminants in drift on biota. An additional objective is that of comparing model estimates of drift deposition with biological data.
APPROACH: Studies include quantification of drift toxicants (chromium and zinc) in air, soil, groundwater, plants and small mammals in the vicinity of large, megawatt size cooling towers. Response of biota to drift contamination is determined through laboratory and field studies. Results are intended for integration to resolve ecological questions concerning drift toxicant contamination, cycling and potential for adverse effects. Data are available for model validation and provide operational or monitoring data of changes in contamination. Although site specific the data are applicable to generic problems concerning tower operation.
RESULTS: Products of the research are applicable to utilities and industries in siting of cooling towers, establishing monitoring programs and guidelines, and to state and federal regulatory agencies in environmental impact assessments. Monitoring or inventory data are valuable to test various drift deposition models. Results are also important to identify sensitivity of plant taxa to chromium contamination and to the state-of-the-art concerning the environmental cycling and transport of chromium.
PROJECT MILESTONES: (1) Interception of drift by plants with contrasting leaf morphology initiate April 1977.

(2) Effects of drift contamination (chromate) on plant processes (photosynthesis) initiate April 1977. (3) Effects of drift on invertebrate populations initiate April 1977.
KEYWORDS: DRIFT;COOLING TOWERS;ENVIRONMENTAL EFFECTS;TERRESTRIAL ECOSYSTEMS;MATHEMATICAL MODELS;BIOLOGICAL MODELS;CHROMIUM;ZINC;ECOLOGICAL CONCENTRATION;ELECTRIC POWER;PLANTS;SOILS;CHEMICAL EFFLUENTS;LEACHING;LAND POLLUTION;ANIMALS;PLUMES

<085057>
TITLE: Energy R and D Inventory
PROJECT NUMBER: 000680
PRINCIPAL INVESTIGATOR: Caton, G.M.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Wilson, John H.;Albert, Ted M.
TELEPHONE: F233-3312
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$150,000; National Science Foundation
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All above and any other relating to energy R and D (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Collect and compile information on energy and energy-related R and D that is conducted or sponsored in the U.S. Information is gathered from government agencies, private industry, trade associations, universities, and non-profit organizations. The scope of projects of interest is broad, including: (1) all types of energy sources, (2) electric power-generation, transmission, distribution, and storage, (3) energy uses and conservation, (4) economic and legal aspects, and (5) environmental and health effects.
APPROACH: Identify places and people involved in energy-related R and D and query them. the responses are categorized, keyworded, coded, edited, and verified if necessary. Summary tables relating expenditures to type of sponsor, type of performing organization, research location, subject categories, type of research, and combinations of the preceding are prepared.
RESULTS: The energy R and D information is computerized and can be searched via the ERDA-RECON computer system. This information is also available in printed form as a House Committee Print. Summary tables of expenditures will be available in printed form.
PROJECT MILESTONES: Publication of results as ''Inventory of Energy Research and Development: 1973-1975'', 5 volume set, Committee Print for House Committee on Science and Technology, Serial U, January 1976. The energy R and D information up-dated on the ERDA-RECON computer system.
KEYWORDS: ENERGY SOURCES;INFORMATION;DATA ACQUISITION;ELECTRIC POWER;USES;ENERGY CONSERVATION;INDUSTRY;LEGAL ASPECTS;ECONOMICS;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;RESEARCH PROGRAMS;COMPUTERS

<085058>
TITLE: Plutonium, Americium and Curium in Terrestrial and Aquatic Environments of Eastern United States
PROJECT NUMBER: 000690
PRINCIPAL INVESTIGATOR: Dahlman, R.C.
ADDRESS: Bldg. 3504, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Watters, R.L.
TELEPHONE: F973-5329
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$390,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (75%);WASTE MANAGEMENT (25%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To evaluate and understand the long-term behavior of Pu in soil with special reference to oxide and monomeric species; (2) to determine the chemical form and characteristics of Pu in soils and sediments of a 30-year-old contaminated floodplain and associated White Oak Creek drainage basin. (3) To estimate Pu distribution in biotic components of the floodplain forest, including intake coefficients for agricultural crops planted in the flood plain soil. (4) To associate plant uptake of Pu with measures of extraction from the contaminated floodplain soil. (5) To determine pool sizes of transuranics in biotic and abiotic components of White Oak Lake. (6) To study food-chain mechanisms for transuranics in edible fish including gastrointestinal uptake, tissue distribution, and turnover kinetics.
APPROACH: Research is conducted on biotic and abiotic behavior of transuranic elements in both field and laboratory systems. Chemical forms of the elements in sediment, soil and water and biota are characterized; kinetics and equilibria of element transfer between biotic and abiotic components are determined; data are developed for use in generic models of biochemical cycling of the transuranic elements. Information developed from the research is directed toward understanding food-chain transfer of transuranic elements to man.
RESULTS: The results are truly providing useful information about Pu in humid environments of Eastern United States. The research efforts are interrelated within three major themes: (1) Pu cycling in a 30-year-old contaminated floodplain, (2) Fundamental research on environmental chemistry and Pu kinetics in soil and sediment matrices, (3) Pu behavior in fresh-water environments of White Oak Lake. Specific results are related to environmental chemists where Pu(IV) is the predominant oxidation state because Pu(VI) is readily reduced and Pu(III) appears unstable in oxidative environments. These findings are significant

because oxidation state may be a very important factor influencing Pu mobility in soils and sediments.
PROJECT MILESTONES: (a) Determine oxidation state characteristics of actinide elements in reference environmental systems June 1, 1976. (b) Determine concentration ratios for Pu uptake by plants from soil contaminated with Pu 30 years ago June 1, 1976. (c) Determine distribution of /sup 237/Pu in abiotic and biotic components of reference aquatic environments in the laboratory. (d) Determine the fraction of indigenous soil Pu, Am, and Cm that is available for assimilation by plants. (e) Understand the chemical species of Pu in soil and water environments, and answer questions about long-term behavior of Pu in reference environments of the Eastern United States.
KEYWORDS: SOILS;SURFACE WATERS;USA;RADIATION MONITORING;PLUTONIUM;AMERICIUM;CURIUM;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;DIFFUSION;SAMPLING;FISHES;INGESTION;PLANTS

<085059>
TITLE: Health Physics Research Reactor
PROJECT NUMBER: 000714
PRINCIPAL INVESTIGATOR: Dickson, H.W.
ADDRESS: ORNL, Building 7710, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$230,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Neutrons;RADIATION/Gamma-rays (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Oak Ridge
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objective of the HPRR program is for support of research in radiation dosimetry and radiobiology. The HPRR is a unique facility for research in the dosimetry of mixed neutron and gamma radiation fields. Depth dose studies are known to be important in large animal irradiations, including man, and there is a concentrated effort at the HPRR in depth dose studies (experimental and calculational) at both the microscopic and macroscopic levels. Additionally the HPRR is used to improve the accuracy and reliability of radiation dosimetry systems and to test for nuclear accident.
APPROACH: The HPRR is made available to the ORNL Biology Division and other research institutions interested in determining dose-response relationships and performing depth dose studies. The reactor may be operated in either a steady state or pulsed mode to meet the experimental requirements. Intercomparison studies of nuclear accident dosimeters and personnel monitoring devices are conducted on an annual basis for establishing the accuracy and reliability of dosimetry systems. A criticality alarm testing program is conducted to meet the needs of those developing or testing criticality alarm monitors.
RESULTS: Reports are prepared on the conduction and results of the dosimetry intercomparison studies and other aspects of nuclear and criticality safety. Dosimetry results are provided to each principal experimenter utilizing the HPRR for biological, chemical, physical or nuclear engineering investigations.
PROJECT MILESTONES: Conduct 3rd Personnel Dosimetry Intercomparison Study (PDIS) February 1977.
KEYWORDS: INSTRUMENTATION;HPRR REACTOR;DOSIMETRY;RADIOBIOLOGY;RESEARCH PROGRAMS;NEUTRONS;GAMMA RADIATION;DOSEMETERS;DESIGN;DEPTH DOSE DISTRIBUTIONS;ANIMALS;URANIUM;MAN;FISSION

<085060>
TITLE: Medical Physics and Internal Dosimetry
PROJECT NUMBER: 000717
PRINCIPAL INVESTIGATOR: Poston, J.W.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Bldg. 4500S, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (10%);PARTICULATES (10%);ORGANICS (10%);RADIATION (60%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This program bears directly on a central problem for the use of atomic energy, specifically, the evaluation and control of internal exposure within acceptable limits. The program is directed toward estimating the absorbed dose to various body organs resulting from the deposition of radioactive material in the human body. In the area of internally deposited emitters, this program has taken the lead in formulating guidelines currently in use in most nuclear energy programs including those in our own country.
APPROACH: The program provides accurate estimates of permissible concentrations of radionuclides in air, water, and food or, equivalently, of limits of daily or yearly intake which would result in doses to man within prescribed limits. We attempt to obtain reliable metabolic data either from experiments or from the literature and interpret them to obtain estimates of the dose received by body tissues as a consequence of various types of exposure to radionuclides: ingestion, inhalation, wounds, medical uses.
RESULTS: The results of this program are usually standards for internal emitters published by the ICRP, NCRP, or ANSI. In addition, dose estimates for radiopharmaceuticals are published by the SNM-MIRD Committee.
PROJECT MILESTONES: (1) Publication of First Revision of ICRP Publication 2 1976-77. (2) Publication of Revision of MIRD Pamphlet 5 1976-77. (3) Publication of additional parts of ORNL-5000 1976-77.
KEYWORDS: RADIOISOTOPES;MAXIMUM PERMISSIBLE CONCENTRATION;AIR;WATER;FOOD;MAXIMUM PERMISSIBLE INTAKE;MAN;DOSIMETRY;RADIOPHARMACEUTICALS;RECOMMENDATIONS;COMPUTER CODES

<085061>
TITLE: General Physics
PROJECT NUMBER: 00718
PRINCIPAL INVESTIGATOR: Ritchie, R.H.
ADDRESS: Health Physics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (10%);PARTICULATES (10%);RADIATION (70%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: To understand the basic interactions of environmental pollutants with matter and the fundamental processes by which man is affected by these pollutants. Our work is also relevant to the elucidation of problems arising in the studies of energy utilization and conversion.
APPROACH: We are developing concepts and methodology to understand the processes by which radiation, noxious pollutants, and airborne particulates exert a deleterious effect on matter and, ultimately, man. Theoretical analysis, computer studies and model building are the main approaches used. We contribute to fundamental understanding of forces between swift charged particles and matter, the transport of ionizing radiations and interactions between particles and surfaces, and between molecules and matter. Our work is closely coupled with experimental programs in the Division which are directed toward the same problems and couplements them in interpreting and suggesting new experiments.
RESULTS: Research which produces models for energy losses of ionic clusters in matter, the transport of high energy radiation in matter equivalent in composition to human tissue, the transfer of electrons in atom-atom collisions, the forces between bodies in an aqueous medium, the forces between particulates and macroscopic bodies.
PROJECT MILESTONES: Regular publication of research results.
KEYWORDS: ION PAIRS;ENERGY LOSSES;MATTER;IONIZING RADIATIONS;INTERACTIONS;CHARGED PARTICLES;TISSUE-EQUIVALENT MATERIALS;ELECTRON TRANSFER;ATOM COLLISIONS;CHEMICAL EFFLUENTS;RADIOACTIVE EFFLUENTS;MOLECULAR STRUCTURE;COMPUTER CODES;TISSUES;AEROSOLS

<085062>
TITLE: Chemical Physics Studies
PROJECT NUMBER: 000719
PRINCIPAL INVESTIGATOR: Compton, R.N.;Reinhardt, P.W.;Schweinler, H.C.;Klots, C.E.
ADDRESS: Health Physics Division, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (10%);ORGANICS (50%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Basic studies of the interaction of electrons, photons and ions with polyatomic molecules are carried out for the purpose of (a) understanding the effect of radiation on matter (in particular living cells), (b) characterizing the properties of atmospheric pollutants and (c) developing advanced concepts for pollution monitoring.
APPROACH: Molecular beams are crossed with electron, photon and fast atomic beams and their interactions are studied by mass and energy analysis of the resulting ions and energy analysis of the secondary electrons. High and ultra-high vacuum techniques coupled with intense laser beams are employed.
RESULTS: Electron affinities, ionization potentials, and electronic states of complex molecules are determined. Rate constants and cross sections are obtained for electron, photon and atomic collisions with complex molecules and are measured with product analysis.
PROJECT MILESTONES: (1) Accurate measurement ionization rates for two-photon ionization of cesium in the vicinity of the 7 /sup 2/P/sub 1/2,3/2/ states. (2) Complete general characterization of pi-electron affinities of organic molecules (theory and experiment). (3) Complete development of new technique for studying electronic states of molecular negative ions.
KEYWORDS: ELECTRONS;PHOTONS;IONS;INTERACTIONS;MOLECULES;IONIZATION POTENTIAL;ATOM-ATOM COLLISIONS;CROSS SECTIONS;ELECTRONIC STRUCTURE;CARCINOGENS;RADIOACTIVE EFFLUENTS;MOLECULAR STRUCTURE;ULTRAVIOLET RADIATION

<085063>
TITLE: Liquid and Surface Physics
PROJECT NUMBER: 000720
PRINCIPAL INVESTIGATOR: Birkhoff, R.D.
ADDRESS: Health Physics Div., Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W7405-ENG-26
FUNDING: Energy Research and Development Administration FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/General (25%);GEOTHERMAL/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: PARTICULATES/Submicron sizes (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH

EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: We are trying to determine the optical and electronic properties of submicron particulates and holes. We are also continuing at the University of Tennessee on our research on the electronic behavior of liquids.
APPROACH: Laser and low energy electron beams are directed at submicron particles and holes and the scattering patterns are observed.
RESULTS: We will learn the surface electronic structure of various particulates. These are midway in size between molecules and solids and are uncertain in behavior. We will look for collective electronic states, effects of point and dipole image forces, presence of surface waves. Application to particulate collection by exhaust filters, adsorption of fibers (e.g. asbestos) in lung tissue, generation and removal from atmosphere.
PROJECT MILESTONES: (1) Separation of interference and plasmon effects on laser excited micron cylinders Jan. 1, 1977. (2) Completion of particulate (laser and electron) irradiation facility July 1, 1977. (3) Obtaining of electron scattering distribution on submicron fibers for determining surface potentials Jan. 1, 1978. (4) Preliminary attempt to measure laser and electron scattering from macromolecules July 1, 1978.
KEYWORDS: SUBMICRON, INVISIBLE IN OPTICAL MICROSCOPE);LIQUIDS;HOLES;ELECTRON DIFFRACTION;ELECTRONIC STRUCTURE;PARTICLES;AEROSOLS;AIR FILTERS;FILTERS;LUNGS;AIR CLEANING;LASERS;HEALTH HAZARDS;AIR POLLUTION ABATEMENT;ASBESTOS;REMOVAL;WATER POLLUTION ABATEMENT;CARCINOGENS;DNA;RESPIRATION;PARTICLES

<085064>
TITLE: Physics of Solids and Macromolecules
PROJECT NUMBER: 000721
PRINCIPAL INVESTIGATOR: Arakawa, E.T.
ADDRESS: Oak Ridge National Laboratory, Health Physics Division, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$220,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (20%);ORGANICS (20%);RADIATION (60%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: The objective is to study some fundamental properties of solids and macromolecules before and after exposure to selected pollutants. This program takes a basic approach to understanding and predicting the effects of pollutants on man and his environment.
APPROACH: Photons with energies from the IR to the soft x-ray region are used to obtain reflectance, transmittance, and photoelectron yield. Such data can be analyzed to yield the optical and dielectric functions associated with the bulk material, thin film effects, and interface properties such as surface roughness. In certain cases electron mean-free-paths and/or electron attenuation lengths can be obtained. Interpretation is in terms of energy levels in the solids and macromolecules and photon-electron, photon-plasmon, electron-electron and electron-phonon interactions in the systems.
RESULTS: These basic observations have direct application to understanding, predicting, and possibly modifying the behavior of selected systems. Specific examples include the development of solar energy collectors, the prediction of the behavior of liquid lithium in a fusion reactor environment, and the measurement of electron mean-free-paths in communications materials. More generally it is desired to understand the basic interactions occurring between normal cells in vivo and the subsequent effects of chemical and radiation assaults.
PROJECT MILESTONES: Periodic publication of the results of basic research in the open literature.
KEYWORDS: POLLUTANT EFFECTS;SOLIDS;ELECTRONIC STRUCTURE;OPTICAL PROPERTIES;MEAN FREE PATH;ABSORPTION;ELECTRONS;DIELECTRIC PROPERTIES;MOLECULES;ENERGY LEVELS;SOLAR COLLECTORS;INFRARED SPECTRA;X RADIATION;ULTRAVIOLET RADIATION

<085065>
TITLE: Atomic and Molecular Physics
PROJECT NUMBER: 000722
PRINCIPAL INVESTIGATOR: Christophorou, L.G.
ADDRESS: Health Physics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: NOXIOUS GAS (10%);ORGANICS (20%);RADIATION (70%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: Study in detail the elementary processes which accompany the interaction of radiation with matter. Investigate the effects of the nature and density of the environment on the elementary photophysical and charge transfer properties of biomolecules and the elementary processes that accompany the interaction of radiation (ionizing and nonionizing) with matter. Link the physical and chemical properties of biomolecules in gases with those in the condensed phase.
APPROACH: Quantitative and integrated experimental and theoretical studies on low-energy electron-molecule interaction processes, negative ions, electron transport and photoionization of molecules in low- and high-pressure gases and in liquids.
RESULTS: Obtain coherent picture of radiation interaction with matter especially low-energy electrons. Link knowledge on basic radiation interaction processes in gases with that on similar processes in condensed media for systems of radiobiological as well as of environmental and toxicological interest. Link physics

with chemistry and both with life sciences and establish in this way a sound understanding of radiation effects and mechanisms on the molecular level.
)JECT MILESTONES: Continue vigorously basic research and publish regularly and promptly results.
?WORDS: RADIATIONS;MOLECULES;INTERACTIONS;GASES;AQUEOUS SOLUTIONS;CARCINOGENS;RADIOACTIVE EFFLUENTS;HYDROCARBONS;OXIDATION;ELECTROMAGNETIC FIELDS;ULTRAVIOLET RADIATION;ELECTRONS

<085066>
TITLE: Basic Measurement Science
PROJECT NUMBER: 000723
PRINCIPAL INVESTIGATOR: Blankenship, J.L.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hudson, Frank
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$240,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (20%);DEVELOPMENT (40%);FULL SCALE DEMONSTRATION (40%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of basic measurement science is to develop and implement new concepts, theories, devices, and advanced techniques which improve man's ability to measure or observe new phenomena.
APPROACH: Advances in other fields of science, mathematics, and technology are exploited and applied to the broad field of measurement science and technology. Since such an endeavor requires a skillful interweaving of measurement theory with devices and technique development, the basic measurement science group is composed of interdisciplinary professional measurement scientists who interact with scientists and technologists from other disciplines to determine appropriate programs and goals for the group.
RESULTS: As a result of this project, various theories, devices and advanced technologies will be developed to enable and improve measurements important to the success of other ERDA programs. This project is an ongoing one with research areas changing to meet ERDA needs; one major, current research area is centered on the development and understanding of radiation imaging systems. This area includes the study of new concepts for position sensitive proportional counters (PSPCs) as well as the study of optimum digital filters for statistically-limited PSPC images. Another major, current research area is centered on the development cf an advanced type of fast-neutron spectrometer which will be used in thermonuclear fusion diagnostics.
PROJECT MILESTONES: (1) The testing in the laboratory of a large-area prototype PSPC torso camera. (2) The testing of the PSPC torso camera by clinical whole-body imaging of radionuclide distributions. (3) The testing in fusion experiments with d-d neutrons of the fast-neutron spectrometer. (4) The derivation of optimum digital filters for two-dimensional statistically-limited images. (5) The testing of optimum digital filters for two dimensional statistically-limited images. (6) The derivation of optimum coded-apertures for one dimensional statistically-limited images. (7) The testing of optimum coded-apertures for one dimensional statistically-limited images.
KEYWORDS: POSITION SENSITIVE DETECTORS;FAST NEUTRONS;NEUTRON SPECTROMETERS;DESIGN;PLASMA DIAGNOSTICS;NEUTRON SPECTRA;GAMMA CAMERAS;MULTIWIRE PROPORTIONAL CHAMBERS;CARCINOGENS;DISEASES;IN VIVO;NOISE

<085068>
TITLE: Solid State Dosimetry
PROJECT NUMBER: 000762
PRINCIPAL INVESTIGATOR: Gammage, R.B.
ADDRESS: ORNL, Building 7710, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biological and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (20%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The solid-state dosimetry research has as a major objective the development of improved detectors and techniques for the quantitative characterization of man's natural and artificial radiation environment. In addition to investigating phenomena, there is the goal of providing a proven product for an identified user.
APPROACH: The approach involves rigorous field testing of the products of research effort in order to improve the existing radiation monitoring capabilities. Applications are mostly in personnel dosimetry for fast neutrons ad weakly penetrating radiations, environmental radiation monitoring, medical patient dosimetry and intercalibration of neutron and photon sources as well as the dosimeters themselves. Special applications include radon monitoring either in dwellings or uranium mines and measurement of tritium or neutrons in the environs of CTR's.
RESULTS: Improved radiation detectors for personnel and environmental monitoring constitutes the product of this project. Important results of the project also include the publication of critical reviews, surveys, bibliographies, and the holding of workshops and training sessions for specialists.
PROJECT MILESTONES: (1) Decision on whether or not to proceed with exoelectron dosimetry 12/1/76. (2) Development of plastic recoil atom track, neutron detectors, suitable for field testing alongside NTA film and Albedo dosimeters 2/28/77. (3) Conduct 3rd International Intercomparison of Environmental Dosimeters at ORNL 6/30/77.
KEYWORDS: INSTRUMENTATION;FAST NEUTRONS;PERSONNEL DOSIMETRY;RADIATION MONITORING;ALPHA DOSIMETRY;NEUTRON DOSIMETRY;DIELECTRIC TRACK DETECTORS;DESIGN;GAMMA RADIATION;X RADIATION;RADIOISOTOPES

<085069>
TITLE: Dosimetry for Human Exposures
PROJECT NUMBER: 00801
PRINCIPAL INVESTIGATOR: Kerr, G.D.
ADDRESS: Oak Ridge National Laboratory, Building 4500 S, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of studies of the dosimetry of human exposure are to improve the physical dosimetry of human radiation exposures and the correlations between biological effects of radiation exposures and radiation dose. The emphasis in these studies is currently on investigations of depth-dose distributions and dose to specific organs within the body from neutrons and gamma rays as functions of exposure geometry. Results of these studies are important in radiation protection, dosimeter design, and cancer radiotherapy. These dosimetry studies and liaison studies with the Radiation Effects Research Foundation (RERF), in Japan, will also result in significant refinements in estimates of radiation exposure risks derived from biological effects observed in survivors of the atomic bombings in Hiroshima and Nagasaki.
APPROACH: Computer codes are developed to analyze radiation dose-biological effect relationships. Use is made of the vast medical and epidemiological studies of the atomic-bomb survivors which constitutes the most extensive source of data on the latent effects of human exposures. Also, they are of major importance in formulating radiation protection criteria.
RESULTS: Review of experimentally measured and theoretically predicted depth dose for neutrons and gamma rays FY77. Age dependent calculations of absorbed dose to organs in which significant biological effects have been observed in A-bomb survivors.
PROJECT MILESTONES: Winter, 1976-77 Low-resolution electron-density distribution of ricin crystals; definition of shape of molecule. Spring, 1977 Determination of binding site for oligosaccharide (membrane receptor). Winter, 1977-78 High-resolution electron-density distribution of ricin crystal; construction of skeletal molecular model.
KEYWORDS: NEUTRONS;GAMMA RADIATION;DEPTH DOSE DISTRIBUTIONS;MAN;A-BOMB SURVIVORS;COMPUTER CODES;BIOLOGICAL RADIATION EFFECTS;RBE;BONE MARROW;RADIATION DOSES;COMPUTER CODES;EPIDEMIOLOGY

<085071>
TITLE: Mechanical Impacts of Entrainment and Impingement
PROJECT NUMBER: 000863
PRINCIPAL INVESTIGATOR: Griffith, J.S.
ADDRESS: Bldg. 1504, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D. Heyward
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South;HYDROGRAPHIC AREAS/Other hydrographic areas Reservoirs
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this research is to define the biological and engineering parameters which cause physical damages to aquatic organisms entrained in power plant condenser cooling water, and the effects of these damages on organism survival. The principal points of physical damage are (1) at the intake screens where larger organisms are removed from the condenser flow (impingement), and (2) in pumps and piping where smaller, non-screenable organisms are deformed and broken. The parameters causing damage are to be defined in ways which will allow preparation of engineering design criteria to minimize or eliminate (if possible) these potential damages.
APPROACH: In the area of impingement, field and complementary laboratory studies will be conducted to determine causes of mortality of fish upon intake screens. Initial field studies will attempt to identify the extent to which fish are moribund before reaching plant intakes and therefore impinged secondarily. Concurrent laboratory experiments will investigate causes of this phenomenon, which appears related to the thermal tolerance of the species. We, in cooperation with TVA, will monitor a series of chemical and physical parameters in the intake canals of three TVA power plants (one nuclear and two fossil-fuel) and concurrently assess impingement and fish abundance and movements within those canals, to assess the influence of the parameters on impingement and the impact of impingement on the fish populations. In the laboratory, a tank enabling scaled-down simulation of several intake and canal designs will be used to study the behavioral responses of small fishes to intake screens, skimmer walls, and the associated ranges of light, temperature, water velocity, and turbulence. The ability of various species to withstand impingement and the effect of schooling on their behavior will also be examined using existing laboratory facilities.
RESULTS: Engineering design criteria for intake and condenser systems which will minimize or eliminate (if possible) potential damages.
PROJECT MILESTONES: (1) Determination of mortalities caused by condenser tubing, and the hydraulic parameters responsible. (2) Determine swimming behavior of young striped bass and other species at intake screens.

(3) Determine effects of cold stress on swimming performance of threadfin shad and other species susceptible to winter impingement. (4) Determine population effects of impingement losses of important fish species.
KEYWORDS: AQUATIC ORGANISMS;IMPINGEMENT;ENTRAINMENT;INTAKE STRUCTURES;THERMAL POWER PLANTS;CONDENSER COOLING SYSTEMS;FISHES

<085072>
TITLE: Environmental Research Park Support
PROJECT NUMBER: 000929
PRINCIPAL INVESTIGATOR: Harris, W.F.
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Oak Ridge National Lab., Tenn. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<085076>
TITLE: Application of Models of Ecological, Agricultural and Environmental Systems to Assessment of Energy Technologies
PROJECT NUMBER: 962
PRINCIPAL INVESTIGATOR: Parzyck, D.C.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Newton, Randolph
TELEPHONE: F233-4556
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: FOSSIL FUEL/General (75%);NUCLEAR/Fission (10%);GENERAL SCIENCE (15%)
ENERGY CYCLE: EXTRACTION (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%);ELECTRICAL TRANSMISSION (20%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/South;COASTS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Streams and impoundments
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This research project is designed to provide models which will assess the regional impact of energy technology development on water quality and quantity, agricultural systems, forest productivity and habitats for endangered species, and air quality.
APPROACH: Research will involve development of computer programs to assess the importance of base-flow and quick-flow chemistry to runoff water quality, determine the effect of low level pollutant concentrations on agricultural systems, provide for maintenance of forest productivity and the existence of habitats for endangered species, and incorporate considerations of chemical transformation and depletion rates into long range atmospheric models.
RESULTS: Documentation of computer programs that perform separation of storm and base flow components of water quantity and quality, application of programs to selected watersheds, and generation of a data base relating energy activities to changes in rate and chemistry of runoff components. Documentation of the agriculture version of the UTM, application of the UTM to agricultural systems, and development of computer program files for use in environmental assessment work. Documentation of regional forest management strategies derived from consideration of ecologic impact on sensitive forest species. Estimates of removal rates for pollutants from a plume.
PROJECT MILESTONES: (1) Documentation of water flow components analysis 1/4/1977. (2) Application of components analysis to selected watersheds 1/7/1978. (3) Development of UTM for agricultural applications 1/1/1977. (4) Documentation of UTM applications to crops 1/1/1978. (5) Adaptation of forest stand growth model tc pine forest 1/10/1977. (6) Application of stand growth model to forest management 1/4/1978. (7) Estimates of sulfate and aerosol deposition rates 1/10/1977. (8) Research coupling of long-range air transport model to ecosystem effects models 1/7/1978.
KEYWORDS: ENERGY SOURCES;ENVIRONMENTAL EFFECTS;COMPUTER CODES;WATER QUALITY;FUNCTIONAL MODELS;REGIONAL ANALYSIS;AGRICULTURE;FORESTS,ENDANGERED SPECIES;POLLUTION;SOILS;HYDRAULICS;TRAJECTORIES;SURFACE WATERS;AIR;ANIMALS

<085080>
TITLE: Sand Tracing Techniques
PROJECT NUMBER: 001289
PRINCIPAL INVESTIGATOR: Case, F.N.
ADDRESS: P.O. Box X, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (30%);GENERAL SCIENCE (40%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES/All (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Site specific Coastal;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Nearshore
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To develop and apply techniques for measuring particulate transport in coastal marine waters.
APPROACH: Radioactive tracers are used to label and follow sand and silt transport. Sediment concentrations

in bottom boundary layers are measured. Transport models are compared to actual data to test understanding of transport processes.
RESULTS: Quantitative rates of sediment transport. Qualitative insight into transport processes.
PROJECT MILESTONES: Construction and testing of prototype self-contained suspended sediment gage in 1977.
KEYWORDS: FATE;COASTAL WATERS;SEDIMENTS;TRANSPORT;MEASURING METHODS;TRACER TECHNIQUES;RADIOISOTOPES;WASTES

<085082>
TITLE: Environmental Response Center
PROJECT NUMBER: 001462
PRINCIPAL INVESTIGATOR: Wilkes, D.J.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Bldg. 2028, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Albert, Ted M.
TELEPHONE: F233-3311
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The Environmental Response Center proposed to provide ERDA-wide response and referral services within approved funding limitation including: in-depth literature services, using computerized data bases and extensive library facilities; the answering of specific environmental questions posed by the scientific community, government agencies, industry, and others; and development of specialized data bases and document collections with publication of resultant bibliographies as natural by-products of the response service.
APPROACH: The role of ERC is the utilization of pooled resources at the command of the Information Center Complex of ORNL to provide timely, comprehensive coverage of the environmental aspects of the broad spectrum of Energy Research and Development.
RESULTS: The operating procedures will be developed to provide speedy processing of inquiries and expansion of the information range. All efforts of ERC will be concentrated on providing ERDA, EPA and other interested agencies the answers to specific questions. Some topical bibliographies will be generated through the preparation of responses to those questions.
PROJECT MILESTONES: In responding to numerous requests for environmental information from persons located throughout the world with a diversity of scientific and technical disciplines, the ERC has made exhaustive use of both manual and computerized searching techniques. Locally generated environmental data bases have been computer-searched. A selective resource center has been established with increased capabilities for maintaining several specialized hard copy document collections and also includes basic environmental reference documents and all pertinent environmental abstract journals that are not yet available in computerized form. A manual environmental information source file is being gathered and includes quick source data for information acquisition, as does ICC's own Document Acquisition File and comprehensive directory of technical environmental specialists. Specialized collections have been developed in such fields as advanced fossil systems and other nonnuclear energy-related areas. This is an ongoing effort that is continually maintained.
KEYWORDS: ENVIRONMENTAL INFORMATION;ORNL;INFORMATION CENTERS;US ERDA;DATA COMPILATION;INFORMATION SYSTEMS;ENVIRONMENT;INDUSTRY;BIBLIOGRAPHIES;ENERGY SOURCES;ENVIRONMENTAL EFFECTS

<085084>
TITLE: Ecological Sciences Information Center
PROJECT NUMBER: 001464
PRINCIPAL INVESTIGATOR: Pfuderer, H.A.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Albert, Ted A.
TELEPHONE: F233-3311
TYPE OF FUNDING: Contract No.-W7505-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$95,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (40%);ELECTRICITY GENERATION (60%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (10%);PARTICULATES (10%);ORGANICS (10%);RADIATION (30%);HEAT, THERMAL (30%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Information support will be provided to ERDA/DBER projects, particularly those within the ORNL Environmental Sciences Division in the areas of environmental effects of electric power generation and radioecology.
APPROACH: Documents will be selected and gathered using automated and manual techniques. These documents will be analyzed and indexed by technically trained information specialists and will be input to and retrievable from a computerized information file.
RESULTS: Answers to ERDA/DBER information requests. Review articles written on the effects of temperature and entrainment on aquatic organisms. Indexed annotated bibliography of literature related to the cycling of carbon in the biosphere.
KEYWORDS: US ERDA;ECOLOGY;INFORMATION SYSTEMS;POWER GENERATION;ENVIRONMENTAL EFFECTS;DATA ACQUISITION;INFORMATION RETRIEVAL;ECOSYSTEMS;CHEMICAL EFFLUENTS;THORIUM;WATER;FISHES;FUEL CYCLE

<085086>
TITLE: X-ray Diffraction
PROJECT NUMBER: 001471
PRINCIPAL INVESTIGATOR: Einstein, J.R.;Wei, C.H.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the 3-dimensional structures of macromolecules and relate structure to function. Present efforts are concentrated on ricin toxin, a protein (and antitumor agent) which is bound to specific receptors on cellular membranes and is then brought into the cell by endocytosis, where it inactivates protein synthesis. We are also working on the variant half of a Bence-Jones protein (part of a human immunoglobulin), and are collaborating in studies on nu bodies, the DNA-histone structural unit of chromosomes of eukaryotic cells. Minor goals include the development of improved methods for macromolecular crystallography, and structure determinations of small molecules of biological interest.
APPROACH: The technique for determining molecular structure is through X-ray diffraction of single crystals of the material. A number of proteins, belonging to the group of lectins and toxins of which ricin is a member, have been extracted from seeds, purified by chromatographic techniques, and crystallized by a variety of procedures.
RESULTS: Determination of the molecular structures would lead to new understanding of the related functions. Determination of the stereo-chemistry of the binding of ricin to its cellular receptors (by X-ray studies of crystalline complexes with moieties of these receptors, once the structure of ricin itself has been determined) would help to explain this type of macromolecular interaction at the cell surface. Structure determination of the Bence-Jones variant half-dimer, and of its complexes with small molecules, would enlarge our knowledge of immunology at the molecular level. An understanding of chromosomal structure is particularly pertinent to understanding biological hazards related to energy production, since their mutagenicity and carcinogenicity are results on interactions with chromosomes, not naked DNA.
PROJECT MILESTONES: Winter, 1976-77 Low-resolution electron-density distribution of ricin crystals; definition of shape of molecule. Spring, 1977 Determination of binding site for oligosaccharide (membrane receptor). Winter, 1977-78 High-resolution electron-density distribution of ricin crystal; construction of skeletal molecular model.
KEYWORDS: PROTEINS;MOLECULAR STRUCTURE;CRYSTALLOGRAPHY;X-RAY DIFFRACTION;BIOCHEMISTRY;CHROMATIN

<085087>
TITLE: Protein Chemistry
PROJECT NUMBER: 001472
PRINCIPAL INVESTIGATOR: Hartman, F.C.
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AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$161,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To characterize the active sites of enzymes in order to acquire a more complete understanding of enzyme mechanisms.
APPROACH: Reactive reagents that are structural analogs of natural substrates are prepared by techniques of organic syntheses. Because of its structural similarity to substrate, the reagent will have a high affinity for the active site and thus in many cases selectively modify an active-site residue. Once chemically labeled, the active-site residue can be identified by standard techniques of protein chemistry.
RESULTS: (1) Partial characterization of the active site of phosphoglycerate mutase by the affinity label bromoacetyletharolamine phosphate. (2) Two newly-synthesized reagents, 2-chloroglyceraldehyde 3-phosphate and 2-phosphoglycolic acid azide will be tested against several glycolytic enzymes. (3) Sequences of active-site peptides from phosphoglycerate mutase and ribulosebiophosphate carboxylase will be obtained.
PROJECT MILESTONES: It is impossible to predict milestones in basic research. Attempts to design new affinity labeling reagents for the characterization of active sites of enzymes will continue. Highly selective enzyme reagents have potential application as chemotherapeutic agents.
KEYWORDS: ENZYMES;PROTEINS;BIOCHEMICAL REACTION KINETICS;AFFINITY;PHOSPHATES;METABOLISM

<085088>
TITLE: Mammalian Cytochemistry and Mutagenesis
PROJECT NUMBER: 001474
PRINCIPAL INVESTIGATOR: Sega, G.A.;Cumming, R.B.
ADDRESS: Biology Division, P.O. Box Y, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS (20%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study the molecular mechanisms of chemical- and radiation-induced mutagenesis in

mammals.
APPROACH: Our finding that unscheduled DNA synthesis, taken to be repair of damaged DNA, occurs in certain meiotic and post-meiotic germ cell stages of male mice after in vivo chemical or X-ray treatment has opened a new approach for rapid screening of potential mutagens. A suspected chemical mutagen is administered to male mice and at the same time tritium-labeled thymidine is injected directly into the testes. At various times after treatment germ cells are recovered and analyzed for the unscheduled uptake of [/sup 3/H]thymidine indicating DNA repair. Also, isotopically labeled mutagens are being used to study the number of chemical lesions induced in mammalian germ cells and the molecular targets of these mutagenic agents.
RESULTS: Considerable data will be accumulated on the types of chemicals that can induce DNA repair in mammalian germ cells and the relative effectiveness of different classes of chemicals in inducing DNA repair. Also, a clearer idea of the molecular targets in the germ cells that are important in chemical mutagenesis experiments should emerge.
PROJECT MILESTONES: Milestones to be aimed for in the near future include: (1) Determining the possible role of protamine (a basic protein in mammalian sperm cells) in the production of dominant lethal mutations by chemical agents. (2) Measuring DNA repair induced in mouse germ cells by a variety of chemicals including polycyclic aromatic hydrocarbons (by-products of coal liquefaction). (3) Determining the sites in the DNA of mammalian germ cells which are attacked by chemical mutagens.
KEYWORDS: X RADIATION;MUTAGENESIS;IRRADIATION;MICE;BIOLOGICAL RADIATION EFFECTS;DNA;BIOSYNTHESIS;GERM CELLS;BIOLOGICAL REPAIR;TRACER TECHNIQUES;MUTAGENS;TESTING;CARCINOGENS;IN VIVO

<085089>
TITLE: Molecular Aspects of Radiation Genetics
PROJECT NUMBER: 001476
PRINCIPAL INVESTIGATOR: Billen, D.
ADDRESS: Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Carcinogens;ORGANICS/Mutagens (25%);RADIATION/Ionizing;RADIATION/Solar (75%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We plan to determine the roles of various substrates, cofactors and enzymes of DNA metabolism in DNA synthesis after irradiation or chemical damage, using bacteria and cultured mammalian cells made permeable to nucleoside triphosphates and other small molecules.
APPROACH: A wide variety of environmental agents are known which induce damage in DNA leading to an inhibition of DNA synthesis or faulty DNA replication. The extent to which DNA repair processes restore the original fidelity of the DNA will ultimately determine the fate of the damaged cell. We are using both bacteria and mammalian cells to assess the roles of several known DNA polymerases and other DNA metabolic enzymes and factors in DNA repair, replication and recombination. DNA mutants of E. coli and B. subtilis provide a genetic approach to defining the roles of individual components of the DNA repair and replicative systems. The information obtained with prokaryotes should provide leads to assess the details of DNA repair and replication in mammalian systems including man.
RESULTS: Our program should provide additional insight into the cellular systems for repairing chromosomal damage. The similarities and differences between ionizing radiation and certain chemicals in regard to the repair response elicited will be further clarified.
PROJECT MILESTONES: (1) Selective chemical control of DNA repair systems in mammalian cells. (2) Rapid screen for potential mutagens and carcinogens inducing DNA Polymerase I repair synthesis in Escherichia coli.
KEYWORDS: DNA;ENZYMES;METABOLISM;BIOSYNTHESIS;RADIATION INJURIES;BACTERIA;ANIMAL CELLS;INJURIES;BIOLOGICAL REPAIR;ESCHERICHIA COLI;BACILLUS SUBTILIS;IONIZING RADIATIONS;POLYMERASES;DRUGS;GENETICS;NEOPLASMS;CARCINOGENS

<085090>
TITLE: Analytic Dosimetry
PROJECT NUMBER: 001478
PRINCIPAL INVESTIGATOR: Turner, J.E.
ADDRESS: Health Physics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: NOXIOUS GAS (15%);METALS (10%);PARTICULATES (10%);ORGANICS (15%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To investigate technical health physics questions in support of ERDA research programs, to develop Health Physics Information System, and to provide up to date technical bibliographies in selected areas of health physics.
APPROACH: Maintain small staff with access to specialists in many areas of health physics and to computerized files of the Information Center Complex at ORNL.
RESULTS: Information and hard copy furnished to researchers in response to inquiries and need for specific data. Bibliographies prepared and published on selected topics in health physics.
KEYWORDS: HEALTH PHYSICS;HEALTH EFFECTS;US ERDA;RESEARCH PROGRAMS;RADIATION PROTECTION;INFORMATION SYSTEMS;BIBLIOGRAPHIES

<085091>
TITLE: Public Health and Demographic Statistics for the Population Near a Nuclear Facility
ROJECT NUMBER: 01479
RINCIPAL INVESTIGATOR: Patrick, C.H.
ADDRESS: Oak Ridge National Laboratory, Building 4500S, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: NUCLEAR/Fissicn Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: TRANSPORTATION (25%);STORAGE (25%);PROCESSING, CONVERSION (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (75%);ANALYTICAL (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;GEOGRAPHIC AREAS/Site specific Oak Ridge
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The purpose of this program is to assess available data sources and methodology appropriate for use in analytical studies and environmental impact statements concerning the potential impact of nuclear power plants on public health. The first part of the program involves determination of the availability of vital statistics and demographic data of local, state, and national origin which are useful for analysis of health effects. The second part involves assessment of methods used by epidemiologists, biostatisticians, and other scientists as seen in the literature on health effects.
APPROACH: Intensive review of methodology for health effects assessments in cooperation with faculty of Johns Hopkins University (Epidemiology Dept.). Involves use of cancer mortality and morbidity statistics on a nationwide basis by county and vital statistics for State of Tennessee. Comparative analyses are made of an area containing a nuclear facility (Oak Ridge), a similar highly educated population not proximate to a nuclear facility, and Tennessee as a whole.
RESULTS: Development of a reliable methodology for the assessment of health effects, and of computer codes for analytical computations of public health statistics.
PROJECT MILESTONES: (1) Assessment of the reliability of methodology on health effects FY 1977. (2) Development of computer programs for continued assembly and monitoring of public health statistics proximate to energy facilities FY 1978.
KEYWORDS: CANCER;NUCLEAR POWER PLANTS;PUBLIC HEALTH;HUMAN POPULATIONS;POPULATION DYNAMICS;EPIDEMIOLOGY;STATISTICS;COMPUTER CODES;DISEASES;IONIZING RADIATIONS;NUCLEAR FACILITIES

<085096>
TITLE: Economic and Environmental Recovery from Severe Reactor Accidents
PROJECT NUMBER: 01500
PRINCIPAL INVESTIGATOR: Chester, C.V.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schroebel, W.W.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: PARTICULATES (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Examine results of very severe reactor accidents such as might result from willful malevolent acts to establish timely and realistic countermeasures.
APPROACH: Realistic accidents involving present and contemplated reactor types will be analyzed. Accidents leading to core meltdown with varying degrees of damage to containment will be considered. Models developed at ORNL using the computer codes YIELDS (ORNL-4996), RELEASE (ORNL-TM-4702), and METSWP (ORNL-4979) plus data bases on meteorological conditions (supplied by NOAA) and demographic variables (from the Regional and Urban Study Group at ORNL) will be used to calculate the impacts on society.
RESULTS: (1) Recommendations for actions to be taken while an accident is in progress to mitigate the effects of the accident. (2) Recommendations for modifications to present siting and containment concepts to decrease the effects of possible accidents. (3) Recommendations for decontamination, reoccupation, and recovery of an affected area. (4) Recommendations for siting criteria and operational safeguards.
PROJECT MILESTONES: Reports on each of the sets of recommendations.
KEYWORDS: REACTOR ACCIDENTS;SABOTAGE;RECOVERY;SITE SELECTION;DECONTAMINATION;METEOROLOGY;AEROSOLS;COMPUTER CODES;ECONOMICS;RADIOISOTOPES;SAFETY

<085097>
TITLE: Bioorganic Chemistry and Enzyme Catalysis
PROJECT NUMBER: 001558
PRINCIPAL INVESTIGATOR: Doherty, D.G.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project involves the development of specific antileukemic agents, the exploration of the nature of OH radical attack on proteins and nucleic acids, the nature of the interactions of

carcinogens with DNA and the adaptation of chemiluminescence methods to investigate the oxidation of aromatic hydrocarbons to more carcinogenic compounds.
APPROACH: Synthetic organic chemical techniques will be utilized to prepare specific new compounds as required to accomplish the objectives of the program; e.g., to develop competitive inhibitors of enzyme systems involved in the multiplication of the leukemic cell, model compounds for radical and DNA binding studies and such structural variations of luminescent compounds as are necessary to elucidate the nature of the reaction. Anti-leukemic compounds will be tested in in vitro enzyme systems and correlated with results obtained in a collaboration with a group studying leukemia in cell culture.
RESULTS: (1) Useful anti-leukemic agents. (2) A better understanding of the radical interactions in biological material. (3) A chemiluminescent method for determining the presence of oxidized intermediates of carcinogens in biological material.
KEYWORDS: PROTEINS;NUCLEIC ACIDS;HYDROXYL RADICALS;CARCINOGENS;DNA;CHEMILUMINESCENCE;HYDROCARBONS;ENZYMES;LEUKEMIA;CELL CULTURES;METABOLISM;BIOCHEMICAL REACTION KINETICS;NEOPLASMS;IN VITRO

<085098>
TITLE: Chemical Effects on the Immune System
PROJECT NUMBER: 001560
PRINCIPAL INVESTIGATOR: Perkins, E.H.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$159,000
TECHNOLOGY: FOSSIL FUEL/General (25%);GENERAL SCIENCE (75%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (10%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The role of immunity and immunologic phenomena in sustaining life and well-being has long been appreciated. Therefore, the objective of this research is to determine the effect of energy-related chemical pollutants, toxic by-products, catabolites and environmental mutagens on the immune system.
APPROACH: Two general categories of approach are underway. (1) To establish suitable technology to evaluate the activity of environmental compounds with regards to immune responsiveness in mice, i.e., in vitro and in vivo screening tests to identify potentially hazardous agents and to determine an order of magnitude for deleterious activity and (2) mechanism studies aimed toward clarifying the suspected role of depressed immune competence in chemical carcinogenesis.
RESULTS: To identify the hazard of the effluent of by-product chemical compounds (e.g., oxides of carbon, sulfur and nitrogen from fossil fuel combustion and toxic agents like plutonium from nuclear fuels) on immunopoiesis. To assess the recovery of the immune system from such injury and to bring this information to the level of clinical applicability.
PROJECT MILESTONES: Results published in the open literature.
KEYWORDS: CANCER;CARBON OXIDES;SULFUR OXIDES;NITROGEN OXIDES;BIOLOGICAL EFFECTS;IMMUNE REACTIONS;MICE;CARCINOGENESIS;IMMUNITY;PLUTONIUM;TOXICITY;AGING;CARCINOGENS;HYDROCARBONS;IMMUNOLOGY;NEOPLASMS

<085099>
TITLE: Delayed Somatic Effects of Environmental Agents
PROJECT NUMBER: 001562
PRINCIPAL INVESTIGATOR: Slaga, T.J.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$400,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (25%);COMBUSTION IN SITU (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%)
POLLUTANTS: ORGANICS/Polycyclic aromatic hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: In view of ERDA's responsibilities in developing fossil fuels for energy we will be confronted with many biological hazards from polycyclic aromatic hydrocarbons (PAH) which are associated with their conversion and utilization. These PAH may have carcinogenic, tumor initiating or promoting activities in man. We propose to study the mechanism of action of certain PAH carcinogens and tumor promoters in epidermal cells both in vivo and in vitro with some studies performed on human epidermal cells in culture.
APPROACH: Dose-response studies on the tumor initiating and promoting abilities of a methylated and non-methylated PAH (7,12-dimethylbenz(a)anthracene and benzo(a)pyrene, respectively) and their cellular metabolites will be undertaken in order to better define complete carcinogenesis. A skin tumor sensitive strain of mice will be used in the above tumor experiments. Since these mice are not available commercially, we plan to start a breeding colony of these mice plus a tumor resistant strain. These mice will be extremely valuable to our research program. We have begun studies of chemical carcinogenesis in vitro using mouse and human epidermal cells. We will determine if there is a correlation between the tumor initiating ability of several PAH and their ability to bind to the bases of DNA and to specific regions in the genome. The cellular metabolism of phorbol ester tumor promotors will be studied using high pressure liquid chromatography.
RESULTS: The results from the tumor experiments on what metabolites contribute to tumor initiating and promoting activities will be available. A quantitative in vitro transformation of both human and mouse epidermal cells into cancer cells should be available. The metabolism studies with phorbol ester tumor promoters will be completed. Some of the studies with the anticarcinogenic agents will be completed and their use as potential chemophophylaxic agents will be known.

PROJECT MILESTONES: Since the majority (greater than 85 percent) of human cancers arise from epithelial tissue it is important to have a quantitative in vitro transformation system. We hope to attain this goal. Also, if we can transform the normal human epidermal cells in culture into cancer cells we will be the first ones to accomplish this. As results become available from our experiments they will be published in appropriate journals.
KEYWORDS: CANCER;BENZANTHRACENE;BENZOPYRENE;CARCINOGENESIS;CELL CULTURES;MICE;MAN;DOSE-RESPONSE RELATIONSHIPS;BIOCHEMISTRY;CARCINOGENS;HYDROCARBONS;TOXICITY

<085100>
TITLE: Effects of Carcinogens and Mutagens on Genes Controlling Growth and Replication of Cells
PROJECT NUMBER: 001563
PRINCIPAL INVESTIGATOR: Papaconstantinou, J.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$85,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study the biochemical characteristics of cancer cells and how these characteristics are acquired: (1) the mechanism of initiation of alpha-fetoprotein synthesis in carcinogen treated liver cells; and (2) the regulation of DNA synthesis and the sequence of DNA synthesis in carcinogen treated cells.
APPROACH: The synthesis of alpha FP in embryonic liver cells and hepatoma using radioimmunoassay procedures. Induction of alpha FP synthesis in carcinogen treated animals. Isolation of alpha FP mRNA. Isolation of alpha FP-DNA sequences. Effect of carcinogens on the physicochemical properties of these nucleic acids.
RESULTS: To understand the interaction of carcinogens with specific DNA sequences and their regulatory proteins. To understand how these carcinogens derepress the expression of these genes.
PROJECT MILESTONES: (1) Isolation of a specific gene and the proteins which regulate its expression. (2) To determine how carcinogens affect the expression of these genes.
KEYWORDS: NEOPLASMS;BIOCHEMISTRY;DNA REPLICATION;PROTEINS;BIOSYNTHESIS;RNA;DNA;CARCINOGENS;GENES;TISSUES

<085101>
TITLE: Biomedical Engineering of Cancer Immunology
PROJECT NUMBER: 001564
PRINCIPAL INVESTIGATOR: Breillatt, Julian P. Eveleigh, John W.
ADDRESS: Oak Ridge National Laboratory (Biology Division), P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$283,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (50%);NUCLEAR/General (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The primary goals of this project are to generate the means for ex vivo immunodepletion therapy, for automated monitoring of the immunological indices of the host/tumor relationship, and for early cancer detection.
APPROACH: The path towards our primary goals is a closely interwoven program to invent, develop and evaluate the required instrumentation and methods; and to produce the necessary pure immunoreagents. The significant events along this path are: (1) mathematical simulation and experimental verification of the chemical kinetics and fluid dynamics of immunosorption reactions, (2) development of systems for immunodepletion, reagent detection and production, and automated immunoassay; and their associated immunosorbents and protocols; (3) production and purification of specific reagents, and (4) development of automated assays for cell-mediated immunity.
RESULTS: (1) Immunodepletion of tumor antigens and associated antibodies from extracorporeal shunts of animals and then human tumor-bearers. (2) Production of a homeostatic state in the disturbed immune regulatory system thru No. 1. (3) Automated immunoassays to monitor patient/tumor relationship: (a) radioimmunoassay for antigen and antibody, (b) cell-mediated immunoassay, (c) immune complex assay, and (d) anti-idiotypic antibody.
PROJECT MILESTONES: (1) Development of prototype automated immunoassay system. (2) Development of immunodepletion cartridge for ex vivo use in humans. (3) Development of control and monitoring system for immunodepletion protocol. (4) Production of pure immunoreagents: antibodies against tumor antigens, tumor antigens, and anti-idiotypic antibodies. (5) Development of automated cell-mediated immunity assay.
KEYWORDS: CANCER;NEOPLASMS;DIAGNOSIS;THERAPY;IMMUNITY;ANTIGENS;ANTIBODIES;CARCINOGENS;COMPUTER CODES;MAN;IMMUNOLOGY

<085102>
TITLE: Bicengineering Research
PROJECT NUMBER: 001565
PRINCIPAL INVESTIGATOR: Hancher, C.W.
ADDRESS: Building 4505, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Rabson, Robert
TELEPHONE: F233-3571
TYPE OF FUNDING: Contract No.-W-7405-eng-26

77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (25%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (75%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To explore fundamental relationships in areas of bioengineering research, particularly with regard to microbial and enzyme engineering separation technology, and bioprocess development for pollution abatement.
APPROACH: Use established chemical engineering research methods and techniques to conceive, design, and evaluate practical biochemical reactors and processes.
RESULTS: A new, highly efficient bioreactor, the tapered, fluidized bed bioreactor (TFBBR). An understanding of the fundamental relationships of biomechanisms andd bioprocesses which will allow efficient design of bioprocess equipment.
PROJECT MILESTONES: (1) Complete studies of the fluid dynamic properties of the Tapered Fluid Bed Bioreactor (TFBBR) April 1, 1977. (2) Complete studies of the mass transfer properties of the TFBBR Oct. 1, 1977. (3) Complete evaluation of TFBBR for degradation of phenolic acids in aqueous wastes Jan. 1, 1978.
KEYWORDS: BIOREACTOR;MICROORGANISMS;ENZYMES;ENGINEERING;POLLUTION;BIOCHEMISTRY;CHEMICAL EFFLUENTS;WATER

<085103>
TITLE: Inhibition of DNA Repair by Chemicals Released from Non-Nuclear Energy Generators
PROJECT NUMBER: 001566
PRINCIPAL INVESTIGATOR: Regan, J.D.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: FOSSIL FUEL/General (20%);FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil and Gas (30%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is well recognized that certain physical and chemical agents can induce DNA damage. However, a more insidious effect of pollutants may be by their indirect means of inducing carcinogenic and mutagenic damage in cellular DNA by inhibiting the DNA repair mechanism. Numerous studies have shown that DNA repair mechanisms are of primary importance in preserving and monitoring the genetic integrity of cellular DNA. Carcinogens and mutagens would have greater effects in their yield of cancers and mutations were it not for these repair mechanisms which efficiently correct DNA damage induced by these agents. If DNA repair mechanisms are inhibited or interfered with in any fashion, damage induced by carcinogens or mutagens would be proportionately increased. Of great importance in this area is the effect of pollutants and products of non-nuclear energy production, particularly those compounds found in coal liquefaction and gasification processes. This vast array of compounds includes such pollutants as ozone, sulfur, and nitrogen oxides and such products as polycyclic hydrocarbons and aromatic amines. Several of these compounds are proven or suspected mutagens and/or carcinogens and can be expected to include possible inhibitors of DNA repair.
APPROACH: We have sensitive, rapid, and informative techniques for studying DNA repair which include (1) bromodeoxyuridine photolysis and (2) molecular weight analysis. In addition, we have fully characterized DNA repair in human cells (normal and repair deficient mutants) after DNA damage by a variety of agents. Clearly, experimental analysis of these compounds must take into account the following observations: (1) if the compound acts as an inhibitor of DNA repair following a physical or chemical insult, (2) if the compound itself damages the cellular DNA and (3) if such damage by the compound is corrected by a cellular repair mechanism.
RESULTS: From our results of the preceding year it is clear that we are encountering several different effects of putative repair inhibitors. First is a frank inhibition of DNA repair with no photodynamic action. Secondly, a combination of DNA repair inhibition and photodynamic action either resulting in cross links or molecular weight reduction in the DNA, the latter being the most frequent. Thirdly, no inhibition of DNA repair but a photodynamic action resulting in a molecular weight reduction in the DNA. That is, an actual damage to the DNA done by these agents in combination with 313 light. Such photodynamic action would be expected in vivo in individuals exposed to certain of these agents and subsequently exposed to normal sunlight. We have received from Dr. Epler, of the Mutagenesis Testing Unit, a large number of additional coal conversion chemicals which are presently under test and will be examined in FY 1977. These include the quinoline derivatives, chloromercuribenzoate compounds and polycyclic hydrocarbon epoxides. Because these are important compounds in coal conversion processes, it is important to investigate these for the three possible types of action that we have encountered with previous putative repair inhibitors as outlined above. When enough of these chemicals have been characterized with regard to what category they may fall into we will be able to make a statement concerning the relationship.
PROJECT MILESTONES: Publication of comprehensive report on selected representative compounds, relating their chemical structure and interaction with DNA to their molecular ability to inhibit DNA repair in human cells.
KEYWORDS: DNA;BIOLOGICAL REPAIR;ULTRAVIOLET RADIATION;HEALTH HAZARDS;BIOLOGICAL EFFECTS;CHEMICAL EFFLUENTS;MUTAGENESIS;CARCINOGENESIS;QUANTITATIVE CHEMICAL ANALYSIS;BIOASSAY;ORGANIC COMPOUNDS;MAN;ANIMAL CELLS;SYNTHETIC FUELS;ENVIRONMENTAL EFFECTS;POWER GENERATION;AIR POLLUTION;LAND POLLUTION

<085104>
TITLE: Development of Tests for Genetic Mutation in Humans
PROJECT NUMBER: 001567
PRINCIPAL INVESTIGATOR: Popp, R.A.;Hirsch, G.P.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.

TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
FUNDING: Energy Research and Development Administration FY77:$106,000
CHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (10%);NUCLEAR/General (75%);GENERAL SCIENCE (15%)
LLUTANTS: ORGANICS/Carcinogens; pesticides (10%);RADIATION/Gamma fallout; accidents; therapy (90%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Marshall Islands
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Tests are being developed to assess the frequency at which base substitutions naturally occur and are induced in human somatic cells following exposure to irradiation or hazardous chemicals. In hemoglobin, amino acid substitutions resulting from nucleotide substitutions become fixed in germinal cells at a low frequency, approximately 10/sup -9/ per codon per year. Base substitutions must also occur at some low frequency in somatic cells. Base substitution genetic damage caused by exposure of humans or animals to irradiaton or chemical mutagens can be determined by measuring the increase over the natural base substitution frequency. Techniques presently used to test for genetic damage in somatic cells cannot measure the frequency of base substitutions, which is an important measurement to make because it represents the kind of mutation that occurs most frequently in evolution.
APPROACH: Methods involve chemical measurements of the frequency at which the wrong (noncoded) amino acids are erroneously incorporated into proteins of humans or experimental animals. Human hemoglobin A is ideal because it is easy to purify and it has no coded isoleucine; therefore the small quantity of isoleucine present in human hemoglobin A is incorporated because of translational errors and/or nucleotide substitutions in the hemoglobin genes of a few erythropoietic stem cells. Data are being collected from the hemoglobin of the Marshallese exposed to gamma-radiation fallout in 1954 and persons accidentally exposed or receiving irradiation therapy. Experimental animal models are being developed to interpret human findings; in particular, a dose-response curve must be etablished in an experimental animal.
RESULTS: These studies will provide the first known data on the natural frequency of base substitution mutations in somatic cells for comparison with the known frequency of nucleotide substitutions in germinal cells. Data will also be obtained on the extent to which base substitutions are elevated in somatic cells of humans exposed to irradiation. A priori, this can be used to estimate the frequency of base substitutions induced in humans exposed to irradiation. The methods will be useful as a means to determine the mutagenic effect of potentially hazardous chemicals.
PROJECT MILESTONES: This year we expect to do a dose response study of the incorporation of isoleucine into the beta-chain of rabbit hemoglobin. Additional analyses will be made on the isoleucine content of Marshallese exposed to fallout in 1954. Blood from others accidentally exposed will be analyzed as it becomes available through Dr. Clarence Lushbaugh, ORAU.
KEYWORDS: MUTAGENESIS;IONIZING RADIATIONS;MUTAGENS;TESTING;GENETIC EFFECTS;AMINO ACIDS;ERRORS;PROTEINS;MAN;BLOOD;GAMMA RADIATION;MOLECULAR STRUCTURE;SOMATIC MUTATIONS

<085105>
TITLE: Comparative Mutagenesis
PROJECT NUMBER: 001569
PRINCIPAL INVESTIGATOR: Epler, J.L.
ADDRESS: Biology Division, Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (10%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (20%);FOSSIL FUEL/Oil Shale (10%);GENERAL SCIENCE (60%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS/Oxides S/N (5%);METALS/Heavy (5%);PARTICULATES/PAH containers (5%);ORGANICS/Mutagens (potentials) (85%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major goal of the comparative mutagenesis group is to provide a means of mutagenicity testing of those compounds produced by various existing or proposed methods of energy generation. These include the primary effluents of existing fossil fuel sources such as sulfur dioxide, the oxides of nitrogen, ozone, hydrocarbons, and heavy metals. It will also include products of newly proposed methodology such as coal liquefaction and of auxiliary methodology.
APPROACH: The work is divided into two phases: one dealing with known compounds expected to occur in the environment through energy production, conversion, or use; and another dealing with actual samples from existing or experimental processes. Using rapid screening genetic assays (''Ames System''), the group is attempting to identify mutagenic agents associated with coal and oil shale extraction, conversion or utilization. To approach the problems of testing large numbers of compounds, we set up a form of the ''tier system.'' Operating units utilizing Salmonella, E. coli, yeast, human leukocytes, mammalian cells, and Drosophila have been initiated.
RESULTS: A large group of compounds were preliminary tested. Many of these compounds are polycyclic hydrocarbons and require metabolic activation with mammalian extracts. The comparative role of assays with activation in microbial systems and the mutagenic response in higher organisms is being investigated. Primary and subfractions of products and aqueous discharges were assayed. Potential mutagenic fractions were identified and attempts will be made to ascertain the specific compound(s) responsible for the mutagenic action.
PROJECT MILESTONES: (1) 1/1/77 Complete short-term assay on (a) 4 process-aqueous discharge, (b) begin work on comparative assays; begin cell culture assay. (2) 3/31/77 Preliminary information on specific compounds; extension to comparative assays; begin work on revised fractionation procedures. (3) 6/30/77 Complete work on revised fractionation. (4) 9/30/77 Preliminary evaluation--cell culture assay; completion of short term assays on environmental effluents; preliminary evaluation--comparative approach; begin work on specific compounds/revised fractionation.
KEYWORDS: MUTAGENESIS;FOSSIL FUELS;ENERGY SOURCES;CHEMICAL EFFLUENTS;SULFUR DIOXIDE;NITROGEN OXIDES;HYDROCARBONS;OZONE;METALS;BIOLOGICAL EFFECTS;ENVIRONMENTAL EFFECTS;SALMONELLA;ESCHERICHIA COLI;YEASTS;LEUKOCYTES;ANIMAL CELLS;DROSOPHILA;COAL;OIL SHALES;BACTERIA;CARCINOGENS;GENETICS;SYNTHETIC FUELS;IN VITRO

<085106>
TITLE: Mammalian Chemical Mutagenesis Testing Program
PROJECT NUMBER: 001570
PRINCIPAL INVESTIGATOR: Russell, W.L.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (10%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (80%);GENERAL SCIENCE (10%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);ORGANICS (60%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This is a comprehensive mouse mutagenesis program to test those chemical compounds and mixtures related to non-nuclear energy production which pose a potential genetic risk to human populations.
APPROACH: The program is comprehensive in three senses. First, it includes tests for transmitted gene mutations as well as for transmitted chromosomal aberrations. Second, since no single end-point has proved adequate for detection of chromosomal aberration events, we use not only the dominant-lethal test, but also the test for heritable translocations, and the X-chromosome-loss test developed by us. Third, related tests are employed that help in the performance or evaluation of the mutagenesis work. Among these are: (a) toxicity tests; (b) fate and metabolism, including dosimetry and interaction with germ-cell DNA; (c) measurement of female reproductive performance (important in itself, but also an indicator of dominant lethality); (d) germ-cell lethality measurement to evaluate the role of selection; (e) measurement of DNA repair in germ cells.
RESULTS: Quantitative evaluation of the risk from any chemicals related to non-nuclear energy production which prove to be mutagenic. In tests where no mutagenic effect is found, the data are expected to show that the sample size was large enough to have detected mutagenicity if it had been at a level considered hazardous.
PROJECT MILESTONES: This is a long-term project to test, one after another, those chemicals or mixtures related to non-nuclear energy production which are identified as possible mutagens. Priority for testing will be based on many factors, including results from non-mammalian tests and probable extent of human exposure. Immediate milestones are the completion of tests on sulfur dioxide, heavy metals, and some polycyclic aromatic hydrocarbons.
KEYWORDS: MICE;MUTAGENESIS;MUTAGENS;TESTING;GENE MUTATIONS;CHROMOSOMAL ABERRATIONS;GERM CELLS;DNA;FEMALES;REPRODUCTION;SULFUR DIOXIDE;METALS;HYDROCARBONS;ANIMALS;IN VIVO

<085107>
TITLE: Ion Chemistry in the Atmosphere
PROJECT NUMBER: 001602
PRINCIPAL INVESTIGATOR: Stockdale, J.A.D.;Schweinler, H.C.;Garrett, W.R.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (80%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To elucidate the physics or gas phase chemistry of atmospheric ion-molecule and ion-ion interactions which result from natural and man-made sources in the environment. Reaction rates, dissociative products, fragment kinetic energies and reaction spectra are determined for a variety of molecular species.
APPROACH: Low energy negative ions are produced by dissociative electron attachment reactions. The negative ions thus produced are allowed to react with target molecules where products are analyzed by a quadrupole mass spectrometer. In a second experiment dissociative ionization by electron bombardment is used to produce molecular ion products which are energy and mass analyzed by time-of-flight and by a quadrupole mass filter.
RESULTS: (1) Kinetic energies or effective temperatures of reaction products. (2) Branching ratios for dissociative products. (3) Ion-molecule scattering cross sections. (4) Ion-ion reaction rates. (5) Detached electron energy spectra.
KEYWORDS: EARTH ATMOSPHERE;ION-ION COLLISIONS;ION-MOLECULE COLLISIONS;REACTION KINETICS;BRANCHING RATIO;CROSS SECTIONS;AIR;CHEMICAL EFFLUENTS;SCRUBBERS;SULFUR COMPOUNDS;CHEMICAL REACTIONS

<085108>
TITLE: Physicochemical Properties of Chemical Pollutants, Biologically Active Molecules and Related Structures
PROJECT NUMBER: 001603
PRINCIPAL INVESTIGATOR: Christophorou, L.G.
ADDRESS: Health Physics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hudson, Frank
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
POLLUTANTS: NOXIOUS GAS (10%);ORGANICS (80%);RADIATION (10%)

CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: Determine basic physical and chemical properties of important pollutants and toxic compounds and unravel their interaction mechanisms and pathways.
APPROACH: Employ novel photophysical, electron impact, ion impact and mass spectrometric techniques, as well as theoretical and computational methods and ''synthesis'' of existing knowledge on the physical and chemical properties and interactions of pollutants and toxic compounds.
RESULTS: Understanding of physicochemical properties, electronic structure, electron-molecule interaction processes, reaction pathways. Use of this knowledge to understand toxic action of biologically active molecules, screen toxic chemicals and elucidate collision kinetics and modeling of reaction pathways and effects in the atmosphere.
PROJECT MILESTONES: Continue vigorously basic research and publish regularly and promptly results.
KEYWORDS: AIR POLLUTION;PHYSICAL PROPERTIES;CHEMICAL PROPERTIES;INTERACTIONS;ELECTRONS;MOLECULES;COLLISIONS;KINETICS;CARCINOGENS;CHEMICAL EFFLUENTS;ELECTROMAGNETIC RADIATION;HYDROCARBONS;ULTRAVIOLET RADIATION

<085109>
TITLE: Pollutant Ion Formation and Atmospheric Clustering Phenomena
PROJECT NUMBER: 001604
PRINCIPAL INVESTIGATOR: Klots, C.E.;Garrett, W.R.;Compton, R.N.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hudson, Frank
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$170,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (80%);PARTICULATES (10%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Through theoretical calculations and experimental measurements, the clustering reactions of a number of positive and negative ions will be determined. Species of interest in atmospheric processes and in combustion of fossil fuels are to be characterized as to types of cluster ions formed, cluster sizes, characteristics, and clustering rates under different ambient conditions.
APPROACH: Supersonic expansion nozzles will be used to create molecular clusters which interact in a crossed beam apparatus with photons, electrons and atomic beams. Reaction products are analyzed by time-of-flight and by quadrupole mass spectrometry.
RESULTS: Detailed information will be obtained on the formation and subsequent clustering of positive and negative ion species of atmospheric constituents and of pollutant ions. These data include cluster sizes, reaction rates, electron affinities of clusters, and other characterizations of such chemical species.
PROJECT MILESTONES: (1) Completion of Phase I experimental apparatus for studies of clustering phenomena in condensable gases Spring 1976. (2) Completion of Phase II experimental apparatus for studies of clustering phenomena in non-condensable gases Fall 1976.
KEYWORDS: CATIONS;ANIONS;ION PAIRS;INTERACTIONS;PHOTONS;ATOMIC BEAMS;FOSSIL FUELS;COMBUSTION;AIR POLLUTION;CHEMICAL EFFLUENTS;SCRUBBERS;SULFUR COMPOUNDS;EARTH ATMOSPHERE;CHEMICAL REACTIONS;MOLECULE COLLISIONS

<085110>
TITLE: Studies of Surface Interactions and Ion Particulate Accretion
PROJECT NUMBER: 001605
PRINCIPAL INVESTIGATOR: Ritchie, R.H.
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AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$175,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (40%);PARTICULATES (35%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: To understand the basic interactions of environmental pollutants with matter and to study, theoretically and experimentally, the forces on charged or neutral bodies located near a solid or liquid surface.
APPROACH: Basic techniques of theoretical physics (e.g., classical electromagnetic theory, quantum mechanics) will be employed in this work. Emphasis will be placed on the role of collective electron and ion oscillatory motion associated with the surface of the condensed phase in determining these forces. Experimental measurements of such forces will be made to complement the theoretical studies.
RESULTS: This project is expected to provide a better understanding and description of the processes of particle accretion, adhesion of particulate matter to macroscopic bodies, energy transport in an atmosphere which contains particulate matter, and reactions among molecules at gas-condensed matter interfaces.
PROJECT MILESTONES: Regular publication of research results.
KEYWORDS: PARTICLES;AIR POLLUTION;INTERACTIONS;ENERGY TRANSPORT;ELECTRONS;IONS;EARTH ATMOSPHERE;AEROSOLS;CHEMICAL EFFLUENTS;INHALATION;MOLECULAR STRUCTURE

<085111>
TITLE: Development of Portable Analyzer
PROJECT NUMBER: 001606
PRINCIPAL INVESTIGATOR: Mrochek, J.E.
ADDRESS: Chemical Technology Division, Oak Ridge National Laboratory, Post Office Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
POLLUTANTS: ORGANICS (30%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (70%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale (60%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: To adapt or develop methodologies for the sensitive and specific assays of labile environmental pollutants by measurement of transmission, absorption, fluorescence, chemiluminescence, or light-scattering signals on the portable Centrifugal Fast Analyzer.
APPROACH: One aspect of this work will be directed toward developing methods for pollutants which are unstable or whose concentration would be changed during transportation from the point of sampling to a laboratory facility. Examples are residual chlorine and ozone in natural waters downstream from power plants. A second aspect of this development effort will be directed toward the accurate and sensitive measurement of biomass and nutrients in the field. Here development of methods for adenosine monophosphate (AMP) and adenosine diphosphate (ADP) are needed to go along with an available method for ATP. In addition, methodologies are needed to measure polysaccharides and phosphate and nitrate at the ppM level.
RESULTS: It is expected that techniques can be developed for the preloading of CFA rotors with reagents for useful analyses of environmental pollutants including silicate, phosphate, nitrate, and ammonia. Using these rotors with the portable CFA and dynamic introduction of samples, it is anticipated that analyses for a number of environmental pollutants can be performed in the field with high precision and accuracy. Coupling fast kinetic data acquisition with assays utilizing enzymes is expected to improve analytical specificity.
PROJECT MILESTONES: (1) Demonstrate sensitive and reproducible enzymatic assay for nitrate reductase from Chlorella September 1976. (2) Demonstrate preparation of preloaded rotors with reagents for four nutrients, phosphate, silicate, ammonia, and nitrate December 1976. (3) Demonstrate kinetic assays for AMP and ADP as additional measurements of biomass March 1977.
KEYWORDS: WATER POLLUTION;MONITORING;CHEMICAL EFFLUENTS;LIQUID CONTAMINATION MONITORS;MEASURING INSTRUMENTS;AMMONIA;PHOSPHATES;SILICA;NITRATES;QUANTITATIVE CHEMICAL ANALYSIS;TRACE AMOUNTS;COMPUTER CALCULATIONS;PHOTOMETERS;DESIGN;BIOCHEMISTRY;BIOMASS;ECOSYSTEMS;MUTAGENESIS;WATER;NUTRIENTS

<085112>
TITLE: Advanced Multidetector Spectrographic Systems for Trace Element and Molecular Analysis
PROJECT NUMBER: 001607
PRINCIPAL INVESTIGATOR: Davidson, J.B.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hudson, Frank
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/Fission (25%);GEOTHERMAL/General (25%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S (25%);METALS/Mercury;METALS/Cadmium;METALS/Arsenic (25%);ORGANICS/Polynuclear aromatics (25%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Applied (30%);DEVELOPMENT/Laboratory scale (60%);FULL SCALE DEMONSTRATION (5%);PRODUCTION (5%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To assess needed instrumentation in personnel site monitoring and analytical chemistry related to energy source development (coal, nuclear). To apply new electronic devices and techniques to development of advanced detection instruments and systems for spectral identification and quantification of metals and organics.
APPROACH: The unifying concept is the application of light amplifiers, multidetector arrays, camera tubes and television technology to analytical spectroscopy. The conventional single slow detector will be replaced with thousands of detector elements operating simultaneously making possible rapidly responding instruments requiring smaller samples. Novel detection techniques which are extensions of nuclear instrument technology will be applied to hydrocarbons in gas phase.
RESULTS: (1) Improved solid state detector array system for analytical spectroscopy having photon counting sensitivity employing analog spectrum correlation and recognition. (2) Personnel and area monitoring systems for polynuclear aromatic hydrocarbons. (3) Improved hydrocarbon detector for gas chromatography.
PROJECT MILESTONES: (1) Electrically cooled, intensified, solid state array (1024 elements) detector operating. (2) Operating analog binary sequence correlator (1024 elements). (3) Prototype personal air sampler, integrating with alarm. (4) Operating prototype hydrocarbon detector for gas chromatography.
KEYWORDS: ENERGY SOURCES;COAL;NUCLEAR ENERGY;ELECTRONIC EQUIPMENT;PERSONNEL MONITORING;MEASURING INSTRUMENTS;SPECIFICATIONS;AMPLIFIERS;SPECTROSCOPY;HYDROCARBONS;GAS CHROMATOGRAPHY;CHEMICAL EFFLUENTS;METALS;SYNTHETIC FUELS

<085113>
TITLE: Resonance Ionization Spectroscopy
OJECT NUMBER: 001608(RT 04 03)
INCIPAL INVESTIGATOR: Hurst, G.S.;Payne, M.G.;Kramer, S.D.;Wagner, E.B.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biological and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
POLLUTANTS: NOXIOUS GAS (90%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To perfect resonance ionization spectroscopy (RIS) and to apply it to systems for the detection of low levels of atomic species.
APPROACH: Dye lasers are used to selectively excite and then ionize atoms. By saturating ionization and detecting electrons in a proportional counter or an electron multiplier, one atom detection is possible.
RESULTS: (1) Demonstrate one atom detection for a variety of applications. (2) Study energy pathways relevant to the species involved in one atom detection.
PROJECT MILESTONES: (1) Demonstrate one atom detection by generating one atom at a time by using the B-10(n,alpha)-Li-7 process by fall of 1976. (2) Demonstrate the use of Rydberg states for one atom detection with lower energy (10/sup -3/ joule) per pulse by March 1977.
KEYWORDS: PHOTOELECTRON SPECTROSCOPY;RESEARCH PROGRAMS;DYE LASERS;LASER RADIATION;PROPORTIONAL COUNTERS;ELECTRON MULTIPLIER DETECTORS;MICROANALYSIS;ATOMS;TRACE AMOUNTS;CHEMICAL ANALYSIS;NUCLEAR REACTION ANALYSIS;CHEMICAL EFFLUENTS

<085114>
TITLE: Continuous Monitors for Effluents
PROJECT NUMBER: 001609
PRINCIPAL INVESTIGATOR: Pitt, W.W. Jr.
ADDRESS: Oak Ridge National Laboratory, Chemical Technology Division, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is the development of continuous-monitoring systems for on-site monitoring of air and water pollutants.
APPROACH: The approach being taken is: (1) Adaptation of existing flow detectors for use as environmental monitors; (2) Identification and conceptualization of new monitors for pollutant detection and measurement.
RESULTS: Prototype models of high-resolution analytical and monitoring systems useful in the area of water pollution.
PROJECT MILESTONES: (1) Prototype continuous chemical oxygen demand monitor constructed Oct. 1, 1976. (2) Prototype continuous flow fluorometer for dissolved uranium constructed March 1, 1977. (3) Conceptual design for chloroorganic monitor formulated April 1, 1977.
KEYWORDS: INSTRUMENTATION;CHEMICAL EFFLUENTS;WATER POLLUTION;MONITORING;AUTOMATION;COAL;AIR POLLUTION;AUTOMATION;ORGANIC CHLORINE COMPOUNDS;RADIATION DETECTION;URANIUM;RADIATION DETECTORS;AIR POLLUTION MONITORS;RADIOACTIVE EFFLUENTS;MONITORING;PERFORMANCE TESTING;WATER QUALITY;AIR QUALITY

<085115>
TITLE: Energy Pathways in Irradiated Gases
PROJECT NUMBER: 001610
PRINCIPAL INVESTIGATOR: Hurst, G.S.;Payne, M.G.;Judish, J.P.;Chen, C.H.;Kramer, S.D.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (25%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To understand the consequences of the absorption of radiation in matter in a detailed fashion. The energy pathways followed as an irradiated system returns to a new state of equilibrium provide the underlying basis for understanding radiation effects at the chemical and biological levels.
APPROACH: A Van de Graaff accelerator is used to irradiate gases with 2-MV protons. Studies are made using time resolved vacuum ultraviolet emission spectroscopy, resonance ionization spectroscopy (using dye lasers to ionize excited species), and total ionization measurements.
RESULTS: (1) Understanding of radiation interactions with gases, including detailed knowledge of excited species created and their further interaction with gases. (2) Energy pathways concepts and supporting data for the design of sensitive pollution detectors.

PROJECT MILESTONES: (1) Extending the development of resonance ionization spectroscopy to excited states of Ne, Ar, Kr, and Ze by December 1976. (2) Evaluate the possibility for time resolved resonance fluorescence for pollution analysis by December 1976. (3) Model energy pathways in all noble gases by December 1977.
KEYWORDS: INSTRUMENTATION;ATMOSPHERIC;IONIZING RADIATIONS;ABSORPTION;CHEMICAL RADIATION EFFECTS;GASES;ENERGY LEVELS;SPECTROSCOPY;EXCITED STATES;VAN DE GRAAFF ACCELERATORS;ULTRAVIOLET RADIATION;CHEMICAL EFFLUENTS

<085116>
TITLE: Environmental Fate of Emissions from Coal Combustion Plants
PROJECT NUMBER: 001624
PRINCIPAL INVESTIGATOR: Van Hook, R.I.
ADDRESS: Bldg. 2001, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3763
TYPE OF FUNDING: Agency in-house effort-Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (40%);PARTICULATES (40%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: (1) Evaluate the role of a forested landscape in the removal of airborne trace contaminants, (2) to determine the physicochemical characteristics of source emissions and atmosphere inputs of selected trace contaminants to a terrestrial landscape, (3) to optimize the use of an atmospheric transport model to compute inputs of trace contaminants to the terrestrial landscape from selected point sources, and (4) to determine if atmospheric emission and landscape deposition of trace contaminants derived from coal-fired power plants result in significant net annual and/or long-term accumulation of these contaminants on a representative East Tennessee watershed.
APPROACH: The technical approach involves use of an intensively instrumented and well-characterized forested catchment (located within 15 km of two large coal-fired power plants) on which measurements of selected trace contaminants in air, rain, on leaf surfaces and in stream water are made on a basis designed to elucidate transport, deposition and cycling of these contaminants on a landscape scale.
RESULTS: Successful attainment of these objectives will provide (1) an increased understanding of the influence of forest vegetation on air quality in the vicinity of coal-fired power plants, (2) an improved state of knowledge concerning the physicochemical characterization of coal-derived aerosols which has implications to both environmental and human health effects considerations, (3) an improved atmospheric transport model for predicting ambient air concentrations and deposition of coal-derived aerosols, and (4) an evaluation of the potential for accumulation of coal-fired power plant emissions deposited on the landscape.
PROJECT MILESTONES: Completion of meteorological tower instrumentation June 1976. Initiation of full-scale aerosol-canopy interactions study. Initiation of plume sampling for source characterization. Material balance of selected contaminants for Walker Branch Watershed.
KEYWORDS: FATE;FOSSIL-FUEL POWER PLANTS;AIR POLLUTION;LAND POLLUTION;TERRESTRIAL ECOSYSTEMS;FORESTS;MONITORING;AIR QUALITY;CHEMICAL EFFLUENTS;AEROSOLS;AIR;ELEMENTS;TRACE AMOUNTS

<085117>
TITLE: Biogeochemical Cycling in Aquatic Ecosystems of Trace Elements in Coal
PROJECT NUMBER: 001625
PRINCIPAL INVESTIGATOR: Elwood, J.W.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, Heyward
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: METALS/Nickel;METALS/Cadmium;METALS/Chromium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Other hydrographic areas Streams, reservoirs
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To develop information on the mechanisms and rates of enrichment of Cd, Ni, and Cr in detritus food chains in Walker Branch Watershed streams and to determine the biological availability of these three elements to aquatic biota in a stream and quarry used as a disposal site for fly ash from a coal-fired electric generating plant.
APPROACH: Baseline measurements of Cd, Ni, and Cr concentrations in detritus food chains in a small stream will be determined, including concentrations in leaf detritus as a function of stage of decomposition. Contribution of surface microflora (bacteria, fungi, algae) to the accumulation of Cd, Ni, and Cr in leaf detritus will be determined in both field and laboratory studies. Mechanisms of enrichment will first be determined in the laboratory by sterilizing leaf detritus and killing algae with radiation and determining differences in enrichment of radiotracers of these three elements. Availability and turnover of Cd, Ni, and Cr to detritivores will also be determined using radioactive tracers in laboratory studies.
RESULTS: Results of this study will define the mechanisms of enrichment of Cd, Ni, and Cr in detritus-based food chains in freshwater environments and the turnover and bioaccumulation of these three elements in aquatic biota. In addition, the biological availability of Cd, Ni, and Cr to aquatic biota in a stream-quarry-reservoir system used for fly ash disposal will be determined. This information will provide information necessary to assess the potential effects of pond disposal of fly ash from coal combustion

and/or other coal technologies.
PROJECT MILESTONES: Complete baseline experiments on the analyses for Cd, Ni, and Cr in the detritus food chain in the Walker Branch Watershed stream.
YWORDS: CADMIUM;CHROMIUM;NICKEL;BIOGEOCHEMISTRY;FOOD CHAINS;AQUATIC ECOSYSTEMS;TRACER TECHNIQUES;BIOLOGICAL ACCUMULATION;AQUATIC ORGANISMS;FLY ASH;WASTE DISPOSAL;ENVIRONMENTAL EFFECTS;WATER

<085118>
TITLE: Fixed and Mobile Low-Elevation Dispersed Sources of Airborne Pollutants
PROJECT NUMBER: 1626
PRINCIPAL INVESTIGATOR: Kaye, S.V.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview/Integrated Assessment
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Determine the sources of atmospheric pollutants in the Kingston-Harriman, Tennessee, area other than TVA power stations.
APPROACH: Identify and quantify major sources of air pollutants including those from automobiles and trucks.
RESULTS: Data not presently available on sources and amounts of air pollutants in the Kingston-Harriman area.
PROJECT MILESTONES: Report end of FY 1977
KEYWORDS: AIR POLLUTION;TENNESSEE;AUTOMOBILES;EXHAUST GASES;CHEMICAL EFFLUENTS;MONITORING;HYDROCARBONS;SULFUR COMPOUNDS

<085119>
TITLE: Ecological Effects of Coal Combustion, Response of Vegetation to SO/sub 2/, Ozone and Acid Precipitation
PROJECT NUMBER: 001627
PRINCIPAL INVESTIGATOR: McLaughlin, S.B. Jr.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Agency in-house effort-Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/O/sub 3/ (50%);SPECIFIED OTHER POLLUTANTS/Acid precipitation (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Ecological Effects of Coal Combustion: Response of Vegetation to SO/sub 2/, O/sub 3/, and Acid Precipitation will examine physiological responses of plants as indicators of acute and sub-acute response of plants to air pollution stress. Primary emphasis will be placed on determining the physiologically significant features of pollutant doses.
APPROACH: With gaseous pollutants (SO/sub 2/ and O/sub 3/) concentration peaks, duration and frequency will be varied while the frequency, pH, intensity and chemical composition of acidified rainfall will be examined and related to plant response. Response parameters to be measured include photosynthesis, respiration, transpiration, and carbohydrate metabolism, and growth. Both individual and combined pollutant regimes will be studied to develop a physiological basis for evaluating probable effects of pollutant stress under field conditions.
RESULTS: This project is designed not only to improve our understanding of the response of plants to pollutant stress, but to provide a means of characterizing pollutant dose in biologically meaningful terms. While the initial phases rely heavily on controlled laboratory exposures, increased emphasis will be placed on evaluation of pollutant stress under field conditions as the project proceeds.
PROJECT MILESTONES: (1) Determine the influence of individual and combined dosage kinetics of SO/sub 2/ and O/sub 3/ on physiology of kidney bean. (2) Determine influence of treatment duration and acidity level, and chemical composition of acid rainfall on plant physiological processes. (3) Examined combined effects of SO/sub 2/, O/sub 3/, and acid precipitation on plant physiology and growth.
KEYWORDS: COAL;COMBUSTION;ENVIRONMENTAL EFFECTS;PLANTS;SULFUR DIOXIDE;OZONE;INORGANIC ACIDS;AIR POLLUTION;ACID RAIN;PHOTOSYNTHESIS;RESPIRATION

<085120>
TITLE: Numeric Information Support for Modeling Analysis, and Assessment of Environmental Impacts of Energy Technologies
PROJECT NUMBER: 1651
PRINCIPAL INVESTIGATOR: Strand, R.H.
ADDRESS: Bldg. 3017, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Albert, Ted
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-eng-26

77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (50%);SOLAR/General (25%);CONSERVATION/General (25%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: NOXIOUS GAS (20%);PARTICULATES (20%);ORGANICS (20%);RADIATION (20%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) To coordinate data management and processing activities within the Division. (2) To assess and implement data management capabilities for Division research projects. (3) To store computer accessible data as a resource for future research. (4) To apply data management techniques to project needs.
APPROACH: A data base resource is being developed containing both numeric research results and textual documentation for the support of projects which analyze and evaluate the environmental impacts of energy technology on regional scales. Research efforts are directed toward collection and management of data on ecological effects of pollutants on ecosystems, or resource use/effects on landscape and drainage systems, and on aesthetic and sociological factors in relation to human welfare.
RESULTS: Efforts in FY 1977 and FY 1978 will expand the data bank so that comprehensive information will be available on effects of many nonnuclear technologies on all aspects of the environment. We will have accumulated enough information to serve as a base from which we can identify and add ''missing'' data. That is, by subsetting information in the data bank according to subject area or phenomenon, it should be readily apparent as to what data are needed to fully understand that ecological phenomenon. Statistical analysis and graphical displays will be used along with existing computer models to actively interrogate the data bank contents. This change from developing the data management capability to actually using that capability is only possible after a critical mass of information has been accumulated. The thrust of these initial efforts will be to identify deficiencies in the data bank such that essential data may be added as required.
PROJECT MILESTONES: (1) Procurement, implementation and presentation to research members of new methodologies in the Statistical Analysis System, 1976 version, 10/1/76. (2) Integration of data resources and data related equipment on a continuing basis, 10/1/76. (3) Expandable air quality data base for southeast U.S., 3/1/77. (4) Data management methodologies for reading any amount of data in any form, 6/1/77. (5) Identification of data resources needed for completing regional assessments, 10/1/77. (6) Procurement and implementation of data resources as previously identified by Division projects, 3/1/78. (7) Continued integration of computer resource and data analysis capabilities with Environmental Science Division research needs, 10/1/78.
KEYWORDS: ENERGY;INFORMATION SYSTEMS;DATA PROCESSING;ENVIRONMENTAL EFFECTS;REGIONAL ANALYSIS;INFORMATION RETRIEVAL;AIR QUALITY;CLIMATES;COMPUTER CODES;ECOSYSTEMS;FORESTS;WATER;WATER QUALITY

<085121>
TITLE: CUMEX Index and Transport Models for Environmental Pollutants
PROJECT NUMBER: 1666
PRINCIPAL INVESTIGATOR: Kaye, S.V.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Bldg. 2030, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Ray
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/Coal (25%);NUCLEAR/General (25%);SOLAR/General (25%);CONSERVATION/General (25%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (15%);TRANSPORTATION (5%);STORAGE (5%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (15%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide (25%);METALS/Cadmium (50%);PARTICULATES/Cadmium (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop an index which is a time-integrated pollutant concentration in a particular sampling medium such that the estimated total exposure to humans via all relevant pathways corresponds to the statutory or otherwise pre-established exposure limit. This index serves as an operational exposure guide and assessment tool applicable to any nonradioactive pollutant from any given source or sources.
APPROACH: Develop and maintain models, computer implementations, and data bases for predicting the time dependent movement of released pollutants through environmental pathways to man, and for estimating the resulting exposures (pollutant concentrations) in target tissues in man.
RESULTS: The final result will be the ability to assess a facility's compliance with existing pollutant standards and to determine if the release poses a threat to human health. The unique features are that the calculated numerical value or ''index'' can be used to determine if a facility is meeting accepted emission standards and the fully developed CUMEX methodology will permit an assessment of human health effects of a combination of several pollutants where synergistic or antagonistic effects may occur.
PROJECT MILESTONES: (1) ORNL Report - CUMEX and cadmium last quarter FY 76. (2) ORNL-TM - CUMEX and SO/sub 2/ 2nd half FY 77. (3) ORNL-TM's - CUMEX and other single pollutants throughout FY 78. (4) Journal article - CUMEX Application mid FY 78. (5) ORNL Report - CUMEX and multiple pollutants end FY 78.
KEYWORDS: CHEMICAL EFFLUENTS;COMPUTER CODES;C CODES;METABOLISM;TRANSLOCATION;BIOLOGICAL INDICATORS;POLLUTION REGULATIONS;STANDARDS;HEALTH HAZARDS;POLLUTION;MEASURING METHODS;MATHEMATICAL MODELS;RECOMMENDATIONS;SULFUR DIOXIDE;CADMIUM;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;MAN;ECOSYSTEMS

<085123>
TITLE: Global Carbon Cycles and Climatic Risks
PROJECT NUMBER: 001669
PRINCIPAL INVESTIGATOR: Olson, J.S.
ADDRESS: P. O. Box X, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond

TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W7405-eng-26
7 FUNDING: Energy Research and Development Administration FY77:$89,000
ECHNOLOGY: FOSSIL FUEL/General (80%);FOSSIL FUEL/Biomass - pyrolysis (10%);SOLAR/Biomass (10%)
NERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/CO/sub 2/ (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (75%);ANALYTICAL (25%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To assess the risks of major climatic, ecological and social changes from CO/sub 2/ release.
APPROACH: Develop a sequence of models for the geochemical cycle of carbon linking (a) global exchanges, (b) continental data and submodels, (c) estimates of tolerable CO/sub 2/ and C-14 additions to the atmosphere. Project large-scale (biospheric) and long-range (ecosystem, social) consequences and risks of global modification of climate, ecology, an oceans related to CO/sub 2/ cycles.
RESULTS: Global models with major subsystems represented, each with relatively few variables and equations or subroutines. Continental/regional model with data base controlled by latitude and/or longitude, geopolitical region or functional entities. Regional/local models reflecting more detail of physiclogical/ecosystem process and mechanism CO/sub 2//C-14 impact and feedback from the climatic change.
PROJECT MILESTONES: (1) 01/06/76 ''Global CO/sub 2/ problem-assessment'' draft to ERDA. (2) 01/10/76 Framework for CO/sub 2//climate model ready for global (hemispheric) test. (3) 01/10/77 Estimate of land use change and fossil fuel impacts on global cycle. (4) 01/10/78 Combine linkages of (carbon cycle yields climate) and (climate yields biosphere)-1st approximation background for policy study.
KEYWORDS: SYSTEMS MODELING;CARBON DIOXIDE;GEOCHEMISTRY;EARTH ATMOSPHERE;ECOSYSTEMS;BIOLOGICAL EFFECTS;SOCIOLOGY;BIOSPHERE;METEOROLOGY;GLOBAL ASPECTS;REGIONAL ANALYSIS;BIOMASS;CLIMATES;PHOTOSYNTHESIS

<085124>
TITLE: Physical and Chemical Characterization of Plutonium in Existing Contaminated Soils and Sediments
PROJECT NUMBER: 001677
PRINCIPAL INVESTIGATOR: Tamura, T.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: METALS/Plutonium (25%);PARTICULATES/Plutonium;PARTICULATES/Soils (75%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To identify the association with the soil and sediment, to determine availability to biota, differentiate the forms, and to assess the potential movement and fate of plutonium existing in contaminated sites of selected ERDA facilities. The sites include Nevada Test Site, Oak Ridge National Laboratory, Rocky Flats and Mound Laboratory. From results obtained from actual-contaminated sites, laboratory studies are performed to define more definitively the reaction mechanisms of plutonium when in contact with soils and sediments matrices of different regional environments and different original release forms.
APPROACH: The existing size association, mineral association, and organic association are determined. Solubilities of the different site sources are determined using selective leaching or complexing agents. With sediment samples, the interstitial water is removed and the ''soluble'' plutonium determined. Representative samples are treated to obtain ultimate size association and mineral association by applying dispersive treatments. Samples are collected as functions of distance from the initial release source, depth into the soil profile, and special situations such as vegetation versus bare areas. Results are related to intra site characteristics as well as inner site differences.
RESULTS: These results are used by each site in their comprehensive evaluation of the contamination. Solubility results are used to evaluate concentrations in plant and animals at each site; size association of the plutonium is used in evaluating the inhalation hazard of the resuspended and resuspendible fractions. Depth distribution results determine potential groundwater contamination as well as rate of reduction in the resuspendible fraction and the ground surface. The different source terms at the sites assist in evaluating potential behavior of different source terms such as oxide forms, solubilized forms, and complexed forms.
PROJECT MILESTONES: T. Tamura, Physical and Chemical Characteristics of Plutonium in Existing Contaminated Soils and Sediments, Intern. Symp. on Transuranium Nuclides in the Environment, IAEA-SM 199/52 1975.
KEYWORDS: NUCLEAR FACILITIES;CONTAMINATION;SOILS;SEDIMENTS;PLUTONIUM;SOLUBILITY;PARTICLE SIZE;PLANTS;SAFETY;RADIOACTIVE WASTES

<085125>
TITLE: National-Regional Socioeconomic and Energy Patterns
PROJECT NUMBER: 1681
PRINCIPAL INVESTIGATOR: Davis, R.M.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Oak Ridge Operations Office and Division of Biomedical and Environmental Research (Washington)
MONITOR: Newton, Randolph
TELEPHONE: F233-4556
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil and Gas (25%);NUCLEAR/Fission (25%)

CHARACTER OF STUDY: RESEARCH (25%);ANALYTICAL (75%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Reduce lead time needed to bring new energy facilities on line by anticipating regional economic conditions that will change energy demands and by anticipating the impacts resulting from alternative energy supply solutions.
APPROACH: Development and trial application of a methodology to regionalize national demographic, economic and energy scenarios. Proposed work will be applied to the effects of alternate strategies for increased coal utilization in the South.
RESULTS: (1) Base-line distributions of population employment and energy conditions in the South for 1985, 2000, 2020. (2) Alternative distributions of population, employment, and energy conditions in the South for 1985, 2000, and 2020 based on national coal assessment scenarios. (3) Discussion of the sensitivity of these results with respect to assumptions of the National Coal Assessment.
PROJECT MILESTONES: (1) Preliminary BEA area distributions of population and employment in the South under base case low coal assumptions (first quarter of FY 1977). (2) Preliminary conversion of BEA area population and employment in the South to energy requirements by load center (first quarter of FY 1977). (3) Final BEA area distributions of population, employment and energy requirement in the South under base case low coal assumptions (third quarter of FY 1977). (4) Preliminary population and employment distributions by BEA area in the South for the high coal electric cases: present environmental and reclamation standards and strict standards separately (third quarter of FY 1977). (5) Final BEA area distribution of population and employment in the South for the high coal electric scenarios (fourth quarter of FY 1977). (6) Preliminary population and employment distributions by BEA areas in the South for the high coal-high liquids and/or gases scenarios (fourth quarter of FY 1977). (7) Preliminary reestimation of BEA area energy requirements for high electricity and high liquids and/or gases to determine the extent to which alternative coal strategies impact regional energy needs (fourth quarter of FY 1977). (8) Final and preliminary BEA area energy, economic, and population results for each scenario summed to the south and compared with similar results estimated for other regions by other national laboratories (fourth quarter of FY 1977).
KEYWORDS: ENERGY SOURCES;ENERGY DEMAND;FORECASTING;REGIONAL ANALYSIS;SOCIO-ECONOMIC FACTORS;COMPUTER CODES;ECONOMICS

<085126>
TITLE: Regional Environmental Assessment
PROJECT NUMBER: 001682
PRINCIPAL INVESTIGATOR: Parzyck, D.C.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Newton, Randolph
TELEPHONE: F233-4556
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (60%);NUCLEAR/General (10%);GEOTHERMAL/General (10%);SOLAR/General (10%);CONSERVATION/General (10%)
ENERGY CYCLE: EXTRACTION (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%);ELECTRICAL TRANSMISSION (20%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/South;COASTS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Streams and impoundments
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This research project is concerned with assessing the regional environmental impact of energy technology facilities sited in the southern United States. Assessment will include considerations of atmospheric transport of pollutants, water resources, ecological effects, and human health impacts.
APPROACH: A framework is being developed for the optimization of energy facility levels of activity among a number of feasible sites located in the region. Input to this assessment framework will include data on air quality and distribution of airborne pollutants, regional water resources, regional land cover and pollutant sensitive forest species in the South, and the distribution of sensitive habitats and bird and mammal species in the region.
RESULTS: Report on the optimum allocation procedure involving considerations of air quality, water resources, and ecologic considerations with case studies for various subregions of the southern United States. Display of distribution of point sources loads of sulfur dioxide, nitrogen oxides, and other pollutants for the South and estimates of forest growth inhibition resulting from implementation of various energy scenarios. Regional data base of firm water yield by regional geographic cells for inclusion to the optimal siting problem. Documentation of land cover variables as they relate to the optimum allocation procedure for siting and application of the forest and growth simulation to assess pollutant impact. Inventory of bird and mammal habitats within the South, description of the niche requirements for these species and development of a model to quantify the impact scenario implementation.
PROJECT MILESTONES: Optimization Case Studies Documented: Air, Oct. 1, 1977; Water, Oct. 1, 1978; Southern Air Quality Trends Documented: March. 1, 1977; Estimates of Sulfur Dioxide Levels for Energy Scenarios: July 1, 1977; Estimates of Vegetative Effects on Atmospheric Transport: July 1, 1978; Documentation of low-flow frequency analysis method: Jan. 1, 1977; Tabulation of firm water yields for selected basins: July 1, 1978; Identification of Spatial Land Cover Needs for South: July 1, 1977; Documentation of forest stand growth similar for SO/sub 2/ sensitive species: Jan 1, 1978; Data base for distribution of birds and mammals in South: July 1, 1977; Development of model to quantify technological impact on birds and mammals: July 1, 1978.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;AIR POLLUTION;WATER POLLUTION;TENNESSEE RIVER;REGIONAL ANALYSIS;WATER RESOURCES;ENERGY SOURCES;HEALTH HAZARDS;HUMAN POPULATIONS;BIRDS;MAMMALS;BIOLOGICAL EFFECTS;AIR;FORESTS;MAN;WATER;AIR QUALITY

<085127>
TITLE: Social Impacts of Alternative Energy Generation Technologies
PROJECT NUMBER: 1683
PRINCIPAL INVESTIGATOR: Peelle, E.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Ray D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$155,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/Fission (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop a unified methodology to assess the impact of energy related facilities upon individuals, communities and regions for the purpose of explaining and predicting social impacts over the effective life of the facility.
APPROACH: A time-series analysis of individual and community changes for nuclear and coal-fired generating facilities. Continuation of nuclear power plant study in Hartsville, Tennessee, and comparison with a new facility as yet unnamed utilizing coal. This cross-technology approach will enable abstraction of common impacts and technology specific.
RESULTS: Schuller, C.R., J. Fowler, T.J. Mattingly, Jr., et al., Citizens' Views About the Proposed Hartsville Nuclear Power Plant, A Preliminary Report of Potential Social Impacts, ORNL/RUS-3, May 1975. (2) Hiltunen, R.A. and C.R. Schuller, User's Manual for a Program to Forecast Local Political Jurisdictions' Shares from General Revenue Sharing, ORNL/RUS-4, August 1975. (3) Hiltunen, R.A. and C.R. Schuller, A Public Budget Model to Simulate the Impact of the Construction of Energy Facilities on Local Public Finances, ORNL/RUS-9, August 1975. (4) Passino, E. and J. Lounsbury, ''Sex Differences in Opposition to and Support for Construction of a Proposed Nuclear Power Plant,'' Environmental Design Research Association (ERDA-7), May 1976 (accepted for publication). (5) Sundstrom, E., J. Lounsbury, C.R. Schuller, J. Fowler, and T.J. Mattingly, Jr., ''Community Attitudes Toward a Proposed Nuclear Power Plant as a Function of Anticipated Outcomes,'' (accepted for publication in Journal of Community Psychology), 1976. (6) Sundstrom, E., R. Passino, T. J. Mattingly, Jr., J. Lounsbury, R. DeVault, J. Costomiris, and D. Dowell, Potential Social Impacts at the Proposed Hartsville Nuclear Plant: A Second Look, ORNL/RUS report (in preparation). (7) Lounsbury, J., C.R. Schuller, E. Sundstrom, J. Fowler, and T.J. Mattingly, Jr., ''The Social Impact Survey of Community Residents About a Proposed Nuclear
PROJECT MILESTONES: (1) 1 Oct. 1976 Selection of Coaltown site. (2) Jan. 1977 Baseline data collected for Coaltown, completed for Hartsville. (3) April 1977 Pre-construction attitude survey in Coaltown. Construction phase survey in Hartsville. (4) July 1977 Baseline report on Coaltown. (5) Sept. 1977 Hartsville survey and project status report.
KEYWORDS: TIME SERIES;ATTITUDE SURVEY;MITIGATION;NUCLEAR POWER PLANTS;CONSTRUCTION;PLANNING;SOCIOLOGY;REGIONAL ANALYSIS;MAN;SOCIO-ECONOMIC FACTORS;SOCIAL IMPACT

<085128>
TITLE: Coal Mining Impacts, Development of Environmental Assessment in Appalachia
PROJECT NUMBER: 1684
PRINCIPAL INVESTIGATOR: Honea, R.B.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Ray D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (80%);TRANSPORTATION (10%);COMBUSTION OR END USE (10%)
POLLUTANTS: PARTICULATES (10%);VISUAL AESTHETICS (30%);SPECIFIED OTHER POLLUTANTS/Water and landscape (60%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/South;HYDROGRAPHIC AREAS/Other hydrographic areas Stream
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: This project will examine the Appalachian coal region to assess the environmental consequences of coal extraction and the potential of Appalachian coal resources to meet future energy needs. The work applies to areas presently being mined and those likely to be mined within portions of Kentucky, West Virginia and Tennessee.
APPROACH: The project will focus upon developing methodologies to analyze high altitude photography and ERTS imagery for use in ascertaining location and extent of strip mining activity. Hydrologic data recently acquired will be used in predicting water quality changes associated with mining activity. Wildlife and terrestrial impact will be assessed.
RESULTS: Maps of Appalachia showing strippable coal reserves based on consideration of environmental, economic and physical constraints. Maps of Appalachia showing drainage basins affected by coal extraction and identification of potentially impacted basins from the standpoint of wildlife habitat and land resources potential, documentation of methods for assessing changes in wildlife species population densities and for predicting changes in water quality constituents as a function of surface mining activity.
PROJECT MILESTONES: (1) Compilation and storage of coal reserves data for eastern United States in computer retrievable form in FY 1977 (1st quarter). (2) Store water quality data relative to present conditions for most of Appalachia in FY 1977 (1st quarter). (3) Develop regional wildlife resources assessment methodology, regional recreational and land resource model, and model for predicting water quality changes (3rd quarter). (4) In response to surface mining in FY 1977 (3rd quarter). (5) Apply method for predicting

water quality changes to a selected watershed within the Tennessee Valley region and begin to synthesize the wildlife, recreational, and water quality assessments for selected major areas.
KEYWORDS: LAND;COAL MINING;ENVIRONMENTAL EFFECTS;WATER POLLUTION;WATER QUALITY;REGIONAL ANALYSIS;REMOTE SENSING;ANIMALS;CLIMATES;COMPUTER CODES;ECONOMICS;FORESTS;PLANTS;SOCIOLOGY;GROUND SUBSIDENCE;WATER;SURFAC MINING;HYDROLOGY

<085129>
TITLE: Development of Criteria for Decontamination
PROJECT NUMBER: 002921
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Oak Ridge National Lab., Tenn. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: DECONTAMINATION;RADIATION PROTECTION;LABORATORY EQUIPMENT;PERSONNEL

<085130>
TITLE: Energy Facilities Siting: National-Regional Assessment
PROJECT NUMBER: 001686
PRINCIPAL INVESTIGATOR: Davis, R.M.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Ray D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$220,000
TECHNOLOGY: FOSSIL FUEL/General (40%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (10%);NUCLEAR/General (50%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (30%);ELECTRICAL TRANSMISSION (10%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Water and land resource consumption (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (50%);DEVELOPMENT (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers and streams
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The purpose of the National and Regional Siting Project is to develop the capability to perform energy facility site screening analysis in the southern United States over space and time initially using a county-level resource information system. The approach requires specification and use of engineering, environmental, and social criteria associated with siting various mixes of energy facilities, including both coal and nuclear technologies.
APPROACH: The analysis approach will utilize a county-level information system. The approach requires specification and use of engineering, environmental, and social criteria associated with siting various mixes of energy facilities including coal and nuclear technology.
RESULTS: (1) Report documenting siting factors associated with coal and nuclear technologies. (2) Report describing the siting procedure and design of each factor model. (3) Computer plots of siting suitability for the southern U.S. at the county level for both coal combustion and nuclear technologies and possibly some types of coal conversion facilities depending upon characterization processes provided by the National Coal Assessment.
PROJECT MILESTONES: (a) Transformation of energy demand projections for the South as provided by the National Coal Assessment (NCA) and distributed by ORNL analyses according to numbers of energy facilities by BEA regions will be completed by the first quarter of FY 1977. (b) Factors important in the siting of nuclear and coal-fired power plants by the first quarter of FY 1977. (c) Preliminary siting distibutions for low-coal high-nuclear (NCA No. 1) by the beginning of the second quarter of FY 1977. (d) Design of the factor models essential to calculate reliable measures for siting at county level by the end of second quarter of FY 1977. (e) Preliminary siting suitability for NCA No. 2 high-coal electric scenarios by the second quarter of FY 1977.
KEYWORDS: LAND;SITE SELECTION;REGIONAL ANALYSIS;THERMAL POWER PLANTS;COMPUTER CODES;CLIMATES;ECOSYSTEMS;PLANTS;WATER

<085131>
TITLE: Environmental Mutagen Info Center - Task 5
PROJECT NUMBER: 001463
PRINCIPAL INVESTIGATOR: Ulrikson, G.U.
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Oak Ridge National Lab., Tenn. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<085133>
TITLE: Environmental Behavior of U and Th as Related to the Thorium Fuel Cycle
PROJECT NUMBER: 001691
PRINCIPAL INVESTIGATOR: Bondietti, E.A.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F973-4155
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION/Alpha (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)

REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;ECOLOGICAL PROCESSES AND EFFECTS
)JECT DESCRIPTION: Environmental behavior of U and Th as related to Th fuel is to evaluate the environmental consequences of high specific activity U and Th isotopes released to terrestrial and aquatic ecosystems. Primary focus will be on isotopic dilution with natural U and Th isotopes and establishment of food chain transport parameters. Critical pathways for radionuclide movement in food chains will be delineated and this data related to radiological assessments of impact to biota.
APPROACH: The literature survey will be used to establish the priorities for further laboratory or field work. Existing literature will be reviewed to establish the extent to which biologically-labile pools of U or Th have been identified. Those reports specifying compartment transfers will be examined in depth. Field and laboratory studies underway attempt to develop soil to plant transfer coefficients and to evaluate labile pools of soil U or Th.
RESULTS: (1) A literature evaluation to determine the state of knowledge on U and Th transfer from soil/sediments to biota. (2) Soil/plant transfer data and soil chemistry data.
PROJECT MILESTONES: (1) Evaluate soil-plant transfer of U and Th Oct. 1977. (2) Evaluate ''available'' U and Th in soils Dec. 1976. (3) Determine feasibility of Plant-Animal transfer studies Apr. 1977.
KEYWORDS: URANIUM;THORIUM;ENVIRONMENTAL EFFECTS;FUEL CYCLE;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;ISOTOPE DILUTION;FOOD CHAINS;CONTAMINATION;RADIONUCLIDE MIGRATION;INGESTION;PLANTS;SOILS

<085135>
TITLE: Gene Expression in Mammalian Cells and Carcinogenesis
PROJECT NUMBER: 001699
PRINCIPAL INVESTIGATOR: Kenney, F.T.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;HEALTH EFFECTS
PROJECT DESCRIPTION: To define molecular mechanisms by which gene expression is regulated in mammalian cells and determine how these are altered by carcinogenic chemicals.
APPROACH: Control of gene expression by hormones (steroids, insulin, cyclic nucleotides) is analyzed in biochemical terms, principally in a hepatoma-inducible enzyme system developed for that purpose. Turnover of specific mRNAs and proteins is analyzed in liver, hepatoma cells, and thymic lymphoma. Control of expression of endogenous virus genomes is analyzed in embryonic mouse fibroblasts.
RESULTS: Most environmentally-induced diseases, especially cancer, can be related to defective regulation of gene expression. This project will provide information necessary for proper evaluation of the health hazard associated with various energy technologies and for development of effective preventive measures.
PROJECT MILESTONES: (1) Jan. 1, 1977 Complete penetration of tyrosine amino transferase mRNA. Begin preparation of CDNA probe. (2) March 1, 1977 Begin analysis of transcriptional control at chromatin level. (3) October 1, 1977 Complete preliminary experimentation on terminal transferase in thymic lymphoma; begin analysis of control by glucocorticoids. (4) October 1, 1977 Begin fractionation of mouse fibroblast chromatin into active and inactive fractions; determine distribution of tumor virus genome using CDNA probe.
KEYWORDS: ANIMAL CELLS;GENES;CARCINOGENS;BIOLOGICAL EFFECTS;TUMOR CELLS;HORMONES;VIRUSES;LEUKEMIA;CARCINOGENESIS;BIOCHEMISTRY;DNA;RNA;GENETICS;NEOPLASMS

<085136>
TITLE: Ultrastructural Cell Biology of Respiratory Tract Preneoplasia
PROJECT NUMBER: 001700
PRINCIPAL INVESTIGATOR: Heckman, C.A.
ADDRESS: P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$94,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS/Polycyclic hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;HEALTH EFFECTS
PROJECT DESCRIPTION: The morphological and biochemical characterization of preneoplastic lesions is one of the most important goals of basic and clinical cancer research. It is the key (1) to the identification of individuals with a high risk of developing cancer and (2) to the development of therapeutic intervention. The purpose of our studies is (1) to correlate ultrastructural and cytochemical changes with the evolution of neoplasia in respiratory epithelium exposed to chemical carcinogens and (2) to correlate subcellular changes with altered biological behavior such as growth in vitro, motility, plasma membrane activities and invasiveness.
APPROACH: The tracheal transplant system is used for ''localized'' tumor induction with carcinogenic polycyclic hydrocarbons. This in vivo system will be the source of carcinogen-altered epithelium and of invasive carcinomas to be studied in vivo and in vitro. We will examine whether the invasiveness of carcinoma cells is due to degradation of extracellular tissue constituents by surface bound lytic enzymes or by lysosomal lytic enzymes. The possibilities of increased phagocytic uptake and degradation of extracellular matrix and increased migration of invasive cells into the surrounding tissue will also be examined. For this purpose the enzyme profiles and the lipid composition of the plasma membranes will be studied in several tumor cell lines maintained in vitro. Subsequently, cell lines derived from carcinogen-exposed but not yet neoplastic epithelium will be similarly investigated. Normal tracheal epithelium grown in vitro will serve as reference material. Ultrastructural studies will be conducted

simultaneously.
RESULTS: The tumor cell lines are being established in vitro and are tested to establish plating efficiency growth rate, saturation density, growth in soft agar, and tumorigenicity. Methods are being developed to grow at least primary cultures of normal tracheal epithelium. Procedures are being developed for subgross identification of carcinogen-induced epithelial lesions in the tracheal transplant system. This will allow us to select abnormal epithelial areas for the study.
PROJECT MILESTONES: The first project milestone is to establish all methods required to maintain normal carcinogen exposed and neoplastic epithelial tissues in vitro and to establish essential growth parameters. Secondly, to determine the ultrastructural and cell biological characteristics of normal, carcinogen exposed, and neoplastic epithelial cells growing in vivo and in vitro.
KEYWORDS: RESPIRATORY SYSTEM;NEOPLASMS;BIOCHEMISTRY;ELECTRON MICROSCOPY;EPITHELIUM;CARCINOGENS;BIOLOGICAL EFFECTS;TUMOR CELLS;TRANSPLANTS;TRACHEA;PHAGOCYTOSIS;ENZYMES;HYDROCARBONS;IN VITRO;LUNGS

<085137>
TITLE: Enzymology of Carcinogenesis
PROJECT NUMBER: 001701
PRINCIPAL INVESTIGATOR: Yang, W.
ADDRESS: Biology Division, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$114,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (20%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To provide biochemical understanding of host involvement during environmental carcinogenesis in mammalian organisms, including humans, with current emphasis on two aspects: (1) responses of host cells at the genomic level upon carcinogenic insults, and (2) unique membrane properties of cancer cells.
APPROACH: The test systems employed are in vitro cell cultures of human and mouse origin. Specific research projects include (1) transfection (human cells become infected by treatment with DNA preparations containing RNA tumor virus genome) as a measure for studying factors influencing insertion of a foreign genetic material into human cell genome, (2) biochemical characterization of mouse Fv-1 gene expression which restricts leukemia virus infection, (3) development of lectin-gel affinity chromatography for isolation of cancer cell antigens, (4) biological assays of transfer factors related to cell-mediated immunity against human cancers.
RESULTS: Development of efficient techniques for studying transfection including procedures for isolation of DNA with high activity of viral genome, and methods for rapid quantitative assay of transfection. Isolation and purification of the Fv-1 gene specific RNA molecule which transfers the resistance property into susceptible cells. Application of PHA-Sepharose, lentil lectin-Sepharose and concanavalin A-Sepharose columns for isolation of tumor virus specific glycoprotein antigens and human breast cancer cell surface glycoproteins. Utilization of labeled adenosine in in vitro assays of lymphocyte-mediated immunity against human cancers.
PROJECT MILESTONES: (1) Transfection in human normal fibroblast-line HSBP: RD-114 virus system (Sept. 1976), Simian sarcoma virus system (Dec. 1976) and Baboon endogenous virus system (March 1977). (2) Purified Fv-1 gene specific RNA preparation (Jan. 1977). (3) Isolation of gp 69/70 antigen from Baboon endogenous RNA tumor virus (Dec. 1976).
KEYWORDS: TRANSFECTION VIRUS GENOME WHICH IS PRESUMABLY INSERTED INTO HOST CELL GENOME);TRANSFER FACTOR;CARCINOGENESIS;ENZYMES;VIRUSES;BIOCHEMICAL REACTION KINETICS;MAMMALS;MAN;DNA;RNA;MICE;CELL CULTURES;GENETICS;PATHOLOGICAL CHANGES;LEUKEMIA;IMMUNOLOGY;BIOLOGICAL EFFECTS;NEOPLASMS;MOLECULAR STRUCTURE;VIRUSES;IN VITRO

<085138>
TITLE: The Molecular Basis for Chronic Heart Failure
PROJECT NUMBER: 001702
PRINCIPAL INVESTIGATOR: Revis, N.W.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/Cadmium and zinc (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The role of toxic air contaminants (both organic and inorganic) and of obstructive pulmonary diseases in the development and the progression of heart failure has been a major interest of this group. In addition, this group has been involved in studying the in vitro metabolic effect(s) of two occupational and urban inorganic air and water pollutants, cadmium and zinc, on lung, heart, kidney and the aorta of rodents. Our objectives are to gain (1) better understanding of the biochemical and physiological events leading to and occurring in the failing heart, (2) determine the biochemical effect(s) of cadmium and zinc on those tissues described above.
APPROACH: We have been studying the binding properties of noradrenaline and glucagon to the plasma membrane of the experimental failing heart of rats and hamsters. In addition, we are attempting to quantitate the phospholipids in the plasma membrane of this heart because hormone binding has been shown to require the phospholipids, phosphotidylinositol and phosphotidylserine. The in vitro effect(s) of cadmium and zinc on the enzymes monoamine oxidase and catechol-O-methyl transferase and the binding of noradrenaline to the plasma membrane of lung, kidney, heart and the aorta of rats and hamsters are presently being studied.
RESULTS: We will determine (1) if the binding of hormone to the plasma membrane and the synthesis of plasma membrane phospholipids are altered in the failing heart, (2) the in vitro and in vivo effect(s) of cadmium

and zinc on those enzymes described above and the binding of hormones to the plasma membrane in rats and hamsters.
JECT MILESTONES: Within the next three years we anticipate that we will be able to elucidate why hormonal metabolism is altered in the failing heart. Information gained during this period will be reported in the scientific journals.
KEYWORDS: CARDIOVASCULAR DISEASES;HEART;AIR POLLUTION;RESPIRATORY SYSTEM DISEASES;URBAN AREAS;WATER POLLUTION;CADMIUM;ZINC;LUNGS;KIDNEYS;AORTA;BIOCHEMISTRY;PHYSIOLOGY;NORADRENALINE;GLUCAGON;RATS;HAMSTERS;PH SPHOLIPIDS;BIOLOGICAL EFFECTS;METABOLISM;PATHOGENESIS;TOXICITY;ANIMALS

<085139>
TITLE: Modeling the Effects of Man-Induced Stresses on Marine Fish Populations
PROJECT NUMBER: 001704
PRINCIPAL INVESTIGATOR: Van Winkle, W.
ADDRESS: Bldg. 2001, X-10, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, Heyward D.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Entrainment and impingement (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this research program is to develop and apply models and statistical methodologies for fish populations that will be of value: (a) in evaluating the consequences of man-made stresses, (b) in placing previously qualitative statements into a quantitative framework, and (c) in defining issues where field and laboratory research are essential for more accurate estimates of impacts.
APPROACH: Two interrelated approaches are used in our computer simulation modeling of fish populations. First, a population transport model is developed in cases where it is important to consider spatial phenomena in addition to temporal phenomena. Such population transport models serve to estimate short-term impacts, such as the yearly reduction, due to entrainment and impingement mortality, in the number of fish that survive their period of susceptibility to power plants. Second, an age-dependent, life-cycle population model is developed to estimate the long-term impact of increased mortality in a given age class on the size and age structure of the total population and, where appropriate, on the yield to the fishery.
RESULTS: Results expected include testimony and ORNL reports to be used in forthcoming hearings for EPA, NRC, and/or FPC, as well as open literature publications.
PROJECT MILESTONES: (1) Further develop and apply age-dependent, life-cycle population models for striped bass and other fish species to estimate the long-term impact of man-induced mortality in a given age class on the size and age structure of the total population and, where appropriate, on the yield to the fishery. (2) Develop and apply the maximum entropy spectral analysis technique to the analysis of environmental time series, with an emphasis on the time series for Atlantic Coast commercial landings of striped bass. (3) Develop a methodology for predicting and determining the minimum statistically detectable difference between fish population levels.
KEYWORDS: FISHES;POPULATIONS;STATISTICS;BIOLOGICAL MODELS;LIFE CYCLE;COMPUTERS;AGE DEPENDENCE;MORTALITY;INDUSTRY;ENVIRONMENTAL EFFECTS;SEAWATER;POLLUTION;POWER PLANTS;MATHEMATICAL MODELS

<085140>
TITLE: Microdosimetry, Biological Modelling and Theoretical Biophysics
PROJECT NUMBER: 001706
PRINCIPAL INVESTIGATOR: Wright, H.A.
ADDRESS: Health Physics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/All types (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To improve our understanding of the physical and chemical interactions that radiation undergoes with biological material and to develop models for predicting the biological effects of radiation.
APPROACH: To start with basic cross sections and describe the initial physical interactions that radiation undergoes with matter and to link these early physical events to later chemical events and ultimately to biological effects.
RESULTS: A better understanding of the structure of charged particle tracks in biological material, the initial processes by which radiation interacts with matter, the mechanisms by which deposited energy is transported through matter, the identification of the processes or mechanisms which are most significant in producing biological effects, and the improvement of models for predicting biological response to radiation.
OJECT MILESTONES: Regular publication of research results.
YWORDS: MODELLING;BIOLOGICAL RADIATION EFFECTS;IONIZING RADIATIONS;BIOLOGICAL MATERIALS;CHARGED PARTICLES;PARTICLE TRACKS;CROSS SECTIONS;BIOPHYSICS;NEOPLASMS;COMPUTER CODES;DNA

<085141>
TITLE: Dosimetry for New Energy System Pollutants
PROJECT NUMBER: 001707
PRINCIPAL INVESTIGATOR: Gammage, R.B.
ADDRESS: ORNL, Building 7710, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/General (10%);FOSSIL FUEL/Coal (90%)
ENERGY CYCLE: STORAGE (10%);PROCESSING, CONVERSION (70%);COMBUSTION OR END USE (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (10%);PARTICULATES (20%);ORGANICS (70%)
CHARACTER OF STUDY: RESEARCH (50%);DEVELOPMENT (25%);ANALYTICAL (25%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This program is focused on toxic pollutants associated with coal conversion processes. The concurrent problem of producing and dealing with large quantities of polycyclic aromatic hydrocarbons (PAH) impoases the obligation of providing adequate protection and measuring devices for workers and the general public. Another ''new'' energy system with serious pollution problems is geothermal (H/sub 2/S, NH/sub 4/, As, Hg, etc.), and it is deserving of the same attention we are giving to coal conversion technology. The prime objectives are to identify the modes of encounter with PAH and other pollutants and to devise instruments and monitoring techniques which will lead to rectification of these problems, principally those of an occupational nature.
APPROACH: Continued assessment of monitoring needs for coal conversion and other energy systems such as geothermal, adaptation and field testing of presently available instruments which respond to PAH at existing coal conversion facilities, and experimental studies of the kinetics of PAH adsorption onto dust-sized particles.
RESULTS: Initiation of studies leading to the development of a survey meter for organic byproducts of coal conversion.
PROJECT MILESTONES: (1) Convene the second ORNL workshop on polycyclic aromatic hydrocarbons: characterization and measurement with a view toward personnel protection 2/28/77. (2) Submit review article on current and projected states of the art for measuring fugitive emissions from synfuel systems 10/1/76. (3) Test and derivative spectrometer and gas chromatography systems in conjunction with personnel dosimeters for collecting polycyclic aromatics 10/1/76. (4) Compile the latest spectroscopic characteristics of biologically important PAH compounds produced in synfuel systems 7/1/77.
KEYWORDS: INSTRUMENTATION;AROMATICS;HYDROCARBONS;AIR POLLUTION;COAL;GEOTHERMAL ENERGY CONVERSION;MONITORING;CARCINOGENS;CHEMICAL EFFLUENTS;POLYCYCLIC AROMATIC HYDROCARBONS;SYNTHETIC FUELS;PERSONNEL DOSIMETRY;PERSONNEL MONITORING;RESPIRATION;COAL LIQUEFACTION;COAL GASIFICATION

<085143>
TITLE: Facility for the Chemical Support of Biological and Environmental Studies Related to Coal Conversion
PROJECT NUMBER: 001722
PRINCIPAL INVESTIGATOR: Clark, B.R.
ADDRESS: Analytical Chemistry Division, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F973-5355
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (10%);ORGANICS (90%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project provides well defined, standard samples for biological and environmental assessment studies on coal conversion related materials. A sample bank, consisting of whole samples and fractions will be established to provide both in-house and perhaps outside needs.
APPROACH: Sample materials will be produced through both private sources and collaborating agencies. These materials will include process, product and effluent stream samples which seem most pertinent in the developing industry. Whole sample stabilities will be determined so that reliable compositional information is available. Whole samples will be fractionated and fraction compositions and stabilities characterized. Analytical and preparative scale approaches will be devised.
RESULTS: A sample bank of whole samples and fractions (according to chemical properties, e.g., aliphatic-aromatic enriched) will be established with compositional data and stability data available. These coal related samples will be available to support biological and environmental research.
PROJECT MILESTONES: (1) Analytical scale fractions of products, appropriate process samples, and effluents will be available and supplied routinely 1/1/77. (2) Reproducibility and recovery of preparative scale fractions will be known 1/6/77. (3) Chemical characterization will be sufficiently advanced to focus on biologically active fractions and to identify and quantitate specific compounds 1/1/78.
KEYWORDS: COAL;ENVIRONMENTAL EFFECTS;SAMPLING;CHEMICAL COMPOSITION;BY-PRODUCTS;COAL LIQUEFACTION;COAL GASIFICATION;SYNTHETIC FUELS;CARCINOGENS;CHEMICAL EFFLUENTS;BIOASSAY

<085144>
TITLE: State of the Knowledge Reports
PROJECT NUMBER: 001724
PRINCIPAL INVESTIGATOR: Ross, R.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Bldg. 2028, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Albert, Ted M.
TELEPHONE: F233-3311
TYPE OF FUNDING: Contract No.-W-7405-Eng-26

77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: CONSERVATION/General (100%)
ERGY CYCLE: PROCESSING, CONVERSION (100%)
ARACTER OF STUDY: ANALYTICAL (100%)
_SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Information activities produce a valuable data base for administrators, decision-makers and researchers. As our energy supplies decrease there will be more emphasis on energy conservation and there is a need to examine some of the effects of energy conservation. This project has the objective of making information on these effects (such as the effect or human health of lowering home thermostats) available in a useful form.
APPROACH: The open literature is searched by manual and machine methods, relevant information acquired and the literature overview prepared by a team of discipline specialists.
RESULTS: An overview will be prepared and 100 copies printed. A computerized bibliographic support base will be maintained.
PROJECT MILESTONES: (1) Draft document for review 8 months after date of commencement. (2) Establishment and maintenance of a data base on-going.
KEYWORDS: ENVIRONMENT;HEALTH HAZARDS;AIR POLLUTION;COAL GASIFICATION;COAL LIQUEFACTION;ENVIRONMENTAL EFFECTS;DATA COMPILATION;CHEMICAL EFFLUENTS;EARTH ATMOSPHERE;MAN;SYNTHETIC FUELS;WATER

<085145>
TITLE: Inventory of Federal Energy-Related Environment and Safety Research
PROJECT NUMBER: 001725
PRINCIPAL INVESTIGATOR: Peck, L.;Shriner, C.
ADDRESS: Oak Ridge National Laboratory, Bldg. 2028, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Albert, Ted M.
TELEPHONE: F233-3311
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$66,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective is to maintain a computerized inventory of the projects funded by all federal agencies dealing with energy-related biomedical and environmental research.
APPROACH: Upon request, BER personnel are able to obtain: (1) the publication of inventory documents printed directly from the computer, arranged by research category and funding agency, and containing summaries of funding, indices of research facilities, investigators, keywords, technology, etc., (2) the manipulation of the data to provide upon demand special listings and funding summaries by subject areas, research laboratories, or other fields of interest, and (3) online availability for computer searching at both ORNL and ERDA.
RESULTS: The data base is being maintained and subsets provided upon request from AES personnel.
PROJECT MILESTONES: To provide upon request from AES personnel, information on any or all of the federally funded projects.
KEYWORDS: BER FUNDED RESEARCH;DATA BASES;US ERDA;RESEARCH PROGRAMS;INFORMATION SYSTEMS;ENERGY;ENVIRONMENT

<085146>
TITLE: RUSTIC: Regional and Urban Studies Information Center Unified-Socioeconomic Analysis and Retrieval System
PROJECT NUMBER: 1726
PRINCIPAL INVESTIGATOR: Loebl, A.S.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Albert, Ted A.
TELEPHONE: F233-3311
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$50,000; Department of Housing and Urban Develcpment
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Providing socioeconomic data, analysis, assessment and technical assistance to a diverse user community. Services have been oriented toward providing the specific data needed to focus on problems of local, state and federal organizations, to investigate technical questions in support of ERDA research programs, to develop an integrated information system and to provide effective assistance in comprehensive data analysis and display related to socioeconomic and energy related studies.
APPROACH: Maintain a small staff, trained in the social, information, statistical, economic and computer sciences to acquire volatile, massive data bases, make these skills and constantly developing areas of expertise available by providing data and technical assistance on an intra-ERDA program basis, maintaining and expanding information resources, assessing information needs of the user community, automating and centralizing documentation and data, developing methods for data analysis and manipulation.
RESULTS: Document experience, thrust and potential of the RUSTIC program, incorporate management of new data, as well as provide for changing user requirements, increase efficiency and enhance cost effectiveness by as far as is practical, improvement of capabilities in the centralized data management system, continue documentation and definition of the RUSTIC repository of socioeconomic, energy and software holdings.
ROJECT MILESTONES: (1) Development of methodology for integrating data bases with a unified information

system. (2) Implement procedures for synthesizing, analyzing and updating data files. (3) Refine and extend existing administrative procedures for collaboration with other agencies in data collection, analysis, dissemination, activities.
KEYWORDS: ENERGY SOURCES;ENERGY DEMAND;FORECASTING;REGIONAL ANALYSIS;SOCIO-ECONOMIC FACTORS;DATA COMPILATION;COMPUTER GRAPHICS;ECONOMICS;INFORMATION;HUMAN POPULATIONS;POPULATION DYNAMICS

<085147>
TITLE: Assessment of Environmental and Biological Effects of Fusion Power Technology
PROJECT NUMBER: 001731
PRINCIPAL INVESTIGATOR: Easterly, C.
ADDRESS: Oak Ridge National Laboratory, Building 7710, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/Fusion (100%)
ENERGY CYCLE: STORAGE (25%);PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (15%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Tritium, activation products (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;GEOGRAPHIC AREAS/Site specific ORNL
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The purpose of this program is to assess the potential health and environmental effects from radioactive releases and magnetic fields associated with fusion power. A systematic assessment is proposed to evaluate available data, and models to identify potential environmental and health effects, and to identify what new information is required for a comprehensive environmental analysis of Controlled Thermonuclear Reactors (CTR).
APPROACH: The objectives will be accomplished using the best present estimates of releases, environmental behavior, and risks to human health. At each stage of the assessment, the current state of knowledge will be reviewed to identify the unknowns and to estimate the relative effect of uncertainties on the final potential impact.
RESULTS: Results are expected to include a ranking in order of relative importance the priority areas for general research and model development; and a review of a number of tritium management strategies designed to minimize exposure to operational workers and members of the public.
PROJECT MILESTONES: Review of Environmental and Metabolic Aspects of Niobium Nov. 1976. Dose Calculations for Unit Releases of Activity for Major CTR Designs Jan. 1977. Assess the Accuracy to which the Conversion Rate of HT to HTO Must be Known for Dose Calculations June 1977. Complete a Meaningful Deficiency Analysis of Metabolic and Environmental Data for Activation Products June 1977.
KEYWORDS: FATE;THERMONUCLEAR REACTORS;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;RADIOACTIVE EFFLUENTS;MAGNETIC FIELDS;ECOSYSTEMS;RADIOISOTOPES;TRITIUM

<085154>
TITLE: National Inventory of Biological Monitoring Programs
PROJECT NUMBER: 002201
PRINCIPAL INVESTIGATOR: Kemp, H.T.
ADDRESS: Bldg. 2031, Environmental Sciences Division, ORNL, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Council on Environmental Quality, Washington, D.C. (USA); Department of the Interior, Washington, D.C. (USA); Energy Research and Development Administration, Washington, D.C. (USA); Department of Commerce, Washington, D.C. (USA)
DIVISION: Environmental Monitoring;Office of Biological Services;Biomedical and Environmental Programs;Fisheries Research Management Division
MONITOR: Reisa, J.J.;Sherk, J.A.;Osburn, Wm. S.;Larsen, C.
TELEPHONE: F382-6854;F343-8032;F233-4155;F634-7476
TYPE OF FUNDING: Contract No.-W-7405 ENG-26;Interagency agreement-40-511-75
77 FUNDING: Energy Research and Development Administration FY77:$25,000; Department of the Interior
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (5%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;COASTS/Other coasts Canada, Mexico;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater lakes, rivers, streams, reservoirs, waters
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Identify existing biological monitoring programs, organizations, and data repositories. (2) Systematically compile pertinent information on each project as to type of data being monitored. (3) Obtain or generate tabular or graphical display of data and/or summaries resulting from selected monitoring programs. (4) Generate indices to allow categorization of programs by data types, organizations, and funding.
APPROACH: Key persons (administrators) were identified in appropriate departments of state and federal government, universities and colleges, consulting firms and business firms. These key persons were contacted by telephone to obtain names of Principal Investigators involved in biological monitoring projects. A packet containing a covering letter, definition sheet, three documentation forms and a return envelope was mailed to each principal investigator. The original packet was followed by two reminder letters. All materials were composed on the basis of a review of literature pertaining to "improving returns of documentation forms." A MINI-BIOMON (Minimal documentation) data base was established to facilitate handling and accounting of projects when received. The MINI-BIOMON now contains over 3,000

projects and provides such information as sponsor of project, state site, funding level, investigator, title, change and cause of change plus appropriate key words and code words. Establishment of the main biological monitoring data base is in progress.
;ULTS: Product/Results Expected: The main Biological Monitoring Data Base will consist of more complete information on selected projects and will be supported by a number of satellite data bases the first of which is the MINI-BIOMON. Other planned satellite data bases will include bibliographic, taxonomic and geographic description. All will be searchable on-line at ORNL and can be manipulated to produce hard-copy summaries. Experience with bibliographic data bases indicates that a two-year cycle is about optimal for update purposes. We therefore propose an update effort for the inventory in FY 1978. This will be done cautiously to avoid antagonizing previous participants. Previous nom-participants will be asked to fill in documentation forms fcr new projects and ones previously missed. With periodic updates the Inventory may be established as a fully operational information analysis center with all of the implied services and products, i.e., regularly scheduled publications, response-referral services, visits and contacts with allied efforts, etc.
PROJECT MILESTONES: July 10, 1976 (tentative date) Demonstration Data Base searchable on-line from ORNL. Sept. 30, 1976 (tentative date) Majority of Biological Monitoring Projects Searchable on-line from ORNL. (1) The complete, finished on-line, data base will consist of approximately 1,000 records. (2) Final camera-ready products to be produced will include (a) Volume 1 Descriptions of the project and the data base, the rationale for the survey, and a user's guide to the data base. (b) Volume 2-A computer-generated, edited, hierarchical, cross-referenced index to the data base. (c) Volume 3-Full file printout aggregated by regions or groups of adjacent states. Indefinite Completion of special interest reports for Council on Environmental Quality and Fish and Wildlife Service.
KEYWORDS: LAND;MONITORING;DATA;BIOLOGY;DATA ACQUISITION;COMPUTERS;INFORMATION SYSTEMS;ECOSYSTEMS;ANIMALS;PLANTS;WATER;BASELINE ECOLOGY

<085155>
TITLE: Environmental Control Technology Data Base
PROJECT NUMBER: 002231
PRINCIPAL INVESTIGATOR: Wilkes, D.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wilson, John H., Jr.
TELEPHONE: F233-4086
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (30%);PARTICULATES (30%);RADIATION (30%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The Environmental Control Technology Data Base of the Environmental Resource Center, Information Center Complex, ORNL, has been established to serve as an information resource to the Environmental Control Technology Division, ERDA, following the formation of that division during FY 1975. This information resource file is to assist division personnel in identifying the problem areas in environmental control, in locating and acquiring relevant information, and in evaluating the effect of such information on the research plan.
APPROACH: The Environmental Resource Center is initiating the development of a resource data base in the area of environmental control technology with special emphasis on fossil energy systems (combustion, conversion, and oil shale) and provides response services to the Environmental Control Technology Division upon request.
RESULTS: This resource data base is in the form of a hard-copy literature collection controlled and manipulated via a computerized bibliographic file. In addition, Environmental Resource Center personnel together with Ecological Sciences Information Center staff are preparing several chapters pertinent to environmental control for a broad overview document on coal conversion pollutants.
PROJECT MILESTONES: (1) Response service - upon request. (2) Literature Collection and Bibliographic File June 1976.
KEYWORDS: ENVIRONMENT;DATA COMPILATION;COMPUTER GRAPHICS;COAL GASIFICATION;COAL LIQUEFACTION;ENVIRONMENTAL EFFECTS;AIR;CHEMICAL EFFLUENTS;WATER;WATER POLLUTION CONTROL;WATER POLLUTION ABATEMENT

<085157>
TITLE: Information Center for Energy Safety
PROJECT NUMBER: 2258
PRINCIPAL INVESTIGATOR: Hoy, H.C.
ADDRESS: Oak Ridge National Laboratory (Building 9764-Y-12), Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Information Systems
MONITOR: Albert, Ted M.
TELEPHONE: F233-3311
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH (30%);DEVELOPMENT (40%);PRODUCTION (30%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;OS
OJECT DESCRIPTION: An Information Center for Energy Safety (ICES) is being established at Oak Ridge National Laboratory (ORNL). ICES will provide a means for collecting, evaluating, storing, and disseminating relevant safety information essential to the development and use of various forms of energy. In particular, this Center will be uniquely concerned with the safety considerations and relevant standards in the design, construction, and operation of the various energy systems and their supportive research facilities. Emphasis will be given to the various energy options which ERDA is developing, exclusive of nuclear and non-ERDA information analysis centers at ORNL. However, available information as it pertains to the health and ecological effects of all energy sources will be accessible to both ERDA and

other potential users.
APPROACH: Information pertaining to the safe design, construction, and operation of all energy-related systems, facilities, and in some cases, transportation means, will be obtained from information systems where possible, particularly the energy data base at ERDA's Technical Information Center (TIC). However, it is apparent that such sources will have to be supplemented by the acquisition and processing of additional documents, journals, non-ERDA meetings and symposiums, and foreign literature. Such additional documents will be stored in ERDA's computer facilities at Oak Ridge where it can be made available on ERDA's RECON network either as part of TIC's or NSIC's data base, or later as a separate system.
RESULTS: The information will be evaluated, as required, by user's needs and disseminated in various forms, e.g., reports, bibliographies, journal articles, response to inquiries, retrospective searches, periodic selective dissemination of information (SDI), a newsletter, NSC newsletter, articles, etc. Among reports ICES would be expected to prepare are state-of-the-art reviews of the safety of various energy systems, compilations of relevant safety standards, codes and/or specifications.
PROJECT MILESTONES: While ICES will, insofar as possible, answer inquiries now, it is not expected that the Center will be fully operational until the latter part of FY 77. However, it is expected that the need to ''catch-up'' will largely be complete and the Center will be able to shift from collecting, cataloging, and storing of information to the evaluation phase and dissemination to the users. 1977 ICES is presently operational. Services now provided are consultation, conduction of special services, and some evaluation.
KEYWORDS: ORNL;INFORMATION SYSTEMS;SAFETY;MAN;FINANCING;HEALTH HAZARDS;ENERGY;HAZARDS

<085159>
TITLE: Office of Environmental Policy, Oak Ridge National Laboratory
PROJECT NUMBER: 002224
PRINCIPAL INVESTIGATOR: Jacobs, D.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Wachholz, Bruce W.
TELEPHONE: F233-4365;C(301)353-4365
TYPE OF FUNDING: Contract No.-W-7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$345,000
TECHNOLOGY: FOSSIL FUEL/General (20%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (10%);NUCLEAR/General (70%)
ENERGY CYCLE: WASTE MANAGEMENT (70%)
POLLUTANTS: RADIATION/Wastes (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Site specific waste disposal sites
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To analyze the relationships among technical, environmental, health, economic, and societal factors and regulations as they affect energy research, development, and demonstration policy decisions or affect commercialization of developed energy systems.
APPROACH: Conduct specific studies of proposed standards for high level radioactive waste disposal, criteria for decontamination of sites, the implications for new energy technologies of the Resource Conservation and Recovery Act of 1976, and constraints on water availability for energy use in the eastern United States.
RESULTS: Periodic topical reports and monthly progress reports.
KEYWORDS: ENERGY SOURCES;DECISION MAKING;NUCLEAR FUELS;ENVIRONMENTAL EFFECTS;LEGAL ASPECTS;POLLUTION LAWS;ENVIRONMENT;RESEARCH PROGRAMS;RADIOACTIVE WASTE DISPOSAL;SAFETY STANDARDS;NUCLEAR FACILITIES;DECONTAMINATION;WATER RESOURCES;REGIONAL ANALYSIS;ENVIRONMENT;LAND USE

<085160>
TITLE: Ultrasensitive Pollutant Analysis
PROJECT NUMBER: 002389
PRINCIPAL INVESTIGATOR: Garrett, W.R.
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Oak Ridge National Lab., Tenn. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;CHEMICAL EFFLUENTS;TRACE AMOUNTS

<085161>
TITLE: Environmental Transport and Effects of Coal Conversion
PROJECT NUMBER: 1693
PRINCIPAL INVESTIGATOR: Gehrs, C.W.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Lewis, Robert A.
TELEPHONE: F233-5079
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (85%);COMBUSTION OR END USE (10%);WASTE MANAGEMENT (5%)
POLLUTANTS: NOXIOUS GAS/COS;NOXIOUS GAS/Hydrocarbons (20%);METALS (10%);ORGANICS/PAH;ORGANICS/Arylamine;ORGANICS/Thiophenes;ORGANICS/Phenols (70%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Define potential ecological effects of coal conversion effluents, identify critical pathways of trace contaminants to biota (including man).
APPROACH: Environmental toxicological studies of whole and fractionated effluents as well as transport, fate,

availability investigations utilizing represenative class compounds.
RESULTS: (1) Quantities of COS released may cause modification of phytoproduction. (2) Phenolic and ammonia components are major acute toxic materials in aquatic environments. (3) PAH and Arylamines are key organic contaminants that might move through aquatic environment to man.
PROJECT MILESTONES: (1) Identify interactions between key atmospheric organic contaminants. (2) Determine validity of chemical fractionation to acute toxicity screening. (3) Develop initial predictive model for availability and transport of PAH's in aquatic environment. (4) Develop protocols for evaluating potential problems of solid wastes.
KEYWORDS: COAL GASIFICATION;COAL LIQUEFACTION;CHEMICAL EFFLUENTS;ENVIRONMENTAL EFFECTS;ENVIRONMENTAL TRANSPORT;CARBON OXYSULFIDE;PHENOLS;POLYCYCLIC AROMATIC HYDROCARBONS;AMINES;WATER POLLUTION;SYNTHETIC FUELS;ORGANIC COMPOUNDS;ECOSYSTEMS

<085162>
TITLE: National Chlorination Symposium
PROJECT NUMBER: 001688
PRINCIPAL INVESTIGATOR: Auerbach, S.I.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D. Heyward
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%)
POLLUTANTS: ORGANICS/Chlorinated (50%);SPECIFIED OTHER POLLUTANTS/Chlorine (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (75%);ANALYTICAL (25%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Definition of chlorination problem and development of ideas and concepts concerning areas of research needing emphasis.
APPROACH: Conduct national symposa with acknowledged leaders in CM and M, health effects, environmental effects, and physical transport.
RESULTS: Publication of symposium proceedings.
PROJECT MILESTONES: Second National Conference on Water Chlorination Schedules for October 31--November 4, 1977. Conference proceedings are to be published. A third conference may be held in April or May 1979.
KEYWORDS: FATE;WATER POLLUTION;CHLORINE;HEALTH HAZARDS;ENVIRONMENTAL EFFECTS;TRANSLOCATION;ECOLOGICAL CONCENTRATION;ENERGY;NUCLEAR ENERGY;FOSSIL FUELS;MEETINGS;ECOSYSTEMS;CHEMICAL EFFLUENTS;MAN;WATER

<085163>
TITLE: Chemical Characterization of Complex Organic Materials Related to Coal Conversion Technology (CCT)
PROJECT NUMBER: 001710
PRINCIPAL INVESTIGATOR: Guerin, M.R.
ADDRESS: Analytical Chemistry Division, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F973-5355
TYPE OF FUNDING: Contract No.-W-7405-Eng-26
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project emphasizes the development of methodology for systematic analyses of complex organic materials which result from or are involved in coal conversion technologies.
APPROACH: Real samples will be procured from private sources and collaborating agencies. These, in conjunction with model samples, will be used to develop the techniques for analyzing for classes of compounds as well as specific compounds in any complex, natural matrix. Separations methodologies will include gas-liquid chromatography, gel chromatography and acid-base fractionation. Chemical identifications will be made using infrared, NMR and mass spectroscopy.
RESULTS: Generalized approaches to the analyses of PAH's and heterocyclic compounds is expected. A great number of heretofore unidentified materials should be added to the catalogue of information on synthetic fuel and effluent compositions. Concomitant studies in the life science areas should result in the analyses of several health and environmentally important compounds.
PROJECT MILESTONES: (1) Development of methodology for the rapid estimation of approximate composition of complex samples, including aqueous samples 1-1-77. (2) Development of methodology for quantitative determination of PAH's in a PAH isolate 1-7-77. (3) Development of methodology for the identification and determination of heterocyclic compounds of nitrogen and sulfur 1-1-78. (4) Determination of principal acidic and basic components 1-7-77.
KEYWORDS: COAL;CHEMICAL ANALYSIS;HETEROCYCLICS;COAL;CHEMICAL ANALYSIS;HETEROCYCLIC COMPOUNDS;ORGANIC NITROGEN COMPOUNDS;ORGANIC SULFUR COMPOUNDS;ORGANIC OXYGEN COMPOUNDS;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;SYNTHETIC FUELS;COAL GASIFICATION;COAL LIQUEFACTION

<085165>
TITLE: Biochemical Treatment of Waste Steams from Coal
PROJECT NUMBER: 001711
PRINCIPAL INVESTIGATOR: Scott, C.D.
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Oak Ridge National Lab., Tenn. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (100%)
KEYWORDS: COAL;COMBUSTION;CHEMICAL EFFLUENTS;LIQUID WASTES;STEAM;BIOCHEMICAL REACTION KINETICS;WASTE HEAT

<085167>
TITLE: Environmental Evaluation of the Guyan Oil Company Enhanced Oil Recovery Pilot Project
PROJECT NUMBER: 2925
PRINCIPAL INVESTIGATOR: Hildebrand, S.G.
ADDRESS: Union Carbide Corporation, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: F233-4905
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$4,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: ORGANICS (25%);VISUAL AESTHETICS (75%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this work is to monitor the Guyan Oil Company Enhanced Oil Recovery Project to make certain environmental disturbance is being kept at a minimal level.
APPROACH: The approach to this project is through onsite observations and sampling.
RESULTS: The product of this effort is periodic reports provided to the Department of Energy Headquarters on the environmental situation at the site.
PROJECT MILESTONES: Initiation of monitoring effort. August 1977.
KEYWORDS: OIL WELLS;ENHANCED RECOVERY;ENVIRONMENTAL EFFECTS;MONITORING;LAND USE;NOISE;OIL SPILLS;WATER;EROSION;MISCIBLE-PHASE DISPLACEMENT;CARBON DIOXIDE

<085168>
TITLE: Evaluation of Environmental Monitors
PROJECT NUMBER: 4103
PRINCIPAL INVESTIGATOR: Scott, C.D.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Duhamel, A. Paul
TELEPHONE: F233-4328
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/As;METALS/Pb;METALS/Ni;METALS/Hg (50%);ORGANICS/Carcinogens (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of the program are twofold: (1) development, design, and construction of advanced, automated, continuous monitoring systems for specific environmental pollutants and (2) characterization of expected pollutants and evaluation of advanced systems in actual and simulated process effluents. The program is primarily concerned with the second task as it relates to coal conversion processes.
APPROACH: Identify specific environmental pollutants associated with coal conversion processes and then develop automated environmental systems for continuous in-situ monitoring of specific airborne or soluble pollutants. An evaluation of automated instrumentation and development of such instrumentation will be pursued.
RESULTS: The results of this program should permit the development of rapid, accurate, and automated analytical instrumentation for monitoring pollutants from coal conversion processes.
PROJECT MILESTONES: Quarterly reports describing progress and the development of automated analyzers.
KEYWORDS: AIR POLLUTION MONITORS;WATER POLLUTION MONITORS;COAL GASIFICATION PLANTS;COAL LIQUEFACTION PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;AEROSOLS;AQUEOUS SOLUTIONS;GASEOUS WASTES;PERFORMANCE TESTING;HYDROCARBONS;ARSENIC;CARCINOGENS;LEAD;NICKEL;MERCURY

<085169>
TITLE: Environmental Applications of Portable Analyzers
PROJECT NUMBER: 004104
PRINCIPAL INVESTIGATOR: Scott
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Oak Ridge National Lab., Tenn. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$74,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING

<085176>
TITLE: Transportation Statistics Data Bank
PROJECT NUMBER: 800133
PRINCIPAL INVESTIGATOR: Foster, W.E.
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Oak Ridge National Lab., Tenn. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fission (100%)
KEYWORDS: TRANSPORT;SAFETY;STATISTICS;DATA COMPILATION

<085177>
TITLE: Preparation of Research Materials--B
PROJECT NUMBER: 2548
PRINCIPAL INVESTIGATOR: Guerin, M.R.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duhamel, A. Paul
TELEPHONE: F233-4328
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is to establish sample repositories of well characterized synfuels derived primarily from coal. These sample materials could then be utilized for example to test for biological and/or physical evaluation. Primary emphasis is placed on obtaining samples of coal liquids, combustion products, and wastes effluents from conversion processes.
APPROACH: The approach to this project is to simply obtain samples from various coal conversion processes for future characterization and evaluation. Primary effort is directed toward using these samples to obtain research data on the various coal conversion processes. The samples collected are chosen carefully to insure that they represent truly viable coal conversion processes currently under consideration.
RESULTS: It is expected that the availability of various coal conversion process samples will permit the generation of useful research data, particularly from a chemical and biological activity point of view. It is not anticipated that the data generated can be used to establish the environmental acceptability of a specific coal conversion process.
PROJECT MILESTONES: The project was completed in FY77.
KEYWORDS: COAL;COMBUSTION;CHEMICAL EFFLUENTS;GASEOUS WASTES;COAL GASIFICATION;COAL LIQUEFACTION;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;CARCINOGENS;MUTAGENS;AIR POLLUTION MONITORS;ENVIRONMENTAL TRANSPORT;COMPARATIVE EVALUATIONS

<085178>
TITLE: Regional Disaggregation of Energy Futures for WRC Assessments
PROJECT NUMBER: 2566
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
77 FUNDING: Energy Research and Development Administration FY77:$30,000
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
KEYWORDS: REGIONAL ANALYSIS;FORECASTING;TECHNOLOGY ASSESSMENT;USA;EVALUATION;WATER QUALITY;ENERGY SOURCES;WATER RESOURCES;MANAGEMENT;ENERGY SOURCE DEVELOPMENT

<085179>
TITLE: Environmental Evaluation Guyan Oil Company for Pilot Project
PROJECT NUMBER: 002925
PRINCIPAL INVESTIGATOR: undesignated
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Oak Ridge National Lab., Tenn. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$4,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)

<085180>
TITLE: Surplus Facility Surveillance
PROJECT NUMBER: 800006
PRINCIPAL INVESTIGATOR: McCord, R.V.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Glauberman, Harold
TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$105,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific ORNL
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To provide routine surveillance and periodic maintenance to ensure that a release of radioactive materials to the environment does not occur because of gradual deterioration of containment.
APPROACH: Routine visual inspections, checks, and tests are made to ensure that the required equipment is operational and that no radioactive materials are released to the environment. Radiation levels, air flows, and pressures are routinely read and recorded and in some situations this information is telemetered to a central surveillance station.
RESULTS: Routine surveillance over the surplus facilities will prevent the release of radiation and/or the spread of contamination to the environment during the interim while plans are being developed to decommission the facilities.
PROJECT MILESTONES: There are no milestones in this effort. Surveillance will continue until the surplus facilities have been decommissioned.
KEYWORDS: SURVEILLANCE;NUCLEAR FACILITIES;DECOMMISSIONING;RADIATION MONITORING;RADIOACTIVE EFFLUENTS;SAFETY;RADIOACTIVE WASTES;RADIOACTIVE WASTE STORAGE;ENVIRONMENT

<085181>
TITLE: Surplus Facilities Surveillance (FPDL)
PROJECT NUMBER: 800007
PRINCIPAL INVESTIGATOR: Schaich, R.W.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control and Technology
MONITOR: Glauberman, Harold
TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Fission products (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To maintain the Fission Product Development Laboratory in a standby operational mode and in a safe condition until funding is available for decontamination and decommissioning. The facility was used from 1958 to 1975 in high level fission product processing, resulting in highly contaminated equipment in the 26 cells.
APPROACH: A surveillance crew is maintained to monitor the liquid and gaseous waste system, to provide health physics coverage, and to maintain needed services, such as cell ventilation, air filtration and radiation detection instrumentation.
RESULTS: Maintenance of the highly contaminated cells of FPDL in a safe standby condition.
PROJECT MILESTONES: Decontamination of FPDL pending funding availability.
KEYWORDS: SURVEILLANCE;NUCLEAR FACILITIES;DECONTAMINATION;DECOMMISSIONING;RADIATION MONITORING;RADIOISOTOPES;RADIOACTIVE EFFLUENTS;SAFETY;RADIOACTIVE WASTES

<085182>
TITLE: Planning for Disposition of Excess Facilities, Reactors
---JECT NUMBER: 800017
NCIPAL INVESTIGATOR: Cagle, C.D.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Glauberman, Harold
TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Site specific ORNL
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY:OS
PROJECT DESCRIPTION: The Oak Ridge Graphite Reactor (OGR), the Low-Intensity Testing Reactor (LITR), the Homogeneous Reactor Experiment No. 2 (HRE-2), and the Molten-Salt Reactor Experiment (MSRE) have been permanently shut down. At the time of shutdown, fuel was removed from the OGR, LITR, and HRE-2; but the MSRE fuel was drained from the reactor into shielded storage tanks in the reactor building. All four of the reactor structures must be kept under surveillance and maintained to keep them environmentally safe. The objective of this program is to study alternative methods for decommissioning the reactors so that little or no future surveillance will be required.
APPROACH: Each reactor structure is being studied in detail in order to provide a step-by-step job breakdown both for complete dismantling and disposal of radioactive portions and for entombment in place in concrete for the LITR, the HRE-2, and the MSRE. Since the OGR is a listed National Historical Landmark, only entombing of the more radioactive portions in concrete within the reactor shield is being considered. From the job breakdowns, estimates of manhour requirements, tooling requirements, and costs will be made.
RESULTS: The studies will provide sufficient information to allow a decommissioning method for each reactor to be chosen on the bases of environmental safety and costs.
PROJECT MILESTONES: Completion of procedures and cost estimates for: (1) LITR June 1975. (2) HRE-2 February 1976. (3) OGR July 1976. (4) MSRE October 1976.
KEYWORDS: REACTORS;DECOMMISSIONING;SAFETY;COST;DECONTAMINATION

<085183>
TITLE: Testing of Large Obsolete Casks
PROJECT NUMBER: 800046
PRINCIPAL INVESTIGATOR: Shappert, L.B.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Sisler, J.A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$159,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The cask tests that are carried out in this program are used to develop information on both behavior and damage in full scale casks, in cask protection systems such as fins or specially designed shock absorber, and in cask contents.
APPROACH: Full scale casks are destructively tested in accordance with the consecutive hypothetical accidents.
RESULTS: This program will produce (1) information on damage in full scale casks, (2) information on damage in cask protection system, and (3) information on damage in cask contents.
PROJECT MILESTONES: (1) Report on HWCTR cask end-on drops and punction test completed Sept. 1976. (2) Draft report of Piqua cask tests completed March 1977. (3) Draft report of IP-100 spent fuel cask tests completed March 1978.
KEYWORDS: CASKS;DESTRUCTIVE TESTING;TRANSPORT

<085185>
TITLE: Assessment of Environmental Control Technology for Coal Conversion Processes
PROJECT NUMBER: 800060
PRINCIPAL INVESTIGATOR: Klein, J.A.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Witmer, Fred E.
TELEPHONE: F233-5587
TYPE OF FUNDING: Contract No.-RK-01-04-01-1(189 Fo. 8000060)
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (10%);PARTICULATES (10%);ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/PH/sub 2/ inorganics (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (50%);ANALYTICAL (50%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
)JECT DESCRIPTION: The sources of, and components in, the aqueous wastes of coal conversion processes will be identified alcng with existing guidelines and standards for the discharge of those materials to the environment. A set of anticipated emission standards for coal conversion processes will be developed. A variety of environmental control technologies will be assessed for their adaptability to coal conversion wastewater.
APPROACH: The literature will be surveyed and pertinent research and development personnel will be contacted in order to estimate the sources, quantities, and compositions of the aqueous effluents. Experimental

screening tests will be performed to determine their suitability to both synthetic and actual wastewater.
RESULTS: Results of this assessment are in the form of a first draft of a final report that identifies effluents from coal conversion plants and evaluates existing and anticipated federal and local effluent guidelines and standards and their impact. The suitability of new and existing wastewater cleanup technologies including biological degradation, char adsorption, and polyelectrolyte adsorption will be determined.
PROJECT MILESTONES: Final report on Assessment of Environmental Control Technology for Hydrocarbonization: (a) initial draft, final report 7/1/77; (b) final report, 10/1/77 (depends on editing and reproduction load at ORNL).
KEYWORDS: CHEMICAL EFFLUENTS;AQUEOUS SOLUTIONS;COAL GASIFICATION;COAL LIQUEFACTION;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;SYNTHETIC FUELS;WASTE WATER

<085186>
TITLE: Nucleic Acid Chemistry of Abnormal Cells
PROJECT NUMBER: 002374
PRINCIPAL INVESTIGATOR: Volkin, E.
ADDRESS: Biology Division of Oak Ridge National Lab., Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$214,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (75%);NUCLEAR/Fission Converters (25%)
POLLUTANTS: ORGANICS (75%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To understand the alterations in kinds and amounts of the various RNAs of human cells produced by cells progressing to the malignant phase of carcinogenesis. To understand the biochemical and molecular basis for such modifications and how they relate to cancer production.
APPROACH: Human cells will be treated with various levels of selected physical and chemical agents that are known to be carcinogenic. Activated and non-activated forms of polynuclear hydrocarbons will be used and their effect on metabolism and synthesis of the various types of RNAs will be evaluated.
RESULTS: We hope to clearly define the mechanism(s) of cell toxicity of such pollutants and to define their role in altering cellular regulatory processes that may play an important role in cancer production, promotion and progression to malignancy.
PROJECT MILESTONES: (1) Begin studies with PAH 1-10-76. (2) Effects on RNA metabolites 1-1-77. (3) Effects on synthesis 1-6-77. (4) Effects on turnover and breakdown of RNAs 1-9-77.
KEYWORDS: NUCLEIC ACIDS;RNA;ANIMAL CELLS;CARCINOGENESIS;CARCINOGENS;HYDROCARBONS;METABOLISM;BIOSYNTHESIS;POLLUTION;BIOCHEMISTRY

<085187>
TITLE: Carcinogenesis, Mutagenesis and Metabolic Activation of Polycyclic Hydrocarbons in Human Cells
PROJECT NUMBER: 002361
PRINCIPAL INVESTIGATOR: Selkirk, J.K.
ADDRESS: Biology Div., Oak Ridge National Lab., Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468;C(301)353-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To assess human risk and to provide understanding of the mechanism for possible intervention therapy, to understand the metabolic fate in animals and man and to correlate animal and human cell data for prediction of risk to man.
APPROACH: Human cells will be exposed to radioactively labelled PAH's. The complete metabolic fate will be established by chemical and radiochemical analysis of reaction products. The ultimate carcinogen and its molecular reaction will be determined. Mutagenic frequency per unit dose will be correlated with frequency of oncogenic cell transformation.
RESULTS: Human cell systems (in vitro) will be developed for rapid, inexpensive and reliable screening for mutagenic and carcinogenic activity of hydrocarbons. The mechanism of reaction, damage and repair will become available.
KEYWORDS: CARCINOGENESIS;MUTAGENESIS;METABOLISM;HYDROCARBONS;ANIMAL CELLS;HAZARDS;DATA;RADIOISOTOPES;RADIOCHEMICAL ANALYSIS;CHEMICAL ANALYSIS;CELL CULTURES;MAN

<085188>
TITLE: Studies on Tumor Cell Immunology
PROJECT NUMBER: 002360
PRINCIPAL INVESTIGATOR: Kennel, S.J.
ADDRESS: Biology Division, Oak Ridge National Lab., Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-483 2000;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)

POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
EARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
JECT DESCRIPTION: Through detailed understanding of viral relationship of mouse leukemia and their associated antigens, specific radiolabelled antibodies will be used to provide immune radiotherapy for this type of cancer.
APPROACH: Using mouse leukemia system purified antibody against viral specific cell surface antigens will be coupled to high specific activity radioiodine as a means of delivering a cytotoxic radiation dose to leukemic cells.
RESULTS: It is expected that the animal model system will determine the feasibility of this type of therapy for cancer as a model for similar studies in human cancer.
KEYWORDS: TUMOR CELLS;IMMUNITY;LEUKEMIA;MICE;ANTIGENS;ANTIBODIES;NEOPLASMS;RADIOTHERAPY;IODINE ISOTOPES;RADIATION DOSES;BIOLOGICAL MODELS;THERAPY

<085189>
TITLE: Reproductive Toxicology
PROJECT NUMBER: 002526
PRINCIPAL INVESTIGATOR: Wallace, R.A.;Dumont, J.N.
ADDRESS: Biology Division, Oak Ridge National Lab., Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, M.
TELEPHONE: F233-3681
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$271,000
TECHNOLOGY: FOSSIL FUEL/General (25%);GENERAL SCIENCE (75%)
ENERGY CYCLE: EXTRACTION (25%);COMBUSTION IN SITU (25%);PROCESSING, CONVERSION (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: ORGANICS/Phenols (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Exploit the amphibian oocyte and embryo as a model to identify cell membrane and cytoplasmic regulatory mechanisms which may be targets of environmental acute and chronic toxicity.
APPROACH: To evaluate the effects of energy conversion environmental contaminants on cellular and developmental events. Effluents from energy producing processes contain potentially dangerous environmental products. In order to test such products, we have developed a model system which is inexpensive, rapid and in which several parameters can be monitored. The system uses the ciliate, Tetrahymena pyriformis, and monitors behavior, cytology, respiration and growth. T. pyriformis forms an integral part of all aquatic ecosystems and is an excellent model for testing pollutants. In our initial studies possible coal-conversion effluents have been examined to determine the lethal and threshold concentrations affecting cytological and functional changes. The aims of this new effort are: (1) examination of hazardous products which are structurally related (i.e., phenol, cresol, halogenated and substituted phenols) to determine how toxicity might be related to molecular structure, thus allowing predictive evaluations; and (2) extension of data obtained with the model system to other aquatic organisms such as Daphnia and amphibians. The amphibian studies, for instance, have already begun and ascertain such parameters
KEYWORDS: REPRODUCTION;AMPHIBIANS;OOCYTES;EMBRYOS;ANIMAL CELLS;POLLUTION;ENERGY CONVERSION;CHEMICAL EFFLUENTS;BIOLOGICAL MODELS;TETRAHYMENA;MONITORING;ENERGY SOURCES;TESTING;HAZARDS;ENVIRONMENTAL EFFECTS;DAPHNIA;STANDARDS;TOXICITY

<085190>
TITLE: Review Criteria for Nuclear Criticality Safety Evaluations for Transportation of Fissile Materials in 10CFR71
PROJECT NUMBER: 800040
PRINCIPAL INVESTIGATOR: Thomas, J.T.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Dunckel, T.L.
TELEPHONE: F233-5464
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (90%);STORAGE (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTPREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Current regulatory packaging standards concerning nuclear criticality safety in shipments of fissile materials may not be adequate and may not provide a consistent minimum margin of safety. Regulations require five times the number of packages allowed in a normal shipment be subcritical when optimally arranged and reflected by water. The factor protects possible criticality in the event several shipments commingle. The factor may not provide a sufficient margin of subcriticality, however, for other contingencies encountered in normal transportation. In several instances calculations have shown that, while a package can meet current criteria, the k-eff of any array can be significantly increased by replacing a water reflector with a concrete reflector. Concrete floors and walls are common to many storage locations and warehouses where packages can be temporarily stored when in transit. The extent of the problem needs to be determined; and, if necessary, the safety standards should be revised.
APPROACH: The effect of fissile mass loadings of various commonly used package insulating materials such as Celotex, wood, polyfoam, Foamglas, and others, will be examined to determine the extent that current standards for specification of mass loadings in fissile packages breach acceptable margins of safety, and are inconsistent in assignment of transport indices.
ULTS: Determine the extent that current regulations for specification of mass loadings in fissile material packages breach acceptable margins of safety and are inconsistent in assignment of transport indices.

Confirm existing criteria or formulate new criteria. Submit results for review and comment. Complete study and issue final report.
PROJECT MILESTONES: Final report due approx. Sept. 1978.
KEYWORDS: FISSILE MATERIALS;TRANSPORT;CRITICALITY;SUBCRITICALITY;CRITICAL SIZE;CRITICAL MASS;GEOMETRY;SHIELDING MATERIALS;CASKS;MATERIALS TESTING;SAFETY STANDARDS;COMPUTER CALCULATIONS

<085191>
TITLE: Study of Effluent Control Technologies for Hydrocarbon and Carbon Monoxide Emissions from Coal Conversion Plants
PROJECT NUMBER: 800158
PRINCIPAL INVESTIGATOR: Fisher, J.P.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control
MONITOR: Witmer, Fred J.
TELEPHONE: F233-5517
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/CO;NOXIOUS GAS/CH4;NOXIOUS GAS/C2H4;NOXIOUS GAS/C2H6 (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this project is to provide a technical and economic comparison of processes available for the control of gaseous hydrocarbon (HC) and carbon monoxide (CO) emissions. The Lurgi gasification process and the HCOAL liquefaction process will be considered as reference source systems, and comparisons of control technologies will consider incineration as the reference control system.
APPROACH: The following tasks will be performed during this study: Task I--Develop information concerning joint sources of contaminated gas from reference source systems; Task II--Identify EPA emission allowances for HC and CO; Task III--Examine industrial and development stage processes for HC and CO removal, recovery, or destruction; Task IV--Develop cost estimates and assess project efficiencies; and Task V--Presentation of results.
RESULTS: A review of the study results will be prepared for ERDA/DECT. The review will include recommendations for future analyses and/or experimentation.
PROJECT MILESTONES: (1) July 15, 1977 Project initiation. (2) September 1, 1977 Mid-project review. (3) September 30, 1977 Final review.
KEYWORDS: HYDROCARBONS;CARBON MONOXIDE;EMISSION;COAL GASIFICATION PLANTS;COAL LIQUEFACTION PLANTS;ECONOMICS;CONTROL;US EPA;RECOMMENDATIONS;AIR POLLUTION;CHEMICAL EFFLUENTS;ENVIRONMENTAL EFFECTS;AIR POLLUTION CONTROL

<085192>
TITLE: Radionuclide Sources in the Coastal Zone
PROJECT NUMBER: 002528
PRINCIPAL INVESTIGATOR: Cutshall, N.H.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-W-7405-ENG-26
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Uranium-thorium series (50%);RADIATION/Uranium-thorium series (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To determine the physical behavior of soluble and insoluble radioisotopes as to interactions with sediments on the seafloor; (2) to determine coastal sources of Th-232 series radioisotopes.
APPROACH: (1) Obtain sediment cores and analyze in vertical profile for thorium and radium isotopic distributions; (2) measure radium and thorium contents of juvenile menhaden from different estuarine systems to locate natural radioactivity sources.
RESULTS: Descriptive models which define the transfer of particulate (insoluble) radioisotopes onto and across the continental shelf.
KEYWORDS: COASTAL WATERS;RADIOISOTOPES;SEDIMENTS;THORIUM 232;RADIUM ISOTOPES;FISHES;CONTAMINATION;ESTUARIES;NATURAL RADIOACTIVITY;CONTINENTAL SHELF;RADIOECOLOGICAL CONCENTRATION

<085193>
TITLE: Inventory of Transuranics in Clinch River
PROJECT NUMBER: 002569
PRINCIPAL INVESTIGATOR: Eyman, L.D.
ADDRESS: Oak Ridge National Laboratory, P.O. Box 117, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$52,000

TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Transuranium elements (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;OS
PROJECT DESCRIPTION: To determine the distribution and concentrations of transuranium elements in the Clinch River sediments and water in the vicinity of the Oak Ridge facility.
APPROACH: Sediment cores from a previous survey will be analyzed for the transuranium (TU) elements. New cores will be taken to determine the present distribution of the TU elements. Water samples will also be analyzed for the elements.
RESULTS: A report on the distribution and concentration of the TU elements in sediments and water will be published.
PROJECT MILESTONES: Report published at end of FY 1978.
KEYWORDS: TRANSURANIUM ELEMENTS;DISTRIBUTION;CLINCH RIVER;RADIOECOLOGICAL CONCENTRATION;SEDIMENTS;DRILL CORES;WATER;CONTAMINATION

<085194>
TITLE: Fossil Fuel Pulmonary Toxicity
PROJECT NUMBER: 002363
PRINCIPAL INVESTIGATOR: Dalbey, W.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, M.
TELEPHONE: F233-3681
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS/Cd (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To define the role that Cd, an environmental agent associated with energy developments, plays in the induction and progression of emphysema or chronic obstructive pulmonary disease (COPD).
APPROACH: Acute exposures of rats to cadmium aerosols will be used to provide a relevant and convenient model for the induction of emphysema. Initial damage after cadmium exposure will be evaluated histologically and autoradiograms prepared to quantitate cell proliferation (as indicated by /sup 3/H-thymidine incorporation). The progression of emphysematous disease will be monitored by pulmonary function tests, morphometric and scanning electron microscopic examination of the lungs, and selected biochemical indices of pulmonary connective tissue metabolism. The influence of host factors such as age-of-exposure, exercise, exposure rate and presence of other environmental stresses (sulfates, NO2 and smoking) will also be considered.
RESULTS: Methods being developed to identify and quantify emphysematous changes. Cd exposures being initiated and retained doses will be determined via serial sacrifice samplings.
KEYWORDS: FOSSIL FUELS;ENVIRONMENTAL EFFECTS;CADMIUM;RATS;INHALATION;TOXICITY;AIR POLLUTION;HEALTH HAZARDS;EMPHYSEMA;ETIOLOGY;LUNGS;PATHOLOGICAL CHANGES;AEROSOLS

<085195>
TITLE: Agricultural Pollutants
PROJECT NUMBER: 001697
PRINCIPAL INVESTIGATOR: Kaye, S.V.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview/Integrated Assessment
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Determine the significant chemical, physical, and mechanical processes involved in the transport or fixation of the toxic metals in the root zone of agricultural land.
APPROACH: Complete a literature survey of all relevant processes; analyze results of research; develop a generalized model.
RESULTS: Report on computer-implemented model in digital form.
PROJECT MILESTONES: Complete literature survey by end of third quarter of FY 1977.
KEYWORDS: METALS;ROOTS;SOILS;COMPUTERS;MATHEMATICAL MODELS;DIFFUSION;TOXICITY;LAND POLLUTION;SOIL CHEMISTRY;AGRICULTURE;ENVIRONMENTAL EFFECTS;CADMIUM;MERCURY;LEAD

<085196>
TITLE: Genetic Effects of Plutonium in Mice
PROJECT NUMBER: 002527
PRINCIPAL INVESTIGATOR: Russell, W.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468

TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION/Plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: There is a sudden increase in general concern over the potential hazard from genetic effects of plutonium. Recent work has shown that plutonium concentrates near the basement membrane of the seminiferous tubules of the testis, thereby exposing spermatogonial stem cells to a significant dose. That being the case, the continuous low-level radiation exposure of these cells is likely to be more easily detected by gene mutation tests than by measures of chromosomal damage. Therefore, since some chromosomal damage has already been demonstrated, there is a high probability that the gene mutation studies will prove positive. The Biology Division of ORNL is the only U.S. laboratory equipped to handle the gene mutation studies, which will be carried out for spermatogonia, in parallel with determinations of chromosomal damage.
APPROACH: Male mice will be injected intravenously with Pu-239 citrate and, after 10 weeks, each will be mated serially with 4 T stock females per week. All offspring will be examined for specific-locus mutations. A subset of the offspring will be fertility tested to score for presumptive translocations. Translocation induction will also be determined cytologically by examination of diakinesis in treated males. To aid in the interpretation of the genetic results, histological examination of the testis will be carried out in Pu-239-treated and control males to determine the extent of any cell selection. Dosimetry by autoradiography and liquid scintillation counting will be done along with the genetic testing, on a simultaneously treated population of male mice. When the various experiments on males are well underway, pilot experiments will be initiated to determine distributional and dosimetric information for injected females. Data from these will be used to determine the feasibility of conducting subsequent genetic tests on Pu-239-treated females.
RESULTS: Mutation rates for specific locus mutations and translocations induced by Pu-239 in spermatogonia will be determined. From these it will be possible to estimate the RBE of plutonium. The spectrum of mutations produced by the specific-locus study, and further cytogenetic analysis of the mutants recovered, will provide information on whether or not plutonium produces relatively more of the serious type of damage (e.g., deficiencies) than occurs with x or gamma irradiation. Information will be obtained on the feasibility of conducting genetic experimerts with Pu-239-injected females.
PROJECT MILESTONES: (1) 30 Sep. 1977 Preliminary estimate of specific-locus mutation rate in spermatogonia. (2) 30 Sep. 1977 Dosimetry information for exposed spermatogonia will be complete. (3) 31 Dec. 1977 Cytological scoring for translocations completed. (4) 31 Dec. 1977 Pilot study on distribution and dosimetry in injected females completed. (5) 31 Dec. 1977 Decision point on whether to proceed with genetic study of plutonium in females. (6) 31 Mar. 1978 Fertility testing of F-1 for translocation estimates completed. (7) 30 Sep. 1978 Cytological analysis of F-1 steriles completed. (8) 30 Sep. 1978 Determination of specific-locus mutation rate in spermatogonia completed.
KEYWORDS: MICE;PLUTONIUM ISOTOPES;GENETIC RADIATION EFFECTS;HAZARDS;TESTES;SPERMATOGONIA;MUTATIONS;RADIATION DOSES;GENES;CHROMOSOMAL ABERRATIONS;PLUTONIUM 239;DOSIMETRY;RADIOINDUCTION;CYTOLOGY;PLUTONIUM COMPOUNDS;CITRATES;INTRAVENOUS INJECTION

<085197>
TITLE: Multienzyme Systems Involved in the Metabolism of Aromatic Amino Acids and Hazardous Aromatic Hydrocarbons
PROJECT NUMBER: 002371
PRINCIPAL INVESTIGATOR: Gaertner, F.H.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$71,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Determine the organization and function of multienzyme systems involved in the biosynthesis and degradation of amino acids. Also determine the hazardous substances associated with the metabolism of aromatic amino acids.
APPROACH: Biochemical and genetic studies will be conducted in neurospora to isolate and characterize the single polypeptide chain carrying the multienzyme system and the influence of intracellular proteases on it.
RESULTS: The intracellular proteases will be isolated and characterized with the use of specific protease assays, inhibitors and substrates. Natural inhibitors of these proteases will be identified and purified.
PROJECT MILESTONES: 6/1/77 (1) Final test of the hypothesis that the aromatic system is a multifunctional enzyme; and (2) structural and catalytic properties of the neurospora protease.
KEYWORDS: AMINO ACIDS;METABOLISM;HYDROCARBONS;AROMATICS;ENZYMES;BIOSYNTHESIS;GENETICS;BIOCHEMISTRY;NEUROSPORA;POLYPEPTIDES PEPTIDE HYDROLASES

<085198>
TITLE: Photosynthesis
PROJECT NUMBER: 002369
PRINCIPAL INVESTIGATOR: Arnold, W.A.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5486
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$50,000

TECHNOLOGY: SOLAR/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: STORAGE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
IONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To understand how light energy is transformed into chemical energy and the details of the steps leading to oxygen production in plants.
APPROACH: Measurements of fluorescence and delayed light after very short times after light flashes.
RESULTS: (1) FY 1977 Find ways to get a handle on the 4 oxidation-reduction levels in chloroplasts. (2) FY 1978 Study chemistry of the steps in the oxidation of water. (3) 1977-1978 Oxidation-reduction levels in chloroplasts.
KEYWORDS: PHOTOSYNTHESIS;PLANTS;CHLOROPLASTS;BIOCHEMISTRY;PHOTOCHEMISTRY;ENERGY CONVERSION;VISIBLE RADIATION;PHOTOCHEMICAL REACTIONS;BIOCHEMICAL REACTION KINETICS;OXIDATION;REDUCTION;WATER

<085199>
TITLE: Regulation of Membrane Transport Systems
PROJECT NUMBER: 002368
PRINCIPAL INVESTIGATOR: Cook, J.S.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the mechanism of regulation of macromolecules in the membrane responsible for the transport of metabolites. Emphasis is on the turnover and synthesis of the transporting molecules.
APPROACH: Study the uptake and fate of specific radioactive ligands which bind to the transport sites. Also study the charges in the transport systems as mammalian cells pass from a non-transformed to a transformed state.
RESULTS: It will be determined whether Na--K ATPase in human cells is an indivisible enzyme, how the 5'-nucleotidase varies throughout the growth cycle of HeLa cells and whether amino acid transport is coupled to Na--K transport.
PROJECT MILESTONES: (1) Oct. 1976 Inducibility of Na--K ATPase in human cells will be determined. (2) June 1977 Steady state turnover of Na--K ATPase in cultured human cells. (3) Oct. 1977 Coupling to amino acid transport to Na--K transport established.
KEYWORDS: MOLECULES;CELL MEMBRANES;METABOLITES;DIFFUSION;BIOSYNTHESIS;LIGANDS;ANIMAL CELLS;ATP-ASE;NUCLEOTIDASES;HELA CELLS;AMINO ACIDS;BIOCHEMISTRY;MEMBRANE TRANSPORT;IN VITRO

<085200>
TITLE: Chemical Toxicology
PROJECT NUMBER: 002362
PRINCIPAL INVESTIGATOR: Witschi, H.R.
ADDRESS: Biology Division, Oak Ridge National Lab., Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, M.
TELEPHONE: F233-3681
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (10%);PARTICULATES (10%);ORGANICS/PNA's (60%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The chemical toxicology program will provide a quick response to questions arising out of the use of potentially toxic materials in ERDA's operations, materials associated with the production of synthetic fuels, and materials associated with energy effluents.
APPROACH: We will set up a program to conduct classical toxicological testing for both acute and chronic toxicity. The method of administration of the materials will depend on what is most appropriate. We have considerable capability in inhalation toxicology as well as the more conventional routes of administration. Tests will consist of, but would not be limited to, acute toxicity as measured by the LD/sub 50/, skin irritation, conjunctival irritation, causticity, and other tests as appropriate. In some cases it may be advisable to do more chronic toxicity testing to evaluate the incidence of chronic degenerative disease, cancer, mutagenesis and teratogenesis.
RESULTS: As a first step, we expect to recruit a full time toxicologist and equip the laboratory. Next, we will standardize all our testing procedures. Once this is done, we will move rapidly into extensive toxicity testing. We anticipate some testing for another division of ERDA, and will work closely with the Division of Operational Safety to help them in some of their problem areas. Toxicity testing will also be conducted on selected coal conversion products preliminary to more extensive testing in the carcinogenesis and mutagenesis programs.
PROJECT MILESTONES: (1) October 1976 Hire toxicologist and equip laboratory. (2) March 1977 Toxicology testing procedures standardized. Begin toxicology testing in animals.
KEYWORDS: TOXICITY;SYNTHETIC FUELS;CHEMICAL EFFLUENTS;SYNTHETIC FUELS INDUSTRY;TESTING;INHALATION;SKIN;EYES;MUTAGENESIS;CARCINOGENESIS;POLLUTION;HYDROCARBONS;NEOPLASMS;IN VIVO;CARCINOGENS

Energy Research and Development Administration/Pacific Northwest Laboratory

<086001>
TITLE: Mechanisms of Radiation Effects
PROJECT NUMBER: 000387
PRINCIPAL INVESTIGATOR: Frazier, M.E.
ADDRESS: Battelle-Northwest, P.O. Box 999, Richland, WB 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$410,000
TECHNOLOGY: NUCLEAR/General (30%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (70%)
ENERGY CYCLE: TRANSPORTATION (10");STORAGE (10%);WASTE MANAGEMENT (80%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The proposed research deals with the biological effects following exposure to radiation. These studies are relevant to accidental exposures and are of particular relevance to separation and waste management aspects of nuclear technology. This project is concerned with basic biological and chemical indices that may aid in the detection and understanding of the primary effects of radiation insult and may also serve in the diagnosis of such early effects. Included within this project are studies of the role of virus in radionuclide induced malignancies, and investigations of the role of free radicals in radiobiological damage.
APPROACH: Considerable effort has been expended to determine the effects of ingesting Sr-90. Those studies provided an experimental animal model to study the mechanism of radiation induced neoplasia. Our current research is designed to complement and extend the research with Sr-90 as well as other radiation induced malignancies (e.g. plutonium induced bone and lung tumors) in rats and beagle dogs. The quantitative relations between radiation dose, radical yields and radical reaction rates obtained in these studies will allow an accurate assessment of the importance of irradiation produced biochemical radicals in the development of radiobiological damage. These studies provide information required in the development of theoretical models for radiobiological damage. Likewise, theories developed can be tested for applicability in model biochemical systems.
RESULTS: At the present time oncogenesis in radiation exposed animals (and man) is poorly understood. Until recently the available technology was insufficient to allow determination of whether the observed malignancies were due to the direct (mutagenic) effects of radiation or due to indirect effects. We feel that developments in nucleic acid hybridization procedures, nucleic acid finger-printing techniques and advances in research with oncornaviruses have provided the technology necessary to begin to answer these basic questions. Free radicals are formed in all cellular systems exposed to ionizing radiation. The purpose of this study is to assess the reactivity of radicals formed in irradiated biochemical systems, identify the most susceptible sites for radical attack, determine the extent of damage initiated by such attack, and suggest chemical methods for modifying or preventing this damage.
KEYWORDS: NUCLEAR POWER PLANTS;WASTE MANAGEMENT;BIOLOGICAL RADIATION EFFECTS;STRONTIUM 90;INGESTION;BIOLOGICAL MODELS;NEOPLASMS;RADIOINDUCTION;RATS;BEAGLES;RADIATION DOSES;RADIATION INJURIES;NUCLEIC ACIDS;HYBRIDIZATION;CARCINOGENESIS;IONIZING RADIATIONS;DNA;BIOCHEMISTRY;NEOPLASMS;ANIMALS;ENZYMES;GENETICS;MOLECULAR STRUCTURE;PATHOLOGICAL CHANGES

<086002>
TITLE: Evaluation of Radionuclides in Man
PROJECT NUMBER: 000390
PRINCIPAL INVESTIGATOR: Nelson, I.C.
ADDRESS: Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: PARTICULATES/Plutonium (50%);RADIATION/Plutonium (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Development and improvement of methods for and the evaluation of the radiological impact of the nuclear industry on workers and environmental residents. Provide support to the U.S. Transuranium Register through radiochemical analyses of USTR samples from exposed workers and controls. Advance procedures for improved measurement sensitivity in analysis of autopsy samples. Provide data based on standardized procedures for use in approved epidemiology studies if warranted.
APPROACH: The approach to this research centers on a program of sampling of human tissues from former residents in the environs of the Hanford project and control groups, analysis of these tissue samples for plutonium and other emitters in a low level analytical laboratory maintained for such measurements. This laboratory also performs measurements on tissue samples for USTR. A model for assessment of environmental impact assessment associated with nuclear waste storage center on a program of measurement of Cs-137 in children whose drinking water supply could become contaminated with nuclear wastes and control groups. The approach to a diagnostic method for promethium 147-Oxide has centered on human testing using Pm-143 preceded by suitable animal studies.
RESULTS: The outputs of this research consist of measurements of plutonium and other radionuclides in relevant tissue samples obtained from human populations postmortem. Program outputs also include tissue

analyses for the USTR. Included as a result of these measurements is data for model development for predicting consequences of nuclear accidents. Output of in vivo studies is expected to be a monitoring technique for assessing environmental impacts of nuclear waste storage facilities where release to ground water is possible. Output of diagnostic technique is a method of sufficient sensitivity for determining the initial body burden following inhalation of promethium oxide.
PROJECT MILESTONES: (1) 1 April 1977 Report of autopsy results through 1975 prepared. (2) 1 Aug. 1976 Interlaboratory calibrated samples sent. (3) 1 Nov. 1976 Results of interlaboratory calibration samples received. (4) 1 Nov. 1977 4th set of calibration samples received. Continuing USTR and environmental sample acquisition and analysis. (5) 1 Oct. 1976 Pm-147 animal studies completed. (6) 1 Oct. 1977 Human testing completed, final report on Pm-147 model prepared.
KEYWORDS: NUCLEAR INDUSTRY;PERSONNEL;RADIOCHEMICAL ANALYSIS;DATA;EPIDEMIOLOGY;TISSUES;SAMPLING;HANFORD PRODUCTION REACTORS;PLUTONIUM ISOTOPES;ENVIRONMENTAL EFFECTS;CESIUM 137;DRINKING WATER;WASTE STORAGE;CONTAMINATION;RADIATION MONITORING;PROMETHIUM 143;PROMETHIUM 147;DIAGNOSTIC TECHNIQUES;LUNGS;METABOLISM;PLUTONIUM;AUTOPSY

<086003>
TITLE: Inhalation Hazards to Uranium Miners
PROJECT NUMBER: 000393
PRINCIPAL INVESTIGATOR: Stuart, B.O.
ADDRESS: Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$572,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: PARTICULATES/Uranium ore dust;PARTICULATES/Cigarette smoke (30%);ORGANICS/Cigarette smoke components (20%);RADIATION/Radon and radon daughters (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the agents or combinations of agents and their levels that are responsible for the high incidences of severe respiratory disease such as pneumoconiosis, emphysema, and carcinoma that are reaching epidemic proportions in uranium miners.
APPROACH: Experimental studies have resulted in pulmonary fibrosis, severe emphysema, and bronchiolar-alveolar and squamous carcinoma in rodents and beagle dogs that receive daily exposures to radon daughters and uranium ore dust, with and without concomitant cigarette smoking. Continuing studies are designed to: (1) define the possible contributing pathogenic roles of uranium ore dust and cigarette smoking; (2) provide reliable data to relate exposure dose to absorbed dose; (3) determine effects of altered dose-rate on carcinogenesis; (4) measure the relative effectiveness of altered radon daughter attachment fractions and ratios upon induction of severe respiratory disease to determine whether the working level concept may not be both inadequate and dangerous in evaluation of inhalation hazards of present and future uranium mining operations.
RESULTS: Determination of maximum permissible air concentrations of pollutants in uranium mine air.
KEYWORDS: CANCER;URANIUM MINES;RESPIRATORY SYSTEM DISEASES;MINERS;PNEUMOCONIOSES;NEOPLASMS;LUNGS;FIBROSIS;RODENTS;BEAGLES;RADON;DAUGHTER PRODUCTS;URANIUM ORES;TOBACCO SMOKES;RADIATION DOSES;INHALATION;DUSTS;HEALTH HAZARDS;MINING

<086004>
TITLE: Removal of Deposited Radionuclides
PROJECT NUMBER: 000403
PRINCIPAL INVESTIGATOR: Smith, V.H.
ADDRESS: Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (10%);STORAGE (5%);PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (5%)
POLLUTANTS: METALS/Actinides;METALS/Plutonium;METALS/Americium;METALS/Etc. fission products (80%);PARTICULATES/Insoluble radionuclide materials (20%)
CHARACTER OF STUDY: RESEARCH (80%);DEVELOPMENT/Laboratory scale (20%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project seeks to find methods to decrease the damage potential from inhaled, skin- or wound-absorbed, or ingested radionuclides.
APPROACH: Diethylenetriaminepentaacetic acid and other chelating agents are being tested for their ability to remove Pu, other actinides and radionuclides from rats and dogs (previously exposed to the radionuclide by inhalation or through simulated wounds). Mechanisms of radionuclide uptake and release and the ability of test agents to influence such release from cells are made in a lung macrophage test system. This is especially useful in studying methods to remove particulate forms of radionuclides. Various pharmaceutic forms of agents are prepared for testing, e.g. slow-release and encapsulated forms. Successful agents are evaluated for toxicity since they will have potential application in man.
RESULTS: Improved and safer agents and methods for decreasing the damage potential from incorporated radionuclides by hastening their removal from the body and thus decreasing the radiation dose to tissues is the main aim of this research. While primarily benefiting workers in the nuclear industry accidentally

exposed to radionuclides, the results of this research would also benefit the public exposed to radionuclides from some accident or in a nuclear war.
KEYWORDS: RADIOISOTOPES;INGESTION;INHALATION;SKIN;WOUNDS;CONTAMINATION;PLUTONIUM ISOTOPES;CHELATING AGENTS;DTPA;REMOVAL;RATS;DOGS;RADIATION DOSES;NUCLEAR INDUSTRY;ACCIDENTS;PERSONNEL;PATHOGENESIS;PLUTONIUM;TOXICITY;MEDICINE;THERAPY

<086006>
TITLE: Fallout Rates and Mechanisms
PROJECT NUMBER: 000533
PRINCIPAL INVESTIGATOR: Young, J.A.
ADDRESS: Pacific Northwest Laboratories, Battelle Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-3600
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$185,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: METALS (10%);SPECIFIED OTHER POLLUTANTS/Radionuclides (90%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objectives of the Fallout Rates and Mechanisms program are (1) to provide a continuous record of the atmospheric concentrations of a spectrum of radionuclides which can be used to assess the hazard to the environment resulting from future releases of radionuclides by nuclear weapons tests, nuclear power reactors, or nuclear fuel reprocessing plants; (2) to detect and characterize episodes of high atmospheric radionuclide concentrations; and (3) to develop an improved understanding of physical processes which determine atmospheric concentrations and rates of removal.
APPROACH: The atmospheric concentrations of a spectrum of 39 radionuclides are being measured continuously at Richland, Washington and Point Barrow, Alaska to provide a record of radionuclide concentrations to be used in assessing the hazards resulting from future releases. When episodes of high concentrations occur the concentrations of 47 radionuclides will be measured, the size spectrum and physical, chemical and radiochemical properties of the radioactive particles measured, and the I-131 dose to man through the grass-milk-thyroid pathway calculated from the measurements of I-131 concentrations in grass samples throughout the United States. Radionuclide measurements will be used to calculate atmospheric residence times, vertical diffusion rates, and deposition velocities.
RESULTS: Air samples will be analyzed for the nuclear power reactor produced radionuclides Am-243, Cm-242, and Cm-244 to determine whether significant amounts of transuranium elements are being released into the atmosphere by nuclear power reactors. The fraction of the transuranium radionuclides present on particles in the respirable size range will be determined, since this is the size range which represents the greatest hazard to man. The I-131 dose to the human thyroid will be calculated from measurements of I-131 in grass in the event of large releases of radioactivity by either nuclear tests or nuclear reactors. The physical and chemical properties of the radioactive particles will be characterized. The solubility of the radionuclides in various aqueous solutions will be determined, since the solubility influences the rate of uptake by the biosphere.
PROJECT MILESTONES: The analysis of current and archived air filter samples for the transuranium radionuclides Pu-241 and Am-241 and also Pb-210 has been initiated. An intrinsic germanium diode has been put into operation for the analysis of air samples.
KEYWORDS: AIR;CONTAMINATION;HEALTH HAZARDS;RADIOISOTOPES;FALLOUT;REACTORS;NUCLEAR EXPLOSIONS;REPROCESSING;RADIOECOLOGICAL CONCENTRATION;IODINE 131;MAN;THYROID;MILK;GRASS;RADIATION MONITORING;DEPOSITION;AMERICIUM 243;CURIUM 242;CURIUM 244;PLUTONIUM 241;AMERICIUM 241;LEAD 210;RADIOACTIVE AEROSOLS;RADIOACTIVE EFFLUENTS;GAMMA RADIATION

<086007>
TITLE: Radioisotopes as Particles and Volatiles
PROJECT NUMBER: 0534
PRINCIPAL INVESTIGATOR: Sehmel, G.A.
ADDRESS: Battelle, Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3600
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (40%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub 2/ (15%);METALS/Mercury;METALS/Arsenic (15%);PARTICULATES/Radioactive;PARTICULATES/Plutonium (70%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Along the atmospheric route from energy facility to man, particles and vapors react and interact with liquids, solids, and gases, each of which may remove, temporarily retain, or have no effect on these particles or volatile materials. The airborne concentrations near the ground and consequently the inhalation hazard will be decreased when these particles and gases ultimately deposit and are retained on environmental surfaces. Consequently, the objective of this research is to develop models for predicting removal of airborne particulates and gases by dry deposition onto environmental surfaces.
APPROACH: Dry deposition rates are measured in both wind tunnel experiments and in field experiments. In the wind tunnel, the effects of particle diameter, density, wind speed, and surface properties can be readily controlled to determine their effect on observed deposition velocities. In field research, experiments are made over more complex terrain using mass budget techniques and comparisons between depositing particles and a non-depositing gas.
RESULTS: This research will develop models for predicting the atmospheric removal rates of airborne particles

and gases by dry deposition onto environmental surfaces. At the present state of knowledge deposition rates are assumed independent of particulate chemical composition and can be adequately predicted for only the simplist of surfaces and conditions. Deposition rates are needed for predicting removal rates over complex terrain including forests, urban areas, and oceans.
JECT MILESTONES: (1) New predictive deposition velocity model developed 29/10/76. (2) Dry deposition chapter for ERDA book, ''Meteorology and Power Production'' 31/12/76. (3) Initial measurement of fallout deposition over long distances 23/4/77. (4) Field deposition velocity measurement using multiple tracers 23/7/77. (5) Field testing a Li-SF/sub 6/ deposition technique over a forest 23/10/77. (6) Field testing deposition velocity techniques over a city 23/4/78. (7) Initial reporting and comparing deposition data 23/8/78.
KEYWORDS: RADIOISOTOPES;SOLIDS;LIQUIDS;GASES;INHALATION;RADIATION HAZARDS;DIFFUSION;FALLOUT;RADIOACTIVE AEROSOLS;REMOVAL;DEPOSITION;WIND TUNNELS;SURFACES;PARTICLES;MATHEMATICAL MODELS;FORECASTING;URBAN AREAS;SEAS

<086009>
TITLE: Atmospheric Boundary Layer Studies
PROJECT NUMBER: 0539
PRINCIPAL INVESTIGATOR: Horst, T.W.
ADDRESS: Battelle, Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3600;C(301)353-3600
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To gain a better understanding of the dispersive capacity of the atmospheric boundary layer and to provide a basin for the improvement of predictive models.
APPROACH: Vertical gradients of the ambient atmospheric pollutants SO/sub 2/, SO/sub 4/, O/sub 3/, and NO/sub x/ will be measured near the ground in both western and eastern Washington state. These gradients will be combined with concurrent micrometeorological measurements to infer the rate of deposition of these pollutants as a function of the meteorology and of the characteristics of the deposition surface. Additionally, an analytical/numerical simulation of resuspension is being made to determine the contribution which the previously deposited material makes to the annual exposure when it is reinserted into the atmosphere.
RESULTS: A data volume will be published detailing the results of past diffusion experiments conducted within this program. A report will be published, summarizing analysis of atmospheric turbulence data collected from a 200' vertical array of fast-response anemometer. This report will emphasize the application of the results to diffusion prediction. Deposition velocities for SO/sub 2/, SO/sub 4/, O/sub 3/, NO/sub x/ and possibly other ambient pollutants will be determined as a function of meteorology for deposition surfaces characteristic of both western and eastern Washington, environments similar to much of the western United States. The contribution of resuspension to the annual exposure from a point source will be determined for input to environmental assessment models.
KEYWORDS: BOUNDARY LAYERS;AIR;MATHEMATICAL MODELS;FORECASTING;DATA ANALYSIS;DIFFUSION;TURBULENCE;DEPOSITION;KRYPTON 85;TRACER TECHNIQUES;ZINC SULFIDES;RHODAMINES;EARTH ATMOSPHERE;METEOROLOGY;ENVIRONMENTAL TRANSPORT;PLUMES;AIR POLLUTION;SULFUR DIOXIDE;SULFATES;OZONE;NITROGEN OXIDES;WASHINGTON;PARTICLE RESUSPENSION

<086010>
TITLE: Urban Pollutant Characterization, Transport, and Deposition
PROJECT NUMBER: 000540
PRINCIPAL INVESTIGATOR: Young, J.A.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(45-1);1830
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/CO/sub 2/;NOXIOUS GAS/SO/sub 2/ sulfates (50%);METALS (30%);ORGANICS/Trichloroflouromethane (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This project is designed to determine the nature and quantities of various energy related pollutants which are emitted to the atmosphere, to determine the rates of transport and diffusion and deposition on the earth's surface, and the chemical and physical transformations during transport. The data obtained are used to develop parametrizations of the various processes for incorporation into numerical models which will then be tested and validated.
APPROACH: Inert tracers are introduced into urban plumes or advantage is taken of the presence of inert atmospheric tracers (CO or fluorocarbons). Concentrations of these tracers and urban pollutants, like SO2, particulates, NOx, are then measured at various downwind distances using aircraft or ground level vehicles. Data for various times and distances permit elucidation of the processes which are operative.
RESULTS: During FY 1977 field experiments were conducted in the Milwaukee and Chicago areas. It was determined from vertical profiling flights in which various pollutants were measured that vertical mixing was considerably less vigorous when the Milwaukee plumes traveled over Lake Michigan than when they traveled over land. From data on Ca, Fe, Pb and Zn upwind and downwind of Milwaukee, emission rates for

these elements were calculated. Sulfate increased with distance initially and then showed decreases suggesting SO2 conversion to sulfate followed by deposition. Maximum sulfate concentrations seem to occur at greater distance when the plume travels over the Lake rather than when it travels over land.
PROJECT MILESTONES: A major field experiment is planned for the fall of 1977.
KEYWORDS: AEROSOLS;AIR POLLUTION;URBAN AREAS;WASHOUT;TRAJECTORIES;CARBON MONOXIDE;SULFUR DIOXIDE;SULFATES;METALS;ENVIRONMENTAL EFFECTS;DEPOSITION;DIFFUSION;CHEMICAL EFFLUENTS

<086011>
TITLE: Particle Resuspension and Translocation
PROJECT NUMBER: 0549
PRINCIPAL INVESTIGATOR: Sehmel, G.A.
ADDRESS: Battelle, Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3763
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$210,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: TRANSPORTATION (10%);STORAGE (20%);PROCESSING, CONVERSION (10%);WASTE MANAGEMENT (60%)
POLLUTANTS: PARTICULATES/Radioactive;PARTICULATES/Plutonium;PARTICULATES/Americium (90%);SPECIFIED OTHER POLLUTANTS/Dust (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Radioactive particles once deposited on natural or man-made surface can be resuspended by wind and mechanical activity so that the particles once more might become a radiological hazard to man. The resuspension process may be repeated many times. The objective of this research is to establish resuspension release rates, and to develop models for predicting atmospheric concentrations, and downwind movement of particles on the basis of observable and/or measurable particle, surface, and atmospheric variables. An important concern to nuclear energy development is the resuspension of plutonium and other transuranics from inadvertent soil contamination, from transportation accidents, and from fallout from nuclear devices.
APPROACH: Resuspension is measured with both controlled inert tracers placed on surfaces and with radioactivity from environmentally contaminated areas. Resuspension rates are measured automatically as a function of wind speed increments and atmospheric stability as well as mechanical disturbances causing resuspension. These field experiments are directed toward determining any resuspension rate changes with time and the effects of increasing resuspension surface roughness. Ultimately, resuspension will be measured for representative climatic and geographic conditions.
RESULTS: Experimentally based resuspension models with predictable resuspension rates will be developed to predict the downwind resuspension and transport of particles as a function of particle, surface, and meteorological parameters. Resuspension rates developed should be applicable to surfaces contaminated from the air as well as contaminated from soil covered radioactive wastes.
PROJECT MILESTONES: (1) Determine if fallout radioactivity is continually being resuspended 10/29/76. (2) First determination of effect of atmospheric stability on resuspension 11/15/76. (3) Resuspension chapter for ERDA book, ''Meteorology and Power Production'' 12/31/76. (4) Experiment started to determine effect of particle properties 2/20/77. (5) Develop resuspendability index 5/21/77. (6) Proof testing of multiple tracer resuspension concept 9/20/77. (7) Proof testing of a rapid means for measuring resuspension 2/21/78. (8) Initial measurement of resuspension over more complex terrain 7/21/78.
KEYWORDS: RADIOACTIVE AEROSOLS;SURFACES;CONTAMINATION;MATHEMATICAL MODELS;AIR;AIR POLLUTION;FORECASTING;PLUTONIUM ISOTOPES;TRANSURANIUM ELEMENTS;WIND;SOILS;FALLOUT;METEOROLOGY;RADIOACTIVE WASTES;ENVIRONMENTAL EFFECTS;RADIOACTIVE EFFLUENTS;PARTICLE RESUSPENSION;RADIONUCLIDE MIGRATION;INHALATION

<086012>
TITLE: Suspended Particle Interaction and Uptake in Terrestrial Plants
PROJECT NUMBER: 000551
PRINCIPAL INVESTIGATOR: Cataldo, Dominic A. Craig, Douglas K.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1):1830
77 FUNDING: Energy Research and Development Administration FY77:$77,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (75%);WASTE MANAGEMENT (25%)
POLLUTANTS: METALS/Plutonium;METALS/Americium;METALS/Neptunium;METALS/Curium;METALS/Technetium (50%);PARTICULATES/0.01-10 mu m (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to characterize and evaluate the interactions of airborne contaminants and of Pu with the foliage of terrestrial plants. Current investigations are concerned with the fate of submicronic particles (0.01 to 0.8 mu m) once intercepted by plant leaves. This includes evaluation of retention mechanisms, leachability, and the availability of foliar Pu deposition for translocation to seed and root tissues.
APPROACH: A low windspeed aerosol exposure facility is used to generate particulates of known physical and aerodynamic size and exposure of plant canopies. Retention mechanisms for particulates deposited onto foliage are evaluated by differential leaching procedures. Availability of foliarly deposited Pu for translocation out of leaves is determined under various vector situations.
RESULTS: This program will provide needed data on the fate and bioavailability of airborne particulates containing Pu with respect to interception by plant foliage and entry into the food chain. Data of this nature is required for the adequate use of long-term predictive models which evaluate critical routes of entry and potential hazards to man.
PROJECT MILESTONES: (1) 1 Feb 1977 Determine the relative mobility of transuranics (Pu, Am, Np, Cm) deposited

on foliar surfaces. (2) 1 June 1977 Illucidation of the mechanisms involved in the foliar retention of particulates. (3) 1 Dec 1977 Determination of the physical parameters of particulates of plutonium which nfluence their availability for translocation from foliar surfaces to seed and root tissues.
ORDS: BIOAVAILABILITY;POLIAR INTERCEPTION;RADIOACTIVE AEROSOLS;PLUTONIUM;AIR POLLUTION;PLANTS;LEAVES;RETENTION;LEACHING;DEPOSITION;TRANSLOCATION;SEEDS;ROOTS;PARTICLE SIZE;CONTAMINATION;UPTAKE;RADIONUCLIDE MIGRATION;AMERICIUM;NEPTUNIUM;CURIUM;PARTICLE RESUSPENSION

<086014>
TITLE: Aerosol and Trace Gas Transformations
PROJECT NUMBER: 0553
PRINCIPAL INVESTIGATOR: Alkezweeny, A.J.
ADDRESS: Battelle, Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$205,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS (40%);METALS (10%);PARTICULATES (40%);ORGANICS (5%);RADIATION (5%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this program is to determine transformation rate of gaseous to particulate in urban plumes from urban areas and power plant complexes, and identifying mechanism(s) responsible for it. Special emphasis is placed on sulfur dioxide to sulfate and ozone in the plume from Milwaukee.
APPROACH: The approach consists of field experiments supported by diagnostic modeling and data interpretation. The measurement will be made in a Lagrangian frame of reference using instrumented aircraft.
RESULTS: A definite buildup of ozone was measured downwind of the city. Furthermore, in most cases, increases in the concentration of sulfate and nitrate aerosol with distance from the source was detected. These increases were also reflected in the independently measured aerosol size distributions. There was evidence from the trace metals data to indicate that meteorological conditions over Lake Michigan were sufficiently stable to render diffusion and particulate deposition essentially negligible.
PROJECT MILESTONES: (1) Analysis and interpretation of data collected during last field operation 1 October 1976. (2) Organize significant findings for reporting and publication 1 December 1976. (3) Preparation for yield operation 1 February 1977. (4) Conduct a Lagrangian experiment over Lake Michigan 1 June 1977. (5) Data analysis 15 July 1977.
KEYWORDS: URBAN AREAS;POWER PLANTS;PLUMES;AEROSOLS;SULFUR DIOXIDE;SULFATES;DATA;METEOROLOGY;HYDROCARBONS;OXIDATION;AIRCRAFT;MEASURING METHODS;COAL;COMBUSTION;BIOLOGICAL EFFECTS;SOLAR RADIATION;AIR QUALITY;AIR POLLUTION;ENVIRONMENTAL EFFECTS

<086015>
TITLE: Hemispheric Pollution Behavior Studies of Chemical and Radiation Substances
PROJECT NUMBER: 000555
PRINCIPAL INVESTIGATOR: Ludwick, J.D.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3600;C(301)353-3600
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (10%);NUCLEAR/General (20%);SOLAR/Ocean, wind (30%);CONSERVATION/End use (10%);GENERAL SCIENCE (30%)
ENERGY CYCLE: COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (30%);METALS (30%);PARTICULATES (20%);ORGANICS (10%);RADIATION (10%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Provide information concerning the present day gaseous and aerosol levels of the hemispheric air. (2) Provide chemical and physical evidence for verification of the long range trajectory model. (3) Measure atmospheric pollutant depletion processes on a large scale. (4) Measure hemispheric cleansing from major cyclonic weather systems. (5) Provide data for health hazard evaluation of toxic aerosols.
APPROACH: Maintain a constant watch on the worldwide aerosols and gaseous materials entering the USA from the vantage point of our West Coast Station. Provide this site with the most sensitive and advanced instrumentation possible. Intercorrelate the chemical, physical and meteorological information obtained to derive a complete picture of the natural and anthropogenic processes contributing to the resultant hemispheric air concentrations.
RESULTS: (1) Establish the present day levels of energy related materials and use them as a future comparator for changes in them. (2) Predict input of major pollutant sources, worldwide, to aerosol concentrations in the USA. (3) Assess the natural hemispheric cleanup processes. (4) Assess the pollutant input to specific oceanic areas. (5) The particle size distribution associated with the elemental distribution will allow evaluation of the aerosol inhalation hazard.
JECT MILESTONES: (1) Define the particle size distribution of the aerosol, 6 months. (2) Measure chemical change of important species on long range trajectories, 9 months. (3) Quantitate the hemispheric depleting

processes, 18 months. (4) Measure energy related organic pollutants in hemispheric air, 12 months. (5) Extent of natural ozone to ground level air concentrations, 12 months.
KEYWORDS: AIR POLLUTION;AEROSOLS;AIR;GASEOUS WASTES;TRAJECTORIES;USA;MEASURING INSTRUMENTS;METEOROLOGY;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;SEAS;POLLUTION;INHALATION;HYDROCARBONS;NITROGEN COMPOUNDS;EARTH ATMOSPHERE;AEROSOL MONITORING

<086016>
TITLE: Research Aircraft Operations
PROJECT NUMBER: 0556
PRINCIPAL INVESTIGATOR: Potter, P.M.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3763
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/Oxygen (25%);PARTICULATES/Fossil fuel residues (25%);RADIATION/Solar (25%);SPECIFIED OTHER POLLUTANTS/Atmospheric tracers, ruthenium, silver, etc. (25%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The purpose of this program is the provision of technical support for ERDA-DBER Atmospheric Research programs, in the form of airborne laboratories and tracer-release facilities. Aircraft support is required especially for the following Atmospheric Sciences programs: Precipitation Scavenging, Atmospheric Boundary Layer Studies, Particle Resuspension and Translocation, Cooling Tower and Cooling Pond-Atmospheric Impact, Aerosol and Trace Gas Transformation, and Urban Pollution and Tracer Studies.
APPROACH: Two aircraft, a Cessna-411 and a Douglas DC-3, have been equipped with tracer release facilities as well as the necessary instrumentation for highly sophisticated measurements of cloud physics, aerosols, pollutant-gases, atmospheric tracers, and turbulence.
RESULTS: Completion of the interfacing of the VLF Navigational System intof the Data Acquisition System of the DC-3 and the installation of the display unit and onboard teletype will provide a data collection system that is extremely flexible for recording a large number of parameters. It will also provide economical recording formats for direct computer input. The DC-3 will be utilized for two types of experiments in support of the MAP3S's Aerosol and Trace Gas Transformation work in St. Louis. It is anticipated that the wind speed and wind direction obtained from the newly installed VLF system will increase the accuracy of the results obtained from these experiments. Aircraft support will be given to precipitation scavenging experiments in the N.E. which are planned for the MAP3S program. Tracer releases into clouds will be made, measurement of pollution distribution entering clouds will be taken, and associated cloud physics and meteorological measurements will be made from the aircraft. The Cessna-411 will be used for continuing Particle Resuspension-Translocation work from forest fires. If funding permits, it may also be used in St. Louis in support of the MAP3S. Additional studies will be conducted on fossil fuel energy plant pollutants and fuel gasification and liquefaction plant pollutants.
PROJECT MILESTONES: These depend on other programs' plans, progress and accomplishments.
KEYWORDS: BOUNDARY LAYERS;AIR;AIRCRAFT;WASHOUT;PARTICLES;AEROSOLS;TRANSLOCATION;COOLING TOWERS;COOLING PONDS;URBAN AREAS;AIR POLLUTION;TURBULENCE;CLOUDS;PLUMES;WEATHER;AEROSOL MONITORING;AERIAL MONITORING;DATA ACQUISITION;SCAVENGING

<086018>
TITLE: ALE Administration
PROJECT NUMBER: 000618
PRINCIPAL INVESTIGATOR: Rickard, W.H.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$43,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To maintain the scientific and educational integrity of the Arid Lands Ecology (ALE) Reserve on the U.S. ERDA Hanford Reservation.
APPROACH: Maintain fences and roadways on the reserve, provide assistance and special equipment to graduate students, promote the use of the reserve by graduate students, prevent unauthorized trespass by livestock and off-road vehicular traffic, preserve parts of the preserve in pristine condition, and to provide a buffer zone for waste management areas on the Hanford Reservation.
RESULTS: Continue to provide protection for an irreplaceable natural resource for scientific and educational study.
PROJECT MILESTONES: The Arid Lands Ecology Reserve has served as an important scientific and educational resource since 1968. In 1976, the reserve was designated by the Institute of Ecology as one of the top 10 ecological sites in the United States qualified to be designated as an Experimental Ecological Reserve (EER). The reserve has served as a study site for the International Biological Program's ecosystem analysis study and as a federal research natural area.
KEYWORDS: US ERDA;HANFORD PRODUCTION REACTORS;ROADS;LAND USE;DOMESTIC ANIMALS;WASTE MANAGEMENT;TERRESTRIAL ECOSYSTEMS;RECOMMENDATIONS;PLANTS;SOILS

<086019>
TITLE: Animal Ecology
PROJECT NUMBER: 000619
PRINCIPAL INVESTIGATOR: Rogers, L.E.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The major objectives of the Animal Ecology program are to: (1) characterize animal populations inhabiting pristine and disturbed communities in the shrub-steppe; (2) conduct quantitative sampling programs to determine density and biomass values for major consumer groups; (3) document transfer pathways and determine consumer feeding preferences; (4) determine transfer rates for selected nutrients, radionuclides, and energy through food chains; and (5) construct a simulation model to depict population dynamics, trophic transfer rates, energy flow, and nutrient cycling through the ecosystem, thereby providing an essential tool for ecosystem management.
APPROACH: Animal characterization studies employ a variety of sampling techniques; live traps, pitfall traps, drift fences, and individual searches. Quantitative density and biomass estimates for major consumer groups are estimated from drop trap, mark-recapture, and unit area censusing techniques. Consumer feeding preferences and transfer pathways will be documented through a microscopic identification of ingested food materials.
RESULTS: (1) Seasonal and altitudinal variations of consumer populations on the Hanford Reservation. (2) Effects of cattle grazing and wildfire on major consumer populations. (3) Food habit preferences of major consumers (invertebrates, small mammals, birds) on the Hanford Reservation. (4) Documentation of seasonal abundance of major consumers occupying dominant plant communities on the Hanford Reservation.
PROJECT MILESTONES: (1) Publish food preference analysis of grasshoppers occupying the Hanford Reservation. (2) Complete analysis of invertebrates inhabiting grazed, ungrazed, and burned sagebrush/bunchgrass communities. (3) Publish analysis of transfer pathway associated with major beetle populations inhabiting the Hanford Reservation. (4) Initiate studies of raptor population dynamics, food habits, and associated prey levels.
KEYWORDS: CATTLE;MAMMALS;BIRDS;INVERTEBRATES;POPULATION DYNAMICS;ECOLOGY;BIOLOGICAL MODELS;NUTRIENTS;TERRESTRIAL ECOSYSTEMS;SEASONAL VARIATIONS;FOOD;HANFORD PRODUCTION REACTORS;PLANTS;INSECTS;COMMUNITIES;SAMPLING;RADIOISOTOPES;ENVIRONMENTAL EFFECTS

<086020>
TITLE: Plant Ecology
PROJECT NUMBER: 000620
PRINCIPAL INVESTIGATOR: Rickard, W.H.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: EXTRACTION (33%);PROCESSING, CONVERSION (33%);WASTE MANAGEMENT (34%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To provide quantitative baseline data concerning ecological parameters in shrub-steppe ecosystems in the Pacific Northwest.
APPROACH: Field sampling procedures, random selections of study plots, means and variances, short- and long-term changes in plant populations, secondary successions, importance of natural and man-induced environmental stresses, simulation modeling, and controlled field experimentation.
RESULTS: Quantitative ecological characterization of ecosystems in the shrub-steppe region, word models, and mathematical models. These data are applicable to evaluations of the environmental impacts of construction and operations of energy facilities (nuclear and non-nuclear) throughout the shrub-steppe region of western North America.
PROJECT MILESTONES: CY 1976 synthesis of five consecutive years of data collections from climax and seral plant communities. Phytomass changes seaonally and year-to-year, mineral cycling behavior, impact of cattle grazing and wildfire.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;SAMPLING;POPULATIONS;PLANTS;ECOLOGY;BIOLOGICAL MODELS;MATHEMATICAL MODELS;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;DATA ACQUISITION;CATTLE;FIRES;BIOMASS;CLIMATES;SOILS;WEATHER

<086021>
TITLE: Analysis of Natural Systems
PROJECT NUMBER: 000622
PRINCIPAL INVESTIGATOR: Eberhardt, L.L.
ADDRESS: Pacific Northwest Laboratory, Battelle N.W., P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)1830
77 FUNDING: Energy Research and Development Administration FY77:$160,000

TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/General (100%)
CHARACTER OF STUDY: RESEARCH/General (75%);ANALYTICAL (25%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Development of quantitative methodology for the description and interpretation of ecological data.
APPROACH: Research and test applications in areas of sampling, statistical methods, modelling and data analysis as applied to ecological problems.
RESULTS: Improved quantitative methodology in ecological applications . . . sampling, census, population dynamics.
PROJECT MILESTONES: Publication of improved rationale for new variants of sampling methodology needed for ERDA programs in environmental research. Publication at sequence of progress reports in various areas.
KEYWORDS: ECOLOGY;BIOLOGICAL MODELS;STATISTICAL MODELS;DATA;DATA PROCESSING;SAMPLING;TERRESTRIAL ECOSYSTEMS;POPULATION DYNAMICS

<086022>
TITLE: Influences of Soils and Sediments on the Chemical Behavior, Transport, and Bioavailability of Pollutants Resulting from Energy Production.
PROJECT NUMBER: 000623
PRINCIPAL INVESTIGATOR: Wildung, R.E.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E-(45-1):1830
77 FUNDING: Energy Research and Development Administration FY77:$61,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: EXTRACTION (5%);TRANSPORTATION (5%);PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (30%)
POLLUTANTS: METALS/Mercury;METALS/Nickel;METALS/Chromium;METALS/Cadmium;METALS/Beryllium;METALS/Thallium (30%);PARTICULATES/Oxides (10%);ORGANICS/Metal ion complexes (10%);RADIATION/Technetium;RADIATION/Iodine (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Principal emphasis in terrestrial studies is on development of an understanding of (1) technetium chemistry and microbiology in soil as these influence technetium solubility over the long-term and plant availability, and (2) the mechanisms, kinetics of uptake, sites of deposition, and form of technetium in plants as these influence the form and availability of technetium in animals. Studies encompass a broad range of soils and plants in order to develop a sound predictive base. Aquatic studies represent a relatively small effort but are directed toward completion of studies on the biogeochemical fate of mercury in the Columbia River and initiation of similar studies of technetium in the river system.
APPROACH: Soils and sediments play a direct role in influencing the behavior, transport, and biological interactions of pollutants in the terrestrial and freshwater aquatic environment. These highly integrated studies involve characterization of the properties of soils and benthic sediments, measurements of the pollutant distribution between solid and liquid phases, and laboratory and field studies to determine the chemical and microbiological factors influencing pollutant form and distribution. This information is being developed for a broad range of soils and sediments and integrated with measurements of pollutant uptake kinetics, biochemistry, and sites of deposition of radionuclides and trace metals in terrestrial plants and animals and benthic organisms.
RESULTS: This program is designed to develop understanding of soil and sediment microbial and chemical processes governing the bioavailability by technetium, iodine, and trace metals. The program provides a basis for identification of critical elements over a broad range of conditions and over the long-term. This information is required for remedial measures and to establish plant siting and engineering criteria.
PROJECT MILESTONES: Soils: (1) 1 Dec 1976 Initiation of investigations to determine the chemical form of technetium in soils; Initiation of investigations to assess the influence of soil properties on technetium availability to plants and the effectiveness of nutrient analogs in fertilizers as remedial treatments; Completion of studies to determine technetium retention in soil as a function of soil properties; (2) 1 Jan 1977 Initiation of investigations to determine the extent of technetium immobilization in soil microflora and plant roots and the rate, extent, and form of technetium released on decomposition of these tissues; Completion of kinetic studies to establish the mechanism of technetium uptake by plants and possible nutrient analogs. (3) 1 June 1977 Completion of studies to determine the chemical form of technetium in plants; Initiation of studies to determine the mode of action and toxicity of technetium in plants. (4) 1 Jan 1978 Initiation of studies to determine the availability of technetium in plant tissues to animals. Sediments: (1) 1 Jan 1977 Measurement of seasonal changes in mercury sedimentation and resuspension rate in Columbia River reservoirs. (2) 1 June 1977 Measurement of the potential for microflora to transform inorganic mercury to volatile forms as a function of seasonal changes in watershed conditions; Initiate laboratory studies to define the sediment and water factors influencing the sorption and release of
KEYWORDS: SOILS;TECHNETIUM;SOLUBILITY;UPTAKE;DEPOSITION;PLANTS;BIOGEOCHEMISTRY;MERCURY;COLUMBIA RIVER;SEDIMENTS;POLLUTION;DISTRIBUTION;ENVIRONMENTAL EFFECTS;IODINE;METALS;INGESTION;FOOD CHAINS

<086023>
TITLE: Sublethal Effects of Tritium on Aquatic Systems
PROJECT NUMBER: 000628
PRINCIPAL INVESTIGATOR: Strand, J.A.
ADDRESS: Battelle Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Neyward, Hamilton

TELEPHONE: P233-5324
TYPE OF FUNDING: Contract No.-E(45-1)-1830
UNDING: Energy Research and Development Administration FY77:$55,000
NOLOGY: NUCLEAR/General (100%)
GY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The study objectives are to determine the effects of low-level tritium irradiation on the immune response of rainbow trout to infectious disease; the nature of radiation stress on immune competence; the genetic transmission of radiation induced immune incompetence; and the development of techniques for measuring sublethal stress.
APPROACH: Trout, exposed to tritium irradiation during embryogenesis, are challenged with a pathogen and their antibody synthesis is measured and compared to controls. Modifications in blood chemistry are measured electrophoretically, and the potential for genetic transmission of radiation induced changes are investigated through study of the progeny of irradiated fish.
RESULTS: Expected results include the development of sensitive techniques for measurement of sub-lethal radiation stress that can be applied to natural fish populations environmentally exposed to tritium irradiation and other energy technology induced stresses.
PROJECT MILESTONES: (1) 31-12-77 Completion of breeding of irradiated fish and primary antigenic stimulation of progeny. (2) 31-12-78 Completion of testing of genetic transmission of radiation induced alteration of immune response in fish.
KEYWORDS: TRITIUM;TROUT;RADIATION DOSES;IMMUNE REACTIONS;PROTEINS;BLOOD SERUM;BIOLOGICAL ACCUMULATION;BIOLOGICAL RADIATION EFFECTS;PROGENY;BIOCHEMISTRY;FISHES;RADIONUCLIDE MIGRATION;GENETIC RADIATION EFFECTS

<086024>
TITLE: Effects of Behavior of Fossil Fuel Effluents in Freshwater Ecosystems
PROJECT NUMBER: 000630
PRINCIPAL INVESTIGATOR: Cushing, C.E.
ADDRESS: Battelle-Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, Charles L.
TELEPHONE: P233-4208
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$197,000
TECHNOLOGY: FOSSIL FUEL/Coal (75%);GENERAL SCIENCE (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (10%);WASTE MANAGEMENT (90%)
POLLUTANTS: METALS (80%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;COASTS/Far West;COASTS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Lakes and streams
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The anticipated growth in numbers of coal-fired steam plants with cooling lakes and the develcpment of new coal technology (SRC) will result in an increased release of effluents into aquatic environments. Trace metals and other pollutants are known to occur in these effluents and can be passed through and concentrated in the aquatic food web leading to man. These effluents may impact on the biota of natural receiving waters or limit the intended multiple use of the cooling lakes for recreation, irrigation, or aquaculture. This program is designed to study the behavior and effects of these effluent components in freshwater ecosystems.
APPROACH: Research will be conducted at operating fossil fuel plants and in the laboratory to provide information for future studies in controlled experimental ecosystems. The proposed research is concerned with the characterization of the effluents, their effect on aquatic productivity, their fate in freshwater systems and their effects, particularly sublethal, on aquatic organisms.
RESULTS: The eventual output of this program will be the development of predictive information on transfer rates of coal combustion effluent components in freshwater food webs, especially large, multiple-use cooling lakes and receiving waters of solvent refined coal plant effluents. In addition, data on chronic and acute sublethal effects on organisms of the food web will provide input for the management of these ecosystems.
PROJECT MILESTONES: (1) 3/78 Assessment of current state-of-the-art--Site surveys of western coal-fired electrical generating plants. (2) 9/78 Bioassays of selected effluent constituents. (3) 9/79 Studies of developing coal technologies--Determination of sublethal effects of effluents on aquatic organisms. (4) 9/80 Determination of transfer rates and mediators of the affects of selected effluent constituents.
KEYWORDS: AQUATIC ECOSYSTEMS;COAL;STEAM GENERATORS;COOLING PONDS;THERMAL EFFLUENTS;METALS;POLLUTION;POSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;AQUATIC ORGANISMS;ENVIRONMENTAL TRANSPORT;SITE SELECTION;TRACE AMOUNTS;CHEMICAL EFFLUENTS

<086028>
TITLE: Combined Effects of Waste Heat and Environmental Factors Acting in Concert
PROJECT NUMBER: 000637
PRINCIPAL INVESTIGATOR: Anderson, D.R.
ADDRESS: Pacific Northwest Laboratories, Battelle Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: P233-5324
E OF FUNDING: Contract No.-E(45-1)-1830
FUNDING: Energy Research and Development Administration FY77:$84,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: METALS (50%);HEAT, THERMAL (10%);SPECIFIED OTHER POLLUTANTS/Inorganic compounds (CI) (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (80%);DEVELOPMENT/Laboratory scale (20%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;COASTS/Far

West;COASTS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: This is a reprogrammed and retitled project from the currently funded 189 entitled ''Combined Effects of Temperature and Pollutants and of Temperature and Disease on Fishes'', ID No. 000637. The proposed research program is designed to quantify the combined action of thermal stress and chemical pollutants and temperature and disease on the physiology of selected aquatic organisms. To date, few data have been collected on the combined interactions of chemical and thermal toxicity on freshwater fishes and fish food organisms. Obtaining quantitative information on environmental stressors acting in concert is crucial to accurate assessment of potential impact from nuclear and fossil fueled electrical generating station effluents. The objective of the proposed investigation is to produce data on the interactions of elevated water temperatures and chemical species typical of cooling water discharges.
APPROACH: Both acute and chronic flow-through bioassays, using multiple test and acclimation temperatures and multiple chemical species (e.g., Cl-2, Cu/sup +/, Cu/sup ++/, Hg, Zn, Cr) will be conducted on warm (Lepomis gibbosus, pumpkinseed) and cold (Salmo gairdneri, rainbow trout and Salvelinus fontinalis, eastern brook trout) water fish and fish food (Pacifastacus leniusculus, crayfish) organisms. In addition to mortality, sublethal parameters such as growth, reproduction, bioretention and tissue destruction will be measured in response to low level toxicant dosage.
RESULTS: Research results will be published in the open literature. Data relevant to the objectives of this proposal are essential and fundamental in determining criteria for establishing regulations on steam-electric stations and other effluents from energy related projects which require environmental impact analysis. The monograph on Columnaris and water temperature will be completed. A literature review will be made describing the relationships between water temperature and other parasitic and infectious diseases of aquatic organisms with specific reference to those which are pathogenic to man.
PROJECT MILESTONES: (1) October 1, 1976 Completion of warm water temperature regime tests of the effects of nickel and chlorine on juvenile coho salmon and rainbow trout. Beginning of chronic cold temperature bioassays of coho salmon and rainbow trout. (2) January 1, 1977 Initiate preparation of a manuscript concerning the acute effects of chlorine-nickel toxicity on rainbow trout and coho salmon. Conduct any experiments that were not possible to be conducted during the warm water period in the summer due to the temperature differential. (3) June 1, 1977 Begin preparation of a manuscript concerning the mechanism of action of nickel in coho salmon and rainbow trout during acute bioassays.
KEYWORDS: WASTE HEAT;FISHES;AQUATIC ORGANISMS;DATA ACQUISITION;COOLING;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;BIOASSAY;CHEMICAL EFFLUENTS;MORTALITY;GROWTH;REPRODUCTION;POWER PLANTS;ENVIRONMENTAL EFFECTS;THERMAL POLLUTION;SYNERGISM;BIOLOGICAL STRESS;DISEASES;NICKEL;CHLORINE;EPIDEMIOLOGY;FISHES;TISSUES;TOXICITY;BIOLOGICAL ADAPTATION;GENETIC VARIABILITY

<086029>
TITLE: Effects of Thermal Discharges on Aquatic Biota
PROJECT NUMBER: 000638
PRINCIPAL INVESTIGATOR: Schneider, M.J.
ADDRESS: Pacific Northwest Laboratory, Battelle Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
POLLUTANTS: HEAT, THERMAL (50%);SPECIFIED OTHER POLLUTANTS/Fish stamina (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Other hydrographic areas Lakes and rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to generate information on the combined effects of swimming induced fatigue and thermal stress on fish and the definition of fish response to sudden cold shock. The former task is yielding valuable basic information related to exercise and active metabolism which is being used to improve estimates of the effects on fishes of thermal discharges into natural systems. The latter task extends from the determination of lower lethal limits and rates of temperature change tolerated on the basis of established level, to the exploration of physiological adaptations that occur within the organisms as a result of cold stress, as might occur from the sudden cessation of power plant discharge.
APPROACH: The fish fatigue studies are based in classical physiological techniques using biochemical indicators of stress and fatigue, i.e., blood glucose and lactate, respectively. The studies of cold shock response are also based in classical thermal response techniques. The critical thermal maximum is being determined for a variety of acclimation states and rates of temperature decline. The temperatures and decline rates are representative of those which might be experienced during power plant shut down.
RESULTS: The fish fatigue studies have revealed valuable information concerning the ability of fish to cope with the combined stressors of enforced exercise and elevated water temperatures. In addition, physiological information is derived regarding metabolism under stressful conditions, the techniques and information will have broad application in the interpretation of chemical and thermal discharge effects. The cold shock program has generated information on the limits of temperature decline and rates for several freshwater species. Additionally, a model simulating the thermal decay rates of an interrupted plume discharge has been generated.
PROJECT MILESTONES: The project currently has reached a significant point in that the investigators have a firm understanding of fish fatigue under conditions of enforced swimming and elevated temperature. This will be manifested in several publications which are now in preparation. The project has also generated an important hypothesis with regard to fish stamina under these conditions and this will be investigated in the next fiscal year. Finally, the critical swim speeds for important fish species at different temperatures and in the presence of chemical toxicants will be determined. (1) Fish Fatigue Laboratory Studies; (2) Fish Fatigue Publications; (3) Cold Shock Laboratory Studies; (4) Cold Shock Publications; (5) Task 1 Fish Stamina; (6) Task 2 Related Consequences; (7) Hypoxia Hypothesis Testing; (8) Toxicant Interaction; (9) Hypoxia Recovery;
KEYWORDS: FISHES;BIOLOGICAL EFFECTS;METABOLISM;POWER PLANTS;REACTOR SHUTDOWN;EXERCISE;BIOLOGICAL FATIGUE;THERMAL EFFLUENTS;NUCLEAR POWER PLANTS;AQUATIC ORGANISMS;MORTALITY;PLUMES;RESPIRATION;BIOLOGICAL STRESS;TEMPERATURE EFFECTS;WASTE HEAT

<086030>
TITLE: Chemistry of Ocean Solutions
--JECT NUMBER: 000641
INCIPAL INVESTIGATOR: Crecelius, E.A.
ADDRESS: Pacific Northwest Laboratories, Battelle Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental and Biomedical Research
MONITOR: Joseph, Arnold B.
TELEPHONE: P233-3035;C(301)353-3035
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$64,000
TECHNOLOGY: FOSSIL FUEL/Coal (25%);FOSSIL FUEL/Oil and Gas (25%);NUCLEAR/Fission (50%)
ENERGY CYCLE: TRANSPORTATION (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (30%)
POLLUTANTS: METALS (70%);PARTICULATES (30%)
CHARACTER OF STUDY: RESEARCH (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Global;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This program is designed to investigate the rates of deposition, dissolution and chemical forms of airborne dust in the coastal marine environment. Emphasis will be placed on establishing the validity of Be-7 as a tracer for deposition of anthropogenic airborne pollutants. Of particular interest will be the chemical forms of the toxic trace metals that dissolve after the aerosols enter the ocean, since this will determine the degree of bioavailability of the metals. A second portion of the program deals with the transuranium elements.
APPROACH: Aerosol and atmospheric deposition samples will be collected in the coastal environment. These samples will be analyzed for Be-7 and trace metals. Aerosol samples will be placed in seawater to measure the rate of dissolution of trace metals and the chemical form of the trace metals in solution.
RESULTS: (1) Deposition rates of metals into coastal marine waters. (2) The validity of Be-7 as a tracer for air-to-sea transfer of pollutants. (3) The dissolution rate and chemical form of aerosols after entering seawater. (4) The behavior of Pu in the coastal marine environment.
PROJECT MILESTONES: (1) July, FY 78 Continue collecting fallout and aerosol samples. (2) July, FY 78 Measure dissolution of aerosols and determine subsequent chemical forms of trace metals in seawater. (3) Dec., FY 77 Collect sediment cores for Pu analysis. (4) July, FY 78 Analyze cores for Pu. (5) Dec., FY 78 Determine Pu levels in coastal water with season. (6) July, FY 79 Measure deposition and chemical behavior of aerosols in seawater at other coastal sites.
KEYWORDS: COASTAL WATERS;POLLUTION;DEPOSITION;DUSTS;BERYLLIUM 7;TRANSURANIUM ELEMENTS;AEROSOLS;CHEMICAL ANALYSIS;METALS;PLUTONIUM;ENVIRONMENTAL EFFECTS;FALLOUT DEPOSITS;RELIABILITY;TRACE AMOUNTS

<086031>
TITLE: Geochemical Ocean Sections Study
PROJECT NUMBER: 000642
PRINCIPAL INVESTIGATOR: Robertson, D.E.
ADDRESS: Pacific Northwest Laboratories, Battelle Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental and Biomedical Research
MONITOR: Forster, W.O.
TELEPHONE: P233-4155
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH (80%);DEVELOPMENT (20%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this chemical oceanography program is to help establish and predict the environmental quality of the oceans with regard to trace metal constituents. This study will provide detailed characterization of the trace metal distribution, behavior and fate in the coastal and open ocean marine environment. It is designed to provide open ocean (baseline) and coastal measurements of the geographical and vertical distribution of trace metals and help elucidate the effect of natural geochemical, biological and physical processes which control the trace metal economy of the oceans.
APPROACH: Through participation in the multi-institutional GEOSECS program and by participation in ship-of-opportunity cruises on ERDA, NOAA and university ships, seawater samples from coastal and oceanic regions are available for trace metal analyses. A variety of analytical techniques, including neutron activation, atomic absorption, and d-c plasma emission spectrometry are being employed for these measurements. Utilizing our own data and the wealth of GEOSECS data on other important constituents the oceanic parameters and processes which affect the trace metal geochemistries will be considered in constructing predictive models for describing the behavior of energy generated contaminants entering the oceans.
RESULTS: (1) Establish the natural oceanic concentrations, distributions and interrelationships of trace elements at Atlantic and Pacific Ocean GEOSECS tracks to distributions in coastal areas. (2) Establish the sources of trace metals to the oceans, including inputs from geothermal and hydrothermal sources. (3) Define the biogeochemical mechanisms which control the natural input, removal and cycling of trace metals in the oceans. (4) Establish concentration gradients and interrelationships of trace metals extending from the continental shelf areas to the open oceans. (5) Define the natural physicochemical processes which recycle or deplete the trace metal concentrations in coastal waters. (6) Develop improved methods of collecting, storing, and handling seawater to provide uncompromised samples for ultra-trace metal analysis. (7) Develop rapid and highly sensitive analytical techniques for measuring trace elements in small volumes of seawater.
PROJECT MILESTONES: (1) 8/30/FY 77 Prepare journal paper describing the geographical and vertical mercury distribution in the Atlantic and Pacific Ocean GEOSECS cruise tracks. (2) 12/31/FY 77 Prepare journal

paper describing the oceanic distribution and geochemistry of a large number of energy related trace elements. (3) 7/31/FY 78 Participate in oceanographic cruises to collect seawater samples extending from the coastlines to the open ocean areas, and begin trace element analysis of large groups of metals. (4) 7/FY 77 Continue neutron activation analysis of open ocean GEOSECS seawater samples for the measurement of Co, Zn, Sb, U, Cs, Rb, Ag and As. (5) 7/FY 77 Initiate measurements of Cd and Se in open ocean GEOSECS waters.
KEYWORDS: OCEANOGRAPHY;SEAS;GEOCHEMISTRY;METALS;TRACE AMOUNTS;COASTAL WATERS;DATA;DISTRIBUTION;SEAWATER;SAMPLING;MATHEMATICAL MODELS;ATLANTIC OCEAN;PACIFIC OCEAN;CONTINENTAL SHELF;WATER POLLUTION;COMPUTER CODES;G CODES;COBALT;ANTIMONY;ZINC;URANIUM;CESIUM;RUBIDIUM;SILVER;ARSENIC;ACTIVATION ANALYSIS

<086032>
TITLE: Effects of Thermal Discharges to Coastal Waters
PROJECT NUMBER: 000644
PRINCIPAL INVESTIGATOR: Young, J.S.
ADDRESS: Pacific Northwest Laboratory, Battelle Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
ENERGY CYCLE: COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (90%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal zone
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This program is designed to investigate the acute and chronic effects of thermal discharges into the marine coastal environment. The program is determining: (1) tolerances of selected Pacific Northwest species to sudden and gradual thermal increases, (2) the effects of long-term temperature increases on coastal attached communities, and (3) the effects of elevated temperature on the growth and reproduction of important commercial, sport, and food-web species.
APPROACH: Thermal tolerances are being analyzed by subjecting test species, e.g., Pandalus danae, to given rates of temperature increase in order to establish a CTM. Hatching success of sand sole, Psettichthys melanostictus, eggs are being investigated by testing for temperature-salinity combined effects using a 6 x 6 temperature-salinity matrix. Community studies use a variety of colonized portable substrates that are subjected to chronic thermal stress and evaluated using biomass and a non-parametric test of species presence.
RESULTS: The anticipated output is the establishment of realistic thermal criteria and, ultimately, the wise uses of heated discharges. Without this information, the biological impact of thermal effluents will remain questionable, and their beneficial use unexplored.
PROJECT MILESTONES: (1) December 1977 Publication of CTM data; completion and analysis of intertidal community experiments. (2) December 1978 Completion of growth studies on flounder and shrimp; completion of modified CTM determination on fish eggs and larvae; completion of studies on thermal influence on reproduction and development of shrimp and flounder. (3) December 1980 Completion of thermal effects on macroalgae community structure.
KEYWORDS: CTM;COASTAL WATERS;THERMAL EFFLUENTS;AQUATIC ORGANISMS;GROWTH;REPRODUCTION;FOOD CHAINS;BIOLOGICAL EFFECTS;EGGS;POLLUTION;FISHES;INVERTEBRATES;COMMUNITIES;TEMPERATURE EFFECTS

<086034>
TITLE: Marine Biogeochemistry of Am and Pu
PROJECT NUMBER: 000648
PRINCIPAL INVESTIGATOR: Weimer, W.C.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Forster, W.O.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Nuclear fuel cycle products (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;HYDROGRAPHIC AREAS/Other hydrographic areas Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This program utilizes the unique natural laboratories in the Marshall Islands to determine the rates of geochemical mobilization and biological incorporation and cycling of transuranium elements in the marine environment. The relatively high concentrations of the transuranics in these Pacific atolls allow the determination of the specific chemical forms undergoing remobilization from the sediments. The rates of transfer of these specific forms between the sediments, water and marine organisms can be measured. This investigation will expand our understanding of the geochemical and biological transformations of Pu and Am in the marine environment and will provide insight concerning the behavior of these elements in other marine locations such as coastal and estuarine environments.
APPROACH: Bikini and Eniwetok Atolls, as well as Thule, Greenland, are unique natural laboratories in which geochemical and biological transformations of Pu and Am will be investigated. Plutonium and Am were released during the testing of nuclear devices at the Pacific atolls; Pu, in a well defined form, was released at essentially a point source from a US B-52 accident at Thule, Greenland. The move of transuranic radionuclides from sediments in the overlying waters will be investigated as a function of bottom-dwelling organisms and leaching by seawater. Vertical distributions of Am and Pu will be determined by core sampling and measurement of transuranic distribution profiles in interstitial waters. Chemical leaching solutions will be used in laboratory investigations to determine if seawater release can be adequately modeled by laboratory experiment.

RESULTS: The principal product in this program will be the determination of the fates of transuranium elements deposited in selected marine sediments and the potential of these isotopes for incorporation in marine organisms.
OJECT MILESTONES: 9-1-76 Preparation of literature publication describing results of geochemical investigations of samples from Thule, Greenland.
KEYWORDS: MARSHALL ISLANDS;GEOCHEMISTRY;BIOGEOCHEMISTRY;TRANSURANIUM ELEMENTS;PACIFIC OCEAN;SEDIMENTS;SEAWATER;AQUATIC ORGANISMS;PLUTONIUM ISOTOPES;AMERICIUM ISOTOPES;BIKINI;ENIWETOK;NUCLEAR EXPLOSIONS;ENVIRONMENTAL EFFECTS;RADIONUCLIDE MIGRATION;RADIOECOLOGICAL CONCENTRATION

<086035>
TITLE: Potential for Plutonium Complexation in Soil and Uptake by Plants
PROJECT NUMBER: 000660
PRINCIPAL INVESTIGATOR: Wildung, R.E.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, C.L.
TELEPHONE: F233-4208
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$235,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: EXTRACTION (5%);TRANSPORTATION (5%);PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS/Plutonium;METALS/Americium;METALS/Neptunium;METALS/Curium (30%);PARTICULATES/Oxides (10%);ORGANICS/Metal complexes (30%);RADIATION/Plutonium;RADIATION/Americium;RADIATION/Neptunium;RADIATION/Curium (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The principal objective of this study is to develop an understanding of the soil and plant factors influencing the availability of plutonium to agricultural plants and to animals with major emphasis on (1) the soil and soil microbial processes which influence the formation of ligands stabilizing plutonium in soil solutions and determination of plutonium long-term behavior in soil, and (2) plant processes which influence transport across the plant root membrane, the form of plutonium and sites of deposition in mature plants and in animals consuming plants.
APPROACH: An integrated approach involving the disciplines of soil science, microbiology, plant physiology, and biochemistry is being employed to study the chemistry of the transuranics in soil, and the ability of soil microorganisms isolated from soil on the basis of transuranic resistance and carbon requirements, to modify the transuranics in a broad range of soil, and the uptake kinetics, biochemistry, and sites of deposition of plutonium in plants and animals.
RESULTS: This program is designed to develop an understanding of the soil and plant factors influencing the form and concentration of transuranic elements in plants and animals. It provides the basis for interpretation of environmental phenomena, identification of critical environmental pathways to man, and prediction of the biological effects of these elements over a broad range of environmental conditions and over the long-term. This information is for remedial measures and to establish nuclear plant siting and engineering criteria.
PROJECT MILESTONES: (1) Complete isolation in vitro of major classes of plutonium-resistant microorganisms (plutonium added as nitrate from an agricultural soil on the basis of metabolic (mixed carbon source) requirements. (2) Initiate soils studies to characterize microbial metabolites as a function of available carbon source and validate predicted metabolic products from in vitro studies. (3) Initiate investigation of the chemical form of xylem, mobile plutonium, and plutonium bond types in sink tissues (with initial emphasis on plant roots). (4) Verify preliminary studies indicating increased plutonium availability to animals on ingestion of plant tissues. (5) Initiate interpretive studies (based on data from soil-plant studies) to explain increased gut transport of plutonium from plant tissues. (1) Complete studies on a range of soils of the rate of plutonium uptake, translocation, and sites of deposition in soybean and alfalfa tissues. (2) Initiate investigations of the fate of plutonium applied to soil in complex and oxide forms. Correlate (for soluble plutonium amendments) the rate and extent of uptake, sites of deposition, and form of plutonium in plants with soil microbial processes and with the properties of soils.
KEYWORDS: PLUTONIUM COMPLEXES;SOILS;PLANTS;DIFFUSION;ANIMALS;BIOCHEMISTRY;RADIONUCLIDE KINETICS;DEPOSITION;MICROORGANISMS;METABOLISM;TRANSLOCATION;CONTAMINATION;TRANSURANIUM ELEMENTS;ROOT ABSORPTION;SOIL CHEMISTRY;BACTERIA;INGESTION

<086036>
TITLE: Radioecology of I-129 and Tc-99
PROJECT NUMBER: 000664
PRINCIPAL INVESTIGATOR: Klepper, B.L.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Iodine-129 and technetium-99 are both long-lived fission products which have volatile and water-soluble forms with potential for release from nuclear fuels reprocessing plants. The very long half-lives and relatively high fission yields of these radionuclides make it important to study their environmental mobility since decisions must be made on permissible release limits for these nuclides. This

research has been undertaken to study the long-term fate of I-129 and Tc-99 released to the environment and the resultant dose rates to be expected in biota as the I-129 and Tc-99 activity is raised in terrestrial and aquatic ecosystems.
APPROACH: Special emphasis is being placed on dose pathways leading to human populations. Existing fuels reprocessing plants in arid and humid environments are being used as sources of environmental I-129 for field studies and laboratory studies are being conducted using I-125 as a tracer for I-129.
RESULTS: Data on I-129 and Tc-99 concentrations in ecosystem components and transfer processes will be used to make more accurate dose projections than are presently possible. Failure to revise these projections could delay implementation of the nuclear energy program.
PROJECT MILESTONES: BNWL document on Iodine-129 environmental mobility and radioecology; Comment draft Dec. 31, 1976; Final draft Aug. 1, 1976.
KEYWORDS: IODINE 129;TECHNETIUM 99;FISSION PRODUCTS;NUCLEAR FUELS;REPROCESSING;RADIONUCLIDE MIGRATION;DOSE RATES;ECOSYSTEMS;CONTAMINATION;IODINE 125;ENVIRONMENTAL EFFECTS;HUMAN POPULATIONS;RADIATION DOSES;RADIOECOLOGY;FISHES;INGESTION;SOILS;ENVIRONMENTAL EXPOSURE PATHWAY

<086037>
TITLE: Radiation Instrumentation -- Radiological Chemistry
PROJECT NUMBER: 000737
PRINCIPAL INVESTIGATOR: Wogman, N.A.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E-(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: RADIATION/Fission products (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This program is primarily concerned with the development of radiochemical instrumentation and analytical technology for the measurement of low levels of radionuclides which enter the environment from the nuclear industry and nuclear testing operations. It is also concerned with the development and refinement of neutron activation analysis technology for the trace elements released to the environment from fossil fuel combustion, coal conversion, oil shale retorting and geothermal power generation. In the nuclear fuel cycle transuranium and long-lived fission products are of immediate concern. Instrumentation and technology developed can be utilized in radioisotope studies of environmental samples; it can be applied with neutron activation analysis to define stable element behavior whereby routes used by natural, tracer, or waste radioisotopes and other toxic pollutants can be followed in the environment.
APPROACH: Improved X-ray, beta-gamma, alpha-beta-gamma, and gamma ray radiation detection systems, together with X-ray fluorescence, neutron activation and other techniques will be combined with analytical techniques to characterize radioisotope and trace element movement through the environs at the various levels encountered. Large surface area detectors with low backgrounds will be developed for direct measurement of X-ray emitting isotopes. A portable field detector for Pu analysis to be developed with a sensitivity of at least an order of magnitude better than now available will be tested in areas contaminated with long-lived radionuclides. The use of a neutron subcritical multiplier will allow trace elements to be determined through their short half-life neutron capture products. Special emphasis will be placed on developing techniques for measuring toxic trace elements in fossil fuels and in the effluents of fossil-fueled electrical generating plants.
RESULTS: This program provides the necessary instrumentation and techniques for the measurements of radioactive and non-radioactive pollutants in environmental samples. Low levels can be measured by the emission of pollutant concentrations at their release points and in the environment thus providing the data base for hazard evaluation to man.
PROJECT MILESTONES: (1) Evaluation completed of low background NaI(Tl) system 12-1-76. (2) Literature report on Cf-252 multiplier facility 5-1-77. (3) Literature publications on background sources and low background system 6-1-77. (4) Evaluation completed for intrinsic Ge for nuclear fuel transuranic elements 9-1-77. (5) Installation completed for automatic cyclic activation analysis in subcritical multiplier 4-1-78. (6) Complete literature report on intrinsic Ge applications to field measurements of fuel cycle radioisotops 6-1-78.
KEYWORDS: RADIOCHEMISTRY;MEASURING INSTRUMENTS;RADIOISOTOPES;NUCLEAR INDUSTRY;NEUTRONS;ACTIVATION ANALYSIS;FOSSIL FUELS;COAL;COMBUSTION;ALPHA DETECTION;BETA DETECTION;GAMMA DETECTION;X-RAY DETECTION;SPECIFICATIONS;RADIATION HAZARDS;CONTAMINATION;OIL SHALES;CALIFORNIUM 252;HEALTH HAZARDS;CHEMICAL EFFLUENTS;FUEL CYCLE

<086038>
TITLE: Radiation Dosimetry
PROJECT NUMBER: 000738
PRINCIPAL INVESTIGATOR: Roesch, W.C.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: PARTICULATES/Alpha emitting (25%);RADIATION/X-rays;RADIATION/Electron;RADIATION/Alpha;RADIATION/Neutron (75%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
OBJECT DESCRIPTION: The Radiation Dosimetry program has the long-term goal of developing basic theoretical relationships between observable physical characteristics of ionizing radiation and the induction of biological damage. Understanding the physical and temporal factors involved in radiation induced damage provides the knowledge necessary for logical extrapolation of experimental laboratory results to the chronic dose levels to which man may be exposed as a result of nuclear power generation. Such knowledge is also valuable in assessing the potential of new radiation (e.g., neutrons and pions) for use in cancer therapy.
APPROACH: This study includes the development of mathematical models of the radiation effect and recovery processes and the design of suitable tests of the validity of those models. Another aspect is the characterization of the initial interaction of radiation with matter in a way which is most closely related to the biological effect. To accomplish this, it will, of necessity, draw heavily on the more basic information regarding the physical and early chemical effects of radiation and upon fundamental radiobiological data at the cellular level. Experimental portions of the program provide specialized irradiation apparatus and dosimetry to determine the radiation parameters relevant to specialized biological experiments.
RESULTS: This work will result in better understanding of the factors involved in the production of cellular damage by ionizing radiation. This understanding will make possible sound predictions of the effect to be expected for irradiations, doses, and dose rates which cannot be directly measured.
PROJECT MILESTONES: (1) November 1976 Complete pilot study of survival of mitotic mammalian cells synchronized without drug treatment. (2) August 1977 If above is favorable, complete definitive measurements and prepare report. (3) August 1976 Complete paper on dose-rate effect. (4) March 1977 Complete paper on temperature dependence of recovery. (5) November 1977 Complete study of the effects of oxygen and stopping power on recovery in a model cell system. (6) August 1977 Select an organism for study which has LET dependence and survival characteristics indicating a fast recovery process. (7) September 1978 Prepare report on fast recovery process. (8) February 1977 Present paper on the microdosimetry of external radiations using the computer programs of the internal microdosimetry project. (9) May 1977 Prepare report on the mean and variance of the specific energy due to individual fast electrons. (10) June 1977 Incorporate an analytical model of cross-section data in Monte Carlo track structure codes and prepare report.
KEYWORDS: MODELING;CELLULAR EFFECTS;DOSIMETRY;IONIZING RADIATIONS;RADIATION INJURIES;RADIOINDUCTION;MATHEMATICAL MODELS;RADIATION DOSES;NUCLEAR POWER PLANTS;BIOLOGICAL RECOVERY;BIOLOGICAL RADIATION EFFECTS;DOSE RATES;ANIMAL CELLS;MUTATIONS;COMPUTER CODES;MICRODOSIMETRY

<0086039>
TITLE: Radiation Physics
PROJECT NUMBER: 000740
PRINCIPAL INVESTIGATOR: Toburen, L.H.
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DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$340,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Electron;RADIATION/Alpha;RADIATION/Neutron (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This research is directed toward understanding the mechanisms through which radiation interacts with matter with major emphasis on material of biological interest. Information on the interactions by which ionizing radiation loses energy in traversing matter and the subsequent transport and degradation of that energy is needed as input to any model which relates the observed biological effect to measurable physical quantities.
APPROACH: This program provides an integrated experimental and theoretical investigation of initial interactions by which ionizing particles transfer energy to matter and the subsequent transport and degradation of that energy. Measurements concentrate on determination of initial interaction cross sections for gas targets and on measurements of life times of quenchable excited species in liquid systems. The work includes investigation of the partition and distributions of energy in the radiation field and in the irradiated media, and determination of the rates and mechanisms of energy transport in the early stages of molecular rearrangement.
RESULTS: The results of this study provide the basic information on the initial interaction processes and formation of early chemical species along charged particle tracks. This information is basic to an understanding of the mechanisms underlying LET effects and dose response relationships.
PROJECT MILESTONES: (1) August 1976 Publish analysis of differential cross sections for noble gas atoms based on criteria of Y.-K. Kim. (2) October 1976 Complete accumulation of data on proton ionization of H/sub 2/O, H/sub 2/, and O/sub 2/. (3) January 1977 Initiate measurements of molecular fragmentation by fast protons. (4) April 1977 Complete study of energy dependence on ionization by carbon ions. (5) May 1977 Obtain preliminary results of Monte Carlo calculation of electron emission from fast proton ionization of carbon foils. (6) June 1978 Publish first study of molecular fragmentation by fast protons. (7) June 1976 Complete manuscript on temperature dependence of energy transport around proton tracks in liquids. (8) September 1976 Complete measurements of LET dependence of fluorescence. (9) November 1977 Publish a stochastic model for fluorescence quenching in binary chemical systems. (10) December 1977 Initiate experiments to measure energy transport effects at less than 10/sup -10/ sec.
KEYWORDS: IONIZING RADIATIONS;BIOPHYSICS;ENERGY LOSSES;BIOLOGICAL MODELS;ENERGY TRANSFER;PARTICLES;TARGETS;PARTICLE TRACKS;BIOLOGICAL RADIATION EFFECTS;ANIMALS;PLANTS;COMPUTER CODES;MOLECULAR STRUCTURE;DOSIMETRY

<086040>
TITLE: Radiation Biophysics
PROJECT NUMBER: 000741
PRINCIPAL INVESTIGATOR: Braby, L.A.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: PARTICULATES/Alpha emitting (10%);RADIATION/Alpha;RADIATION/Electron;RADIATION/Gamma-ray;RADIATION/Neutron (90%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The Radiation Biophysics program provides the critical experimental tests of existing and evolving theories of radiation action needed to guide further development of these theories. The kinetic behavior of biological repair and other processes at lethal and sublethal radiation levels are studied with emphasis placed on those aspects of the theories which are necessary for the extrapolation of biological effects from typically high laboratory doses and dose rates to the chronic doses that may be experienced as a result of nuclear power generation.
APPROACH: Theories developed in the Radiation Dosimetry program are tested on simple biological systems with emphasis on mammalian cells but utilizing other eucaryotes as needed for specific experiments. The effects of dose rate and LET on the probability of reproductive death will be investigated as a function of factors such as cell cycle age, oxygen concentration and temperature. A cellular system in which the cumulative effects of free radical damage are not masked enzymatic recovery processes will be sought.
RESULTS: This work will result in a clearer understanding of the processes involved in producing radiation damage, and provide the foundation for realistic predictions of effects produced by environmental radiation levels.
PROJECT MILESTONES: (1) June 1976 Determine mean recovery time for a typical eucaryotic cell in split dose experiments. (2) November 1976 Measure survival of mammalian cells at mitosis under electron irradiation. (3) November 1976 Determine the temperature dependence of recovery time for a eucaryotic species. (4) March 1977 Begin a study of oxygen and LET effects on a eucaryotic species. (5) October 1977 Begin rapid mixing experiments to study effects of radiolysis products.
KEYWORDS: BIOPHYSICS;RADIOBIOLOGY;BIOLOGICAL RADIATION EFFECTS;LETHAL RADIATION DOSE;BIOLOGICAL REPAIR;DOSE RATES;DOSIMETRY;ANIMAL CELLS;MAMMALS;LET;CELL CYCLE;OXYGEN;TEMPERATURE DEPENDENCE;RADICALS;RADIATION INJURIES;RADIOSENSITIVITY EFFECTS;COMPUTER CODES;MUTATIONS;IN VITRO;MICRODOSIMETRY;MATHEMATICAL MODELS

<086041>
TITLE: Ecological Distribution and Fate of Pu and Am in a Processing Waste Pond on the Hanford Reservation
PROJECT NUMBER: 000834
PRINCIPAL INVESTIGATOR: Emery, R.M.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives of this study are: (1) develop the historical background of the pond, (2) characterize the pond limnologically to establish an ecological profile, (3) determine the ecological distribution of transuranics in the pond, (4) measure rates of transfer of transuranics moving between ecological compartments in the pond, (5) develop a material budget which describes the movement of transuranics through a model aquatic ecosystem, and (6) synthesize acquired information to express the ecological (and health physics) significance of transuranics entering a freshwater system.
APPROACH: Characterization of limnological and radiological aspects of the pond is being done routinely by measuring baseline parameters which describe the physicochemical conditions, species composition, biomass and production rates, and by sampling ecosystem components and supply sources for transuranic analyses. To develop material budgets for transuranics moving through a pond ecosystem, artificial ponds will be used as models which will be studied continuously to follow the passage of plutonium and americium introduced from a reprocessing waste effluent source.
RESULTS: The anticipated results of this research will be qualitative and quantitative expressions of the behavior and fate of transuranics in a freshwater ecosystem. This information may be applied to the development of predictive capabilities for assessing ecological and health physics significance of transuranics in aquatic and adjacent ecosystems.
PROJECT MILESTONES: (1) Completion of limnological characterization of waste pond. (2) Completion of identification of transuranic distribution in ecological compartments of waste pond. (3) Completion of in situ Pu and Am uptake/retention in waste pond biota. (4) Completion of autoradiographic studies of Pu/Am in sestonic diatoms. (5) Completion of development of approximate methods for determining Pu/Am in waste pond samples. (6) Completion of Pu/Am material budget studies in controlled pond systems. (7) Completion of comprehensive final report on waste pond studies.
KEYWORDS: HANFORD PRODUCTION REACTORS;PLUTONIUM ISOTOPES;AMERICIUM ISOTOPES;ENVIRONMENTAL EFFECTS;WASTE PROCESSING;PONDS;LIMNOLOGY;TRANSURANIUM ELEMENTS;DISTRIBUTION;CONTAMINATION;AQUATIC ECOSYSTEMS;RADIONUCLIDE MIGRATION;RADIOACTIVE WASTES;WATER POLLUTION;REPROCESSING;NUCLEAR FUELS;SPENT FUELS

<086042>
TITLE: Quantitative Ecology of Impact Evaluation
PROJECT NUMBER: 000835
PRINCIPAL INVESTIGATOR: Thomas, J.M.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/General (100%)
CHARACTER OF STUDY: RESEARCH/Applied (75%);ANALYTICAL (25%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determine required sensitivity of ecological surveys to detect various levels of impact from energy development. Search for improved methods and techniques.
APPROACH: Analysis of existing data and field and statistical tests of available methodology.
RESULTS: Improved methodology in design and application of quantitative measures of impacts of energy development.
PROJECT MILESTONES: Publication of assessments of methodology in use, followed by reports on improvements.
KEYWORDS: ENVIRONMENT;MONITORING;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;DATA ANALYSIS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;PLANTS;ANIMALS;FISHES;STATISTICS;MEASURING METHODS

<086043>
TITLE: Effects of Hydroelectric Generation on Riverine Ecology
PROJECT NUMBER: 000836
PRINCIPAL INVESTIGATOR: Pickeisen, D.H.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, C.L.
TELEPHONE: F233-4208
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$107,000
TECHNOLOGY: HYDROELECTRIC (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Dissolved gases, physical modification (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers and reservoirs
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives of this project are to determine the effects of dissolved gas supersaturation on freshwater aquatic organisms and to determine the effects of short-term fluctuations in river flow caused by use of hydroelectric facilities to meet load demands. Studies of gas bubble disease involve determining effects of temperature on tolerance of selected fish species to supersaturation and ability of fish to recover from loss of equilibrium due to gas bubble disease. River level fluctuation studies include determining degree of dehydration of smallmouth bass nests and effects of entrapment of fish in ponds which intermittently communicate with the main river.
APPROACH: Gas bubble disease is studied in the laboratory in a variety of testing procedures based on the 4-day bioassay. Mortality, equilibrium loss, and recovery are monitored. Gas levels are measured by a gas tensicmeter or by gas chromatography. River level fluctuations are studied in the field using standard population sampling techniques.
RESULTS: This research will produce open literature reports including significant findings and supporting data. These findings will define the degree of impact on aquatic ecosystems of gas bubble disease and river flow variations. Omission of this project will result in a continuation of operation of hydroelectric facilities with less than a complete understanding of their environmental impacts. A continuation of operations having significant impacts would reduce ecosystems diversity and might cause a reduction in valuable sport and commercial fishery production.
PROJECT MILESTONES: (1) March 1976 Publication of proceedings of Gas Bubble Disease Workshop (CONF-74-1033). (2) March 1976 Selection of study sites for river level fluctuation. (3) April 1976 Aerial photography of river level fluctuation study sites during special low flow period.
KEYWORDS: RIVERS;ECOLOGY;HYDROELECTRIC POWER PLANTS;GASES;SUPERSATURATION;AQUATIC ORGANISMS;GAS BUBBLE DISEASE;FISHES;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;FLOW RATE;TOXICITY

<086044>
TITLE: Fate and Effects of Petroleum Hydrocarbons in Marine Coastal Ecosystems
PROJECT NUMBER: 000838
PRINCIPAL INVESTIGATOR: Vanderhorst, J.R.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: C(301)353-5549
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (30%);STORAGE (30%);PROCESSING, CONVERSION (40%)
POLLUTANTS: ORGANICS/Petroleum hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental

shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal zone
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This is a laboratory research program to define effects of petroleum (crude oil and refined oils) on marine intertidal communities and to develop standard procedures to allow comparison between this and other laboratory studies and field results.
APPROACH: A continuous-flow petroleum metering system for bioassay work has been developed and tested using chemical measurement methods and bioassay organisms. Preliminary tests and a six-month continuous exposure have been conducted using a No. 2 fuel oil and field-colonized artificial substrates. Minimally the approach provides a highly efficient screening device to determine oil-sensitive species.
RESULTS: It is anticipated that the study will be extended to other oils and that the resulting community structures will be diagnostic of oil contamination.
PROJECT MILESTONES: (1) August 1976 Describe effects of a No. 2 fuel oil on marine intertidal communities. (2) March 1977 Describe system distribution of Prudhoe Bay crude oil at multiple concentrations. (3) September 1977 Describe effects of chronic exposure to Prudhoe Bay crude oil dispersions on marine intertidal communities. (4) March 1978 Determine tissue content of petroleum hydrocarbons for selected community members. (5) June 1979 Evaluate reliability of laboratory predictions using artificial substrate units in field monitoring.
KEYWORDS: HYDROCARBONS;PETROLEUM;AQUATIC ECOSYSTEMS;COASTAL WATERS;OILS;BIOASSAY;POLLUTION;ENVIRONMENTAL EFFECTS;PLANTS;AQUATIC ORGANISMS;WATER POLLUTION

<0860045>
TITLE: Assessment of Social Values in Thermal Plant Siting
PROJECT NUMBER: 0975
PRINCIPAL INVESTIGATOR: Burnham, J.B.
ADDRESS: Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/Fission (80%)
ENERGY CYCLE: ELECTRICITY GENERATION (90%);ELECTRICAL TRANSMISSION (10%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (40%);ANALYTICAL (60%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this project is the development of methodology for concisely assessing the environmental, social and economic impacts of thermal power plant site and design alternatives on the potentially affected community.
APPROACH: The methodology being developed incorporates procedures for making technical estimates of impact on several criteria including human health and safety, aesthetics, water quality, air quality, economics, cultural/recreational opportunities and characteristics, and animal/plant life. Community values with respect to each of these criteria are also solicited. Technical estimates of impact for each criterion are combined with the respective community value and the resulting weighted estimates of impact summed across all criteria to produce a composite assessment of power plant impact.
RESULTS: The composite index of impact will provide a means of ranking the acceptability to the community of power plant site and decision options and thus will provide one basis for selecting among options. In addition, because of the incorporation of multiple criteria of impact, each with an associated community value, areas of specific community concern can be readily identified. Offending siting or design factors could be revised accordingly.
PROJECT MILESTONES: (1) January 1977 Complete survey instrument pretesting. (2) January 1977 Complete peer group review of completed methodology. (3) March 1977 Topical Reports: Methodologies for: Quantified Assessment of Thermal Power Plant Effects on Human Health and Safety, and Community Cultural and Recreational Characteristics. (4) March 1977 Select site for initial testing, commence data acquisition. (5) January 1978 Complete initial testing, select site for time dependence testing, commence data acquisition for ''pristine'' site condition.
KEYWORDS: THERMAL POWER PLANTS;ECONOMICS;SITE SELECTION;SOCIO-ECONOMIC FACTORS;DESIGN;PUBLIC HEALTH;WATER QUALITY;AIR QUALITY;ENVIRONMENTAL EFFECTS;DECISION MAKING;LAND USE

<0860049>
TITLE: Toxicology of Tritium and Krypton
PROJECT NUMBER: 001257
PRINCIPAL INVESTIGATOR: Ballou, J.E.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$215,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (50%);NUCLEAR/Fusion Magnetic;NUCLEAR/Fusion Laser (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (90%);ELECTRICITY GENERATION (10%)
POLLUTANTS: RADIATION/Krypton;RADIATION/Tritium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to evaluate the biological hazard of exposure to elemental tritium and Kr-85 by determining the biological effects in rodents and larger animal species exposed to the radioactive gas atmospheres.
APPROACH: Studies will include both short-term and chronic exposure of animals to H-3 and Kr-85 gas atmospheres to determine tissue distribution and retention kinetics, as well as long-term biological effects, for purposes of defining the tissues at risk. Also included are dose-effect studies to determine

tumorigenicity teratologic potency and capacity to induce changes in lung biochemistry and pulmonary function.
--SULTS: Past estimates of the hazard of radioactive noble gases and elemental tritium have been based largely on theoretical arguments which consider the external surface dose as the limiting factor or make other assumptions concerning physical-chemical reaction rates. The present study will test the validity of the theoretically based hazard evaluation by providing biological data which compares the effect of internal dose, particularly to lung, with a predominantly surface dose cumulated during immersion in a gas atmosphere. The relative importance of these two distributions of dose in the induction of latent biological effects will be evaluated.
KEYWORDS: EFFLUENTS;TRITIUM;KRYPTON;TOXICITY;HEALTH HAZARDS;AIR POLLUTION;BETA PARTICLES;DOSE-RESPONSE RELATIONSHIPS;NUCLEAR ENERGY;RADIONUCLIDE KINETICS;ANIMALS;INHALATION;METABOLISM;NEOPLASMS;TERATOGENESIS

<086050>
TITLE: Toxicity of Thorium Cycle Nuclides
PROJECT NUMBER: 001258
PRINCIPAL INVESTIGATOR: Ballou, J.E.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The uranium-thorium breeder reactors proposed for nuclear power production will employ fuel mixtures and fuel recycle process solutions that have not been evaluated for the biological hazards needed for safety evaluation. This project will investigate for special hazards associated with these materials; namely the mixed U-Th-Pu oxide fuels, the nitric acid process solutions of these fuels, the high specific activity uranium isotopes and the radioactive decay products that are unique to this nuclear process.
APPROACH: The metabolism of the oxide fuels and nitrate solutions of the major radionuclides, following inhalation, ingestion and cutaneous application will be studied in rodents. The influence of specific activity, amount of radioactivity and composition of various fuels and process solutions on the toxicology will be determined. The toxicity of uranium isotopes in equilibrium with their decay products or in freshly separated state will be investigated. The long-term biological effects of inhaled fuels, U-232, U-233 and process solutions will be determined and compared with results from similar studies with the transuranic elements.
RESULTS: The results of short-term studies (in vitro and in vivo) will aid in evaluating the importance of specific activity in the toxicology of uranium and U-232 contaminated fuel materials. Long-term biological effect studies will provide the information needed to relate the toxicity of thorium fuels to that of other nuclear materials, e.g., oxides of uranium and plutonium, that have been studied extensively in biological systems.
KEYWORDS: BREEDER REACTORS;URANIUM ISOTOPES;THORIUM ISOTOPES;NUCLEAR FUELS;HAZARDS;PLUTONIUM ISOTOPES;NITRIC ACID;DECAY;RODENTS;METABOLISM;OXIDES;NITRATES;TOXICITY;URANIUM 232;URANIUM 233;BIOLOGICAL RADIATION EFFECTS;AEROSOLS;ANIMALS;NEOPLASMS;INGESTION;INHALATION;IN VITRO;ANIMAL CELLS

<086051>
TITLE: Ecology Studies
PROJECT NUMBER: 001261
PRINCIPAL INVESTIGATOR: Klepper, E.I.
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<086053>
TITLE: Real-Time Measurement of Plutonium in Air at Below MPC Levels
PROJECT NUMBER: 001267
PRINCIPAL INVESTIGATOR: Stoffels, J.J.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: PARTICULATES/Plutonium (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is to develop an instrument which will measure airborne particulate plutonium at concentrations below the MPC level on a continuous, real-time basis. An additional objective is that the instrument provide information on the quantity of plutonium in each individual particle and, under appropriate conditions, on the size of each particle.
APPROACH: A new mass spectrometric technique for detection and measurement of plutonium in air is being investigated. A small mass spectrometer with a direct air-inlet to the ion source is being developed for this purpose. Particulate material entrained in the stream of air sampled will strike a hot filament in the source and produce a burst of ions. The ions will be mass separated in the magnetic field of the

spectrometer and an ion detector will monitor mass 271 corresponding to /sup 239/Pu/sup 16/O/sub 2/.
RESULTS: This project is expected to produce a new instrument which is a million times more sensitive than existing instruments for real-time measurement of plutonium concentration in air. In addition, the direct-inlet mass spectrometer is expected to provide information on the size distribution of plutonium particles, a capability which no other instrument presently provides.
PROJECT MILESTONES: (1) First ion beam through the plutonium direct-inlet mass spectrometer (Pu DIMS) March 1976. (2) Completion of minicomputer-based data system September 1976. (3) Pu DIMS calibrated with non-radioactive material December 1976. (4) Begin dual detector development March 1977. (5) Pu DIMS calibrated with plutonium June 1977. (6) Begin field demonstration of Pu DIMS July 1977. (7) Dual detection system operational January 1978.
KEYWORDS: AIR;PLUTONIUM 239;MEASURING INSTRUMENTS;MAXIMUM PERMISSIBLE CONCENTRATION;PARTICLES;MASS SPECTROMETERS;RADIATION MONITORING;SPECIFICATIONS;PARTICLE SIZE;CONTAMINATION;AEROSOLS

<086054>
TITLE: In Situ Pollutant Measurements
PROJECT NUMBER: 001287
PRINCIPAL INVESTIGATOR: Wogman, N.A.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$54,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS:
METALS/Mercury;METALS/Lead;METALS/Antimony;METALS/Tin;METALS/Silver;METALS/Cadmium;METALS/Arsenic;METALS/Selenium;METALS/Nickel;METALS/Copper;METALS/Zinc and transuranics (80%);ORGANICS/Carbon (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Puget Sound
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To evaluate potential hazards of pollutants associated with sediment drift, dredging operations, or biological uptake in harbors, estuaries and coastal waters. This program improves existing techniques and applies the new measurement techniques for in situ analysis for trace pollutants from coal, oil, oil shale, coal conversion and nuclear technologies. In situ measurements are developed which require no sample collection or subsequent laboratory analysis, thereby permitting real-time analysis and analysis of the sediment surface in its undisturbed natural environment.
APPROACH: Three areas will be emphasized: (1) in situ analysis of toxic trace elements; (2) in situ analysis of radionuclides; and (3) in situ analysis of organic pollutants. An in situ X-ray fluorescence probe will be used to map concentrations in sediments of inorganic pollutants which are ranked as priority one by EPA. The X-ray fluorescence analysis probe will be evaluated at Puget Sound and in Lake Washington with correlation of data obtained by other techniques. Depth profile capabilities will be improved to allow in situ analysis of energy-related pollutants which have been deposited over a period of tens of years. Carbon and Ni pollutants from oil-related materials will be measured with a portable 14 MeV neutron generator.
RESULTS: This program allows the in situ analysis of pollutants in sediments and therefore allows studies of the stress of ecosystems within well characterized marine and fresh water environments.
PROJECT MILESTONES: (1) Publish results of in situ X-ray fluorescence field measurements in Lake Washington, February 1977 and San Francisco Bay, August 1977; (2) Open ocean evaluation of in-situ x-ray fluorescence system, June 1978; (3) Evaluation of 14 keV portable neutron generator for field analysis of C and Ni, May 1977; (4) Determine modifications of in-situ x-ray fluorescence system needed to measure elements at depths to 1000 ft, May 1977.
KEYWORDS: SEDIMENTS;ESTUARIES;COASTAL WATERS;HARBORS;POLLUTION;MEASURING METHODS;COAL;OILS;OIL SHALES;DATA ANALYSIS;RADIOISOTOPES;PROBES;PUGET SOUND;CARBON;NICKEL;X-RAY FLUORESCENCE ANALYSIS;AQUATIC ECOSYSTEMS;ENVIRONMENTAL EFFECTS;HYDROCARBONS;GAMMA RADIATION;BIOLOGICAL STRESS;ECOLOGICAL CONCENTRATION;RADIOECOLOGICAL CONCENTRATION;HAZARDS

<086055>
TITLE: MAP3S Modeling Studies
PROJECT NUMBER: 1328
PRINCIPAL INVESTIGATOR: Wendell, L.L.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (30%);METALS/Trace (10%);PARTICULATES/SO/sub 4//sup =/ (60%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The principle objective of this project is to develop a computer model which will simulate the atmospheric transport, chemical transformation, and wet and dry removal of the pollutants produced from coal-fired power plants. The model is to be used in the evaluation of the human health and ecological effects of these pollutants over a multi-state region. The initial emphasis will be the sulfate problem in the northeast United States.
APPROACH: This project is to be accomplished by developing the model in a segmented fashion. It is to be composed of the most technically and economically appropriate methods available for describing the relevant processes. A comprehensive series of tests with meteorological data as well as source data will be conducted to determine the model's sensitivity to the parameterizations of the transformation and removal processes. Continuing interaction with experimental programs will provide information valuable for

the parameterizations.
RESULTS: The work on the quasi-Lagrangian segment model emphasized: (1) the development of a more realistic representation of the mixed layer behavior and its relationship to dispersion of the emitted pollutant, (2) a reactive plume model capable of more complex chemistry, (3) addition of a feature which allows calculation of H ion concentration in precipitation, and (4) efforts to derive a realistic precipitation scavenging algorithm. A model verification test showed that use of time averaged precipitation led to more than twice the wet removal of SO2 than use of the real time precipitation data.
PROJECT MILESTONES: Model Develoment Task: (1) Improve the formulation of mixing depth behavior, plume chemistry and chemistry in the precipitation. 1 Jan 1977. (2) Incorporate more sophisticated flow representations with multiple layers and isentropic considerations. 1 Mar. 1977. Model Testing and Application: (1) Extensive sensitivity testing of the model and its components for the various transport and mixing depth formulations as well as the transformation and removal parameterizations. 1 Apr. 1977. (2) A comparison of modeled precipitation chemistry results with the measurements from the precipitation chemistry network. 1 May 1977. (3) Investigation of the effect of using bulk values in precipitation. This effect is to be closely coordinated with work in this same general area by Brookhaven National Laboratory (BNL) and Argonne National Laboratory (ANL). C. M. Sheih (ANL) and L. L. Wendell (PNL) worked at BNL for approximately one month collaborating with personnel from BNL. This collaboration proved very fruitful because of the complementary nature of the work at the ERDA laboratories.
KEYWORDS: COAL;FOSSIL-FUEL POWER PLANTS;MATHEMATICAL MODELS;POLLUTION;REMOVAL;ENVIRONMENTAL EFFECTS;SULFATES;ECONOMICS;METEOROLOGY;DATA;AIR POLLUTION;HEALTH HAZARDS;ENVIRONMENTAL TRANSPORT;PLUMES;EARTH ATMOSPHERE;AEROSOL MONITORING;COMPUTER CODES;SULFUR DIOXIDE

<086056>
TITLE: Transuranics Uptake by Plants as Affected by Weathering and Ageing
PROJECT NUMBER: 001329
PRINCIPAL INVESTIGATOR: Schreckhise, R.G.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (30%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determine the effect of time (ageing and weathering) on the uptake of transuranic elements from soil by range and crop plants.
APPROACH: An experimental approach using small, weighing lysimeters is used to expose soil and plants to realistic soil water, temperature, and other field conditions.
RESULTS: Determine if ageing and weathering enhances the availability of transuranic elements from contaminated soil by range and crop plants.
PROJECT MILESTONES: Twenty years of soil ageing and weathering associated with botanical and microbial activity with yearly observations of plant uptake values and measurements every 3 years to determine solubility of the transuranium elements in the soil and other factors which might affect the phytoavailability of the transuranics.
KEYWORDS: PLANTS;TRANSURANIUM ELEMENTS;SOILS;UPTAKE;CROPS;AGE DEPENDENCE;TIME DEPENDENCE;WEATHER;CONTAMINATION;RADIONUCLIDE KINETICS;AMERICIUM;CURIUM;NEPTUNIUM;RADIONUCLIDE MIGRATION;SOILS

<086057>
TITLE: Bioavailability of Energy Effluents on Coastal Ecosystems
PROJECT NUMBER: 001332
PRINCIPAL INVESTIGATOR: Gibson, C.I.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549;C(301)353-5549
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$380,000
TECHNOLOGY: FOSSIL FUEL/General (70%);NUCLEAR/General (30%)
ENERGY CYCLE: COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (75%)
POLLUTANTS: METALS (30%);ORGANICS (30%);RADIATION (20%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal zone
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this program is to enable man to predict the long-term effects of energy related activities on the coastal ecosystem and thus make sound judgments on the uses of this region and allow a maximum utilization of a resource with a minimum of environmental impact.
APPROACH: A multidisciplinary effort is being made to identify the source term, chemical interactions, bioavailability and effects, and fate of the effluent materials through field and laboratory investigations. Site measurements of pollutant quantities and forms are made and the data used to design laboratory experiments. The laboratory experimental results are used to develop predictions models which are then verified by field investigation.
RESULTS: This research will provide an understanding of the bioavailability and fate of energy facility pollutants in the marine ecosystem. This will enable man to develop realistic criteria for effluent releases that will allow a maximization of the systems absorptive capacity while protecting the

environment. It will also provide needed data for design and site selection criteria for existing and new energy technologies.
PROJECT MILESTONES: (1) December 1977 Characterization of long-term effects of copper on Pandalus danae. (2) December 1978 Completion of initial phase of Sequim Bay sediment studies; completion of initial source-term identification and characterization; completion of initial copper tolerance studies; verification of mathematical hydrodynamic model of Sequim Bay. (3) December 1980 Completion of simple food-chain studies.
KEYWORDS: AQUATIC ECOSYSTEMS;COASTAL REGIONS;POLLUTION;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;SEAS;DATA ACQUISITION;ENVIRONMENTAL TRANSPORT;CHEMICAL EFFLUENTS;COPPER;SEDIMENTS;COMMUNITIES;ECOLOGICAL CONCENTRATION

<086058>
TITLE: Environmental Pollution Analysis, Instruments and Methods Developing
PROJECT NUMBER: 001334
PRINCIPAL INVESTIGATOR: Wogman, N.A.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (40%)
POLLUTANTS:
METALS/Arsenic;METALS/Selenium;METALS/Beryllium;METALS/Vanadium;METALS/Tin;METALS/Nickel;METALS/Antimony;METALS/Chromium;METALS/Zinc;METALS/Copper;METALS/Lead;METALS/Lithium;METALS/Gallium;METALS/Mercury (50%);PARTICULATES/Soils and colloids (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The energy needs of the country can best be met by major utilization of coal, oil, natural gas, oil shale, nuclear fuels, and geothermal steam. Before a realistic assessment can be made of the potential environmental impact of the pollutants from these energy-related technologies, it is essential that amounts and physical and chemical properties of associated pollutant materials be determined. Pollutants enter the environment as a result of fuel extraction, transport, conversion and utilization in energy production and should receive early and detailed characterization to provide the essential information for subsequent studies of their environmental impact. This program develops both laboratory and field instrumentation and methods for detailed pollutant analysis. It designs and evaluates new sampling and analysis techniques required to obtain maximum sensitivity under practical conditions, and methods to study the physical and chemical forms of non-nuclear pollutants in the environment.
APPROACH: Environmental pollution analysis requires the development of laboratory and field methods and instrumentation to measure the molecular form, chemical form, physical form, transport, fate, and transformation of pollutants. The most useful techniques for characterization include anodic stripping, voltametry, specific ion analysis, ESCA, ion probe, and the GC/MS.
RESULTS: This program is expected to develop laboratory instrumentation and methods for the analysis of physical and chemical forms of specific pollutants such as As, Hg, and Pb. The required evaluation of new sampling and analysis techniques is being pursued to obtain maximum sensitivity under the conditions required for the measurement of pollutants in environmental samples. Instrumental techniques are expected to be developed for pollutant species and forms and from all types of energy-generating technologies.
PROJECT MILESTONES: (1) July 1976 Open literature publication prepared on matrix correction program for X-ray fluorescence analysis of thick environmental samples. (2) Sept. 1976 Open literature publication prepared on simple 2-point integration spectral analysis method for X-ray fluorescence.
KEYWORDS: COAL;OILS;NATURAL GAS;NUCLEAR FUELS;NATURAL STEAM;ENVIRONMENTAL EFFECTS;POLLUTION;MEASURING INSTRUMENTS;SPECIFICATIONS;CHEMICAL STATE;CHEMICAL ANALYSIS;AIR;CHEMICAL EFFLUENTS;BERYLLIUM;ARSENIC;VANADIUM;NICKEL;ANTIMONY;CHROMIUM;TIN;ZINC;COPPER;LEAD;SELENIUM;LITHIUM;GALLIU;MERCURY;WATER;X-RAY FLUORESCENCE ANALYSIS

<086059>
TITLE: Pacific Northwest Regional Assessment Program
PROJECT NUMBER: 1348
PRINCIPAL INVESTIGATOR: Swift, W.H.
ADDRESS: Battelle-Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-4556
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$669,000
TECHNOLOGY: FOSSIL FUEL/Coal (60%);FOSSIL FUEL/Oil and Gas (20%);NUCLEAR/Fission (10%);HYDROELECTRIC (10%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (10%);PROCESSING, CONVERSION (15%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (15%);ELECTRICAL TRANSMISSION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (15%);PARTICULATES (25%);ORGANICS (10%);RADIATION (5%);HEAT, THERMAL (15%);VISUAL AESTHETICS (5%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Assess the environmental, socioeconomic and health effects of alternative energy functions in the Pacific Northwest.
APPROACH: Develop and apply dynamic simulation models and regional data base.

RESULTS: Assessments of technologies and alternative development paths.
PROJECT MILESTONES: June 1978-National Coal Assessment completed.
KWORDS: ENERGY SOURCES;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;SIMULATION;MATHEMATICAL MODELS;REGIONAL ANALYSIS;HEALTH HAZARDS;EARTH ATMOSPHERE;CHEMICAL EFFLUENTS;TECHNOLOGY ASSESSMENT;PLANNING;ALASKA;IDAHO;MONTANA;OREGON;WASHINGTON;WYOMING

<086060>
TITLE: Inhaled Transuranics in Rodents
PROJECT NUMBER: 001406
PRINCIPAL INVESTIGATOR: Sanders, C.L.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$480,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (40%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (10%);WASTE MANAGEMENT (20%)
POLLUTANTS: RADIATION/Plutonium;RADIATION/Americium;RADIATION/Curium;RADIATION/Einsteinium (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this project is to examine in small mammals the fate and effects of inhaled transuranic compounds, specifically the nitrate forms of Pu-238 and Es-253 and the dioxide forms of Pu-238, Pu-239, Am-241 and Cm-244.
APPROACH: Both the Wistar rat and the Syrian golden hamster have been studied, with emphasis being placed on studies with the rat. The scope of the research also includes (1) an examination of the spatial and temporal dose-distribution patterns (for alpha irradiation) in the lung as they influence the pathogenesis and incidence of lung cancer, (2) a morphometric study of the response of lung tissue to inhaled /sup 239/PuO/sub 2/, and (3) attempts to determine the mechanism(s) of malignant transformation in the lung.
RESULTS: This study will provide data required for hazard evaluation and the establishment of permissible exposure limits for man for inhaled transuranics.
KEYWORDS: TRANSURANIUM ELEMENTS;INHALATION;RATS;HAMSTERS;RADIATION DOSE DISTRIBUTIONS;PLUTONIUM 238;PLUTONIUM 239;AMERICIUM 241;CURIUM 244;EINSTEINIUM 253;LUNGS;NEOPLASMS;HEALTH HAZARDS;DOSE LIMITS;BIOLOGICAL EFFECTS;ANIMALS;CARCINOGENS;INHALATION;PATHOGENESIS;TOXICITY;PARTICLES

<086061>
TITLE: Inhaled Plutonium Nitrate in Dogs
PROJECT NUMBER: 001407
PRINCIPAL INVESTIGATOR: Dagle, G.E.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$390,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Plutonium nitrate (50%);PARTICULATES/Plutonium (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives are to determine the deposition, translocation, distribution, dosimetry and biological effects of inhaled soluble forms of plutonium in a long-lived species of animals so that the results of accidental contamination in man can be evaluated.
APPROACH: Beagle dogs will be given single inhalation aerosol exposures to /sup 238/Pu(NO/sub 3/)/sub 4/ or /sup 239/Pu(NO/sub 3/)/sub 4/ at initial alveolar deposition levels of 2, 10, 50, 250, 1250, or 3000 nCi. These dogs will be held for life span observations and additional dogs will be periodically sacrificed to provide information on deposition and translocation and to study the pathogenesis of dose-related effects. The dogs on study receive periodic examination, thoracic radiographs, and hematologic and clinical chemistry evaluations. The dogs sacrificed receive a complete necropsy and histopathologic examination, and tissues are radiochemically analyzed.
RESULTS: The project will help to provide maximal permissible body burdens of ''soluble'' plutonium after inhalation and will help predict the results of accidental contamination in man. The critical tissue after inhalation of soluble forms of plutonium could be lung, tracheobronchial lymph nodes, skeleton, or liver. The effects of continued translocation of plutonium from the lung to the bone, lymph nodes, and liver will be evaluated. These effects will be compared with hot particles of plutonium oxide in the lungs of dogs and comparisons made between the different spatial distribution of soluble and insoluble plutonium.
KEYWORDS: PLUTONIUM NITRATES;INHALATION;TRANSLOCATION;DISTRIBUTION;DOSIMETRY;BEAGLES;PLUTONIUM 238;PLUTONIUM 239;LIFE SPAN;DOSE-RESPONSE RELATIONSHIPS;PATHOLOGY;RADIOCHEMICAL ANALYSIS;MAXIMUM PERMISSIBLE BODY BURDEN;TISSUES;AEROSOLS;ANIMALS;INHALATION;LUNGS;NEOPLASMS;PATHOGENESIS

<086062>
TITLE: Aerosol and Analytical Technology
PROJECT NUMBER: 001408
PRINCIPAL INVESTIGATOR: Cannon, W.C.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468

TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: EXTRACTION (11%);COMBUSTION IN SITU (11%);TRANSPORTATION (11%);STORAGE (11%);PROCESSING, CONVERSION (11%);COMBUSTION OR END USE (11%);ELECTRICITY GENERATION (11%);ELECTRICAL TRANSMISSION (11%);WASTE MANAGEMENT (12%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Aerosol Technology - The objective of this effort is improvement of aerosol exposure techniques for nuclear power source materials and concerns generation and characterization of inhalation atmospheres, relation of aerosol properties to respiratory deposition and clearance, and accuracy of aerosol exposure dose control. Analytical Technology - The objective of the analytical technique develcpment phase of this program is to improve the radiochemical analysis procedure and sample analysis and handling techniques. The tasks include improvement of sample management and quality control to reduce sample backlog and storage problems, to reduce the cost of low-level Pu analysis, to improve the sensitivity of the Pu analysis procedures, and to develop new techniques for low-level assay of radioisotopes. The scope of the research covers development of analytical facilities and techniques needed to support PNL programs, but not identifiable with an individual program.
APPROACH: The approach in developing aerosol exposure techniques is aimed at improving the ability to predict and/or control the dose delivered to experimental animals by inhalation. On-line aerosol characterization, lung deposition studies and improved aerosol generation techniques as well, contribute to the goal. Analytical technique improvement effort is directed to increasing efficiency of biological sample preparation by use of such procedures as freeze drying, increasing low level plutonium analysis efficiency by use of High Performance Liquid Chromatography and overall analytical efficiency by use of computers for sample logging and data storage.
RESULTS: By the end of FY 77 it will be possible to determine the particle size distribution of radioactive aerosols on-line (within a few minutes of the time the aerosol sample is taken). This development, together with instruments already available and results of deposition research, should make it possible to control inhalation dose to within 25 to 30 percent of the target value. Improved column extraction procedures should reduce analysis time for very low level biological samples by several hours per sample. Computer logging procedures will ensure a smooth flow of samples through the analysis laboratory.
KEYWORDS: RADIOACTIVE AEROSOLS;INHALATION;LUNG CLEARANCE;RESPIRATORY SYSTEM;LUNGS;RADIATION DOSES;NUCLEAR POWER;ENERGY SOURCES;RADIOCHEMICAL ANALYSIS;SAMPLING;QUALITY CONTROL;PLUTONIUM;ENVIRONMENTAL EFFECTS;COMPUTERS;EFFICIENCY;CHROMATOGRAPHY;PARTICLE SIZE;AIR POLLUTION;RESPIRATION;TISSUES

<086064>
TITLE: Modifying Radionuclide Effects
PROJECT NUMBER: 001410
PRINCIPAL INVESTIGATOR: Mahlum, D.D.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Radionuclides (100%)
CHARACTER OF STUDY: RESEARCH (90%);ANALYTICAL (10%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is directed at evaluating the influence of exogenous agents and environmental situations on the metabolism and effect of transplutonic elements.
APPROACH: This project currently involves studies on the influence of iron reserves on plutonium metabolism, on the mechanisms of induction of mammary tumors in rats injected with plutonium, plutonium metabolism and effect during pregnancy and lactation, and on the relationships between size of exposed area and the effects of beta-irradiation on the skin of miniature swine. Studies on the effects of alcohol on the metabolism of plutonium and other radionuclides are presently being completed and experiments on transplutonic element metabolism under conditions of protein deficiency are being initiated.
RESULTS: The data resulting from this project will be available for consideration in establishing exposure guidelines. It may be useful in identification of groups of individuals who may be inappropriate for employment under conditions wherein permissible occupational exposure levels may be experienced or for whom additional protection is required.
KEYWORDS: TRANSPLUTONIUM ELEMENTS;METABOLISM;IRON;PLUTONIUM;MAMMARY GLANDS;NEOPLASMS;PREGNANCY;RATS;BETA PARTICLES;SKIN;MINIATURE SWINE;BIOLOGICAL RADIATION EFFECTS;PROTEINS;BIOLOGICAL EFFECTS;ALCOHOLS;BLOOD;AMERICIUM;IRON;HORMONES

<086065>
TITLE: Gut-Related Radionuclide Studies
PROJECT NUMBER: 001411
PRINCIPAL INVESTIGATOR: Sullivan, M.F.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (50%);NUCLEAR/Fission Breeders (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (60%);WASTE MANAGEMENT (40%)
POLLUTANTS: METALS/Plutonium (40%);PARTICULATES/Plutonium (20%);ORGANICS/Plant-bound plutonium (20%);RADIATION/Plutonium (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: Determine the toxicity of ingested radionuclides.
APPROACH: Administer various forms (compounds) of reactor fuels to animals by ingestion.
RESULTS: Determine quantity absorbed and the effect of chemical and physical nature of the nuclide on its absorption.
KEYWORDS: RADIOISOTOPES;INGESTION;TOXICITY;NUCLEAR FUELS;ANIMALS;CHEMICAL STATE;INTESTINAL ABSORPTION;INTESTINES;RADIONUCLIDE KINETICS;PLUTONIUM;SKELETON

<086066>
TITLE: Biohazards of Reactor Accidents
PROJECT NUMBER: 001413
PRINCIPAL INVESTIGATOR: Sullivan, M.F.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Div. of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E-(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Plutonium (30%);PARTICULATES/Plutonium (30%);ORGANICS/Plant-bound plutonium (10%);RADIATION/Plutonium (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determine the hazard of reactor fuels that may enter the environment and be ingested.
APPROACH: Administer combinations of reactor fuels with animal or plant material, that may enter the food chain, by mouth to animals.
RESULTS: Determine amount absorbed through the gut and its toxicity.
KEYWORDS: NUCLEAR FUELS;HAZARDS;INGESTION;ANIMALS;PLANTS;FOOD CHAINS;INTESTINAL ABSORPTION;TOXICITY;REACTOR ACCIDENTS;CONTAMINATION;NEOPLASMS;SKELETON

<086067>
TITLE: Dosimetry of Internal Emitters
PROJECT NUMBER: 001417
PRINCIPAL INVESTIGATOR: Cross, F.T.
ADDRESS: Battelle Memorial Institute, Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (90%);DEVELOPMENT/Laboratory scale (5%);ANALYTICAL (5%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific PNL
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The ''Dosimetry of Internal Emitters'' Program is aimed primarily at providing dosimetric guidance and support to radiobiology programs at PNL. In particular, the program includes considerations of dosimetric design of experiments; materials; theoretical and experimental dosimetry of various tissues and organ systems and eventual relating of dosimetry data to observed biologic effects. The program assists in providing the scientific data required to evaluate risks, establish acceptable levels of exposure and elucidate mechanisms of radiation interaction with biological systems.
APPROACH: The program combines scientific data with theoretical and experimental dosimetry of biological tissues. The test systems are in vivo (mouse, rat, hamster, dog, swine, primate) and in vitro. The exposure conditions are radioisotope ranging from acute to all manner of chronic. The biological endpoint will be relating relevant absorbed dose to all biologic effects.
RESULTS: The product/results expected for the internal emitters program are the development of scientific data for evaluating risks that may be associated with Nuclear Energy Technology, the establishment of acceptable levels of exposure through relevant extrapolation of animal data to man, and elucidation of mechanisms of radiation interaction with biological systems.
PROJECT MILESTONES: As this program is generally aimed at providing dosimetric guidance to the radiobiology studies at PNL, specific milestones are incapable of precise definition and will be dependent upon the progress of the individual studies.
KEYWORDS: DOSIMETRY;NUCLEAR ENERGY;DOSIMETRY;TECHNOLOGY ASSESSMENT;RADIOBIOLOGY;BIOLOGICAL MATERIALS;TISSUES;ANIMALS;DOSE-RESPONSE RELATIONSHIPS;HUMAN POPULATIONS;HEALTH HAZARDS;COMPUTER CODES;PLUTONIUM;RADIOISOTOPES;SAFETY

<086069>
TITLE: Analytical Techniques for Tc-99 Measurements in Environmental Samples
PROJECT NUMBER: 001428
PRINCIPAL INVESTIGATOR: Kaye, J.H.
ADDRESS: 320 Building, 300 Area, Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)

POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is to develop a mass spectrometric technique for high sensitivity analyses of Tc-99 in environmental and other materials. The measurement sensitivity to be attained is to be more than 100 times greater than that available with existing analytical techniques. Such sensitivity is required for performance of programmed environmental studies of Tc-99.
APPROACH: The analytical approach to be employed involves, first, the addition of a known amount of Tc-97 tracer to the sample. Then a radiochemical separation and purification of the Tc-97 and the unknown quantity of Tc-99 is made. The resulting solution is loaded onto a mass spectrometer filament and the ratio of Tc-97/Tc-99 is determined. Since the amount of Tc-97 which was added is known, the absolute amount of Tc-99 present in the sample can be calculated directly from the measured isotopic ratio.
RESULTS: The results of this research and its application to effluent and environment analyses should establish the behavior of Tc-99 in the environment. This will allow a determination of its possible accumulation in sufficient concentration as to contribute significantly to the radiation exposure in time to take corrective action. Tc-99 is both difficult to monitor and contain; thus the consequences, if any, of its loss and accumulation in the environment should be established.
PROJECT MILESTONES: (1) Report of Tc-99 analysis procedure 15 October 1976. (2) Begin development of Tc-97 isotope dilution technique 18 October 1976. (3) Reduce detection limit by factor of ten 28 March 1977. (4) Complete improvements to mass spectrometer operating parameters 30 June 1977. (5) Complete final testing and demonstration of analysis procedure 30 September 1977. (6) Initiate development of dual detector system 3 October 1977. (7) Complete evaluation of procedure modification needs 30 December 1977. (8) Complete development of dual detector system 30 June 1978. (9) Completion of project 30 September 1978.
KEYWORDS: ANALYSIS;TECHNETIUM 99;MEASURING METHODS;ENVIRONMENT;MASS SPECTROMETERS;SPECIFICATIONS;TECHNETIUM 97;CONTAMINATION;MONITORING;ECOSYSTEMS;RADIOACTIVE EFFLUENTS;RADIONUCLIDE MIGRATION;RADIATION DETECTORS

<086073>
TITLE: Inhaled Plutonium Oxide in Dogs
PROJECT NUMBER: 001460
PRINCIPAL INVESTIGATOR: Park, J.P.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$800,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: TRANSPORTATION (20%);STORAGE (20%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: RADIATION/Plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is concerned with long-term experiments to determine the dose-effect relationships of inhaled plutonium oxide in beagle dogs, and shorter-term experiments to study the kinetics and dosimetry of transplutonium elements, such as /sup 241/AmO/sub 2/, /sup 244/CmO/sub 2/, and various oxide mixtures.
APPROACH: A life-span study involving about 300 beagles is currently in progress. The dogs received a single 5 to 30-minute exposure to /sup 239/PuO/sub 2/ or /sup 238/PuO/sub 2/ aerosols 3 to 5 years ago.
RESULTS: These data will be used for estimating the relative risk of these alpha-emitting radionuclides, which are prominent components of nuclear fuel cycle effluents.
PROJECT MILESTONES: Dose-effect relationship data for inhaled /sup 239/PuO/sub 2/ or /sup 238/PuO/sub 2/ at the median life-span (12 years old) of beagles will be available in 1982.
KEYWORDS: PLUTONIUM OXIDES;INHALATION;DOGS;HEALTH HAZARDS;NUCLEAR ENERGY;DOSE-RESPONSE RELATIONSHIPS;CHRONIC INTAKE;RADIONUCLIDE KINETICS;DOSIMETRY;AMERICIUM 241;CURIUM 244;PLUTONIUM 239;PLUTONIUM 238;AIR POLLUTION;NUCLEAR FUELS;AEROSOLS;ANIMALS;NEOPLASMS;IN VIVO;METABOLISM;PATHOGENESIS;PARTICLES

<086074>
TITLE: Fetal and Juvenile Radiotoxicity
PROJECT NUMBER: 001461
PRINCIPAL INVESTIGATOR: Sikov, M.R.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$330,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Radionuclides (100%)
CHARACTER OF STUDY: RESEARCH (90%);ANALYTICAL (10%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to obtain information on metabolism and effects needed to establish appropriate exposure limits for radionuclides of potential hazard to the rapidly growing infant or child or for the pregnant woman.
APPROACH: Specific areas of current emphasis in this project include studies on the factors controlling the transplacental passage and distribution of plutonium and other transplutonic elements in the fetoplacental unit and to define the differential metabolic and morphologic factors responsible for differences in the biological disposition and effects of /sup 239/Pu and /sup 241/Am administered in the prenatal and neonatal periods are in progress. Studies using organ culture are examining the pathogenesis of the embryotoxicity of prenatally administered radionuclides and the role of cell kinetics and differentiation in amplifying the potential for neoplastic change after perinatal radionuclide exposure is being studied in other experiments. Studies on the deposition and retention of inhaled /sup 239/PuO/sub 2/ by neonatal and adult rats are being extended to include intermediate ages and evaluations of effects.

RESULTS: This project is producing quantitative information which serves as input to the deliberations of various standards-setting bodies relative to the analysis of radionuclide hazards during development. These data and resulting standards will help to prevent exposure of developing individuals to deleterious levels of radionuclides. At the same time, this knowledge will help to prevent unnecessarily high control levels resulting from overestimation of hazard to this age group.
KEYWORDS: NUCLEAR ENERGY;HEALTH HAZARDS;RADIONUCLIDE KINETICS;RADIONUCLIDE MIGRATION;PLUTONIUM;TRANSPLUTONIUM ELEMENTS;METABOLISM;CHILDREN;FETUSES;RATS;AGE GROUPS;RADIOECOLOGICAL CONCENTRATION;BIOCHEMISTRY;SKELETON;NEOPLASMS;BLOOD;NEUROLOGY;TERATOGENESIS

<086075>
TITLE: Trace Constituent Analysis by Laser Excitation
PROJECT NUMBER: 001617
PRINCIPAL INVESTIGATOR: Bushaw, B.A.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (30%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/Radical species (20%);METALS/Mercury;METALS/Selenium (20%);ORGANICS/PNA's; other hydrocarbons (30%);RADIATION/Argon;RADIATION/Xenon;RADIATION/I/sub 2/;RADIATION/Krypton;RADIATION/Isotopes (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This study is aimed at developing laser techniques for the detection of very low levels of pollutants on either a real-time basis or with minimum sample preparation. The objective of this program will be to develop techniques by which many species of pollutants may be detected at concentrations which are orders of magnitude below those achieved by conventional means. Where possible, real-time detection will be achieved for non-nuclear and nuclear pollutants.
APPROACH: The program will take advantage of several properties of dye lasers to allow real-time analysis of low level trace constituents. Species which have excited electron transition states in the near ultraviolet are viable candidates for this technique. Following excitation, the species of interest will be detected either by fluorescent emission or by ion pair detection following further excitation to the ionization level. Since the narrow band widths of dye lasers allow selective excitation of a given species without interference from neighboring atoms or molecules, sample preparation is generally limited.
RESULTS: The principal result of this program will be the development of new experimental techniques which will be applicable to the environmental problems associated with energy production. Specifically, laser excitation techniques will be developed for the detection of isotopes of Kr, Xe, Ar and I/sub 2/ from nuclear sources, and fossil fuel related pollutants such as Hg, Se, No/sub x/, SO/sub x/, H/sub 2/S, PNA's, light-induced free radicals and other products.
PROJECT MILESTONES: (1) Jan. 1, 1977 Publication on analysis for I-129/sub 2/ in the presence of I-127/sub 2/. (2) Mar. 1, 1977 Communication submitted on Doppler-free high resolution spectra of naturally occurring krypton. (3) Oct. 1, 1977 Installation completed of CW dye laser for thermal lensing and saturation spectroscopy. (4) Dec. 1, 1977 Publication on laser excitation techniques. (5) March 1, 1978 Publication on Xe isotope analysis techniques. (6) June 1, 1978 Publication on studies of PNA's in liquid phase using thermal lensing techniques.
KEYWORDS: TRACE AMOUNTS;CHEMICAL EFFLUENTS;ENERGY;ENVIRONMENTAL EFFECTS;MEASURING METHODS;FOSSIL FUELS;NUCLEAR ENERGY;DYE LASERS;RADIOISOTOPES;NITROGEN OXIDES;SULFUR OXIDES;MERCURY;SELENIUM;HYDROCARBONS;RARE GASES;AIR POLLUTION;RADIOACTIVE EFFLUENTS;KRYPTON;XENON;IODINE;ULTRAVIOLET RADIATION;RADICALS;CHEMICAL ANALYSIS;SPECTRA

<086076>
TITLE: Coal Conversion Pollutant Chemistry
PROJECT NUMBER: 1654
PRINCIPAL INVESTIGATOR: Petersen, M.R.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, Dave
TELEPHONE: F233-3763
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/Organic vapors;NOXIOUS GAS/H/sub 2/S (20%);METALS/Mercury;METALS/Arsenic;METALS/Antimony;METALS/Selenium;METALS/Nickel;METALS/Zinc;METALS/Coppe;METALS/Pb;METALS/Cadmium;METALS/Samarium (40%);ORGANICS/Phenols;ORGANICS/PNA's;ORGANICS/Heterocyclic (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Rapid City, SD, Tacoma, Wn.
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Characterize the inorganic, organic, and possibly metallorganic compounds which are released during pilot plant operations of various coal conversion processes. We will determine the concentrations and distribution of the toxic elements, the general class of organic and metallorganic compounds in the major effluent and emission stream at each pilot plant and the concentrations of the more toxic mutagenic and carcinogenic substances. Samples and subfractions of samples will be tested using the Salmonella/microsome mutagenicity test as a screening technique to find which fractions are most mutagenic or carcinogenic. Although the principal objective is not the development of analytical techniques for measuring pollutants, where necessary, we may improve the technology to permit a detailed characterization.

APPROACH: Neutron activation and x-ray fluorescence techniques will be used to determine trace metal concentrations. Aqueous and liquid samples will be analyzed using spectroscopy, polarography, d.c. discharge emission spectroscopy and mass spectrometry. Organic and organometallic compounds will be separated into class groups using gas chromatography, high pressure liquid chromatography, and mass spectrometry. The Salmonella/microsome mutagenicity tests will be used for screening compound classes.
RESULTS: The anticipated output of these studies is a compilation of toxic, mutagenic and carcinogenic organic compounds and elements which will arise from coal conversion processes. Some information about the relative mutagenicity of various effluent fractions will be obtained.
PROJECT MILESTONES: (1) Publications on completed mutagenicity tests and organic characterization from solvent refining coal processes. (2) December 1, 1976 Initiate sampling at coal gasification plant.
KEYWORDS: COAL INDUSTRY;COAL GASIFICATION;COAL LIQUEFACTION;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;CHEMICAL EFFLUENTS;HEALTH HAZARDS;MUTAGENS;CARCINOGENS;TOXICITY;MUTAGENESIS;CHEMICAL ANALYSIS

<086077>
TITLE: Precipitation Scavenging in MAP3S
PROJECT NUMBER: 1655
PRINCIPAL INVESTIGATOR: Hales, J.M.
ADDRESS: Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$490,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (25%);COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The project is designed to study the distribution and quality of precipitation in the greater N.E. USA and to relate this to fossil fuel emissions and synoptic meteorology. It also involves a study of the mechanism of scavenging of gaseous and aerosol pollutants by storm systems and a development of models which describe the scavenging mechanism.
APPROACH: Four tasks will be performed in order to accomplish the goals of this project. These are: (1) The specification of wet transformation rates and the concurrent meteorological conditions for the conversion of SO/sub 2/ to sulfate. (2) The analysis of the movement of air pollution in frontal storms. (3) The prediction of wet removal of pollutants from the atmosphere. (4) The acquisition of reliable, high quality precipitation chemistry data. References: (1) Davis, W.E., and L.L. Wendell, Some Effects of Isentropic Vertical Motion Simulation on a Regional Scale Quasi Lagrangian Air Quality Model, to appear in the proceeding of the Third Symposium on Atmospheric Turbulence, Diffusion, and Air Quality, October 1976. (2) Kreitzberg, C.W., D.J. Perkey, and J.E. Pinkerton, Mesoscale Modeling, Forecasting, and Remote Sensing Research, AFCRL-TH-74-0253, 1974. (3) Lavoie, R.L., A Mesoscale Numerical Model of Lake-Effect Storms, J. Atmos. Sci., 29, pp. 1025-1040, 1972.
RESULTS: A series of 7 precipitation chemistry sites were established and data are being routinely generated and disseminated. A series of lake effects storms field experiments were conducted over Lake Michigan and data are being analyzed.
PROJECT MILESTONES: Wet Transformation Task-Milestones for FY 1977 are: (1) Installation of instrumentation and samples for study of SO/sub 2//SO/sub 4/ (ratio downwind of a coal-fired power plant). 1 December 1976. (2) Completion of feasibility study on fabrication of a separator for sampling sulfur dioxide and sulfate in the air and in the suspended droplets. 1 April 1977. Air Pollution Trajectory Methods Task-Milestones for FY 1977 are: (1) To complete comparison of model using average temperatures and wind with model using observed data. 1 November 1976. (2) To incorporate an average radiational cooling submodel. 1 June 1977. Precipitation Scavenging Task-Milestones for FY 1977 are: (1) Decision on the type and location of a precipitation scavenging field experiment during the winter of FY 1977. 15 October 1976. (2) Completion of field experiments and formulation of the Lavoie model. 1 March 1977. (3) Completion of initial wind tunnel or tandem aircraft tests for sizing aerosol tracers. 1 July 1977. (4) Decision on field experiment for the winter of FY 1978. 30 September 1977.
KEYWORDS: WASHOUT;PRECIPITATION SCAVENGING;ATMOSPHERIC PRECIPITATIONS;FOSSIL FUELS;POLLUTION;SULFUR OXIDES;NITROGEN OXIDES;CHLORINE;POTASSIUM;SODIUM;CALCIUM;MAGNESIUM;ENVIRONMENTAL EFFECTS;AIR POLLUTION

<086079>
TITLE: Inhalation Hazard to Coal Miners
PROJECT NUMBER: 001975
PRINCIPAL INVESTIGATOR: Stuart, B.O.
ADDRESS: Battelle-Northwest, Richland, WA 99352
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$84,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: NOXIOUS GAS/Components of diesel engine exhaust (30%);PARTICULATES/Coal dust;PARTICULATES/Diesel exhaust (40%);ORGANICS/Coal;ORGANICS/Diesel exhaust (30%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are to study the biological behavior and effects of present and anticipated coal mine air contaminants, with particular emphasis on the mechanisms of development of the chronic respiratory disease, coal workers pneumoconiosis (CWP), and to evaluate the degree of hazard associated with possible extensive use of diesel engines in coal mines as they are currently used in hard-rock (non-gaseous) mines.
APPROACH: This research will correlate results from air sampling in working coal mines, together with

experience in characterization of complex organic gas-aerosol atmospheres from combustion engine exhausts, with observed biological changes in large and small experimental animal models developed for study of human respiratory diseases.
RESULTS: The development of pneumoconiosis, its progression to massive pulmonary fibrosis and to emphysema will be studied to clarify the mechanisms of induction of these diseases and the levels of specific mine air contaminants that are necessary to induce them.
KEYWORDS: COAL DUST;COAL MINING;AIR POLLUTION;LAND POLLUTION;HEALTH HAZARDS;DIESEL ENGINES;EPIDEMIOLOGY;EXHAUST GASES;ANIMALS;RESPIRATORY SYSTEM DISEASES;INHALATION;BIOCHEMISTRY;PATHOGENESIS

<086081>
TITLE: Malnutrition and Metal Toxicity
PROJECT NUMBER: 001979
PRINCIPAL INVESTIGATOR: Ragan, H.A.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$95,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: EXTRACTION (10%);PROCESSING, CONVERSION (40%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/Nickel;NOXIOUS GAS/Arsenic;NOXIOUS GAS/Vanadium;NOXIOUS GAS/Zinc;NOXIOUS GAS/Beryllium;NOXIOUS GAS/Mercury;NOXIOUS GAS/Iron (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Iron deficiency and protein deficiency are common in both industrialized and underdeveloped countries. However, little is known about the synergistic toxicity when nutritional deficiencies are combined with exposures to heavy metals. Certain metals are known to interfere with iron deficiency, and some are detrimental to the immune system. In addition, the hematopoietic system and immunocompetence are adversely affected by either iron or protein deficiency. The objectives of this project are to define these interrelationships.
APPROACH: This project will investigate, in laboratory animals, the effects of iron and/or protein deficiency on the toxicity of pollutant metals. Screening studies will determine those metals whose toxicity or absorption appears enhanced in nutritionally deprived animals. Based on these preliminary studies, subsequent investigations will investigate, in detail, the effects on the hematopoietic and immune systems. The incidence of neoplasia of nutritionally deprived animals exposed to pollutant metals will be compared to control animals similarly exposed.
RESULTS: This research will provide information regarding populations that may be at greater risk from heavy metal exposures, and could ultimately result in re-evaluation of existing permissible exposure limits.
KEYWORDS: NUTRITIONAL DEFICIENCY;IRON;PROTEINS;NUTRITIONAL DEFICIENCY;EPIDEMIOLOGY;SYNERGISM;BIOLOGICAL EFFECTS;HEALTH HAZARDS;METALS;HEME;ANIMALS;DIET;TOXICITY;LAND POLLUTION;GEOTHERMAL ENERGY CONVERSION;BLOOD;CARCINOGENS

<086082>
TITLE: Toxicology of Plutonium-Sodium
PROJECT NUMBER: 001981
PRINCIPAL INVESTIGATOR: Kaune, W.T.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$210,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Sodium and plutonium released as vapor and condense to form particulates (50%);PARTICULATES/Plutonium (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific Wherever breeder reactors are sited
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the biological behavior and effects of plutonium released with sodium in a manner simulating a hypothetical core disruptive accident in a liquid metal fast breeder reactor.
APPROACH: (1) Develop technology for generating vaporization-condensation aerosols from LMFBR fuel and mixing these with sodium in appropriate sequence. (2) Develop and apply techniques for exposing experimental animals to these aerosols. (3) Study the deposition, distribution, excretion and biological effects of these inhaled aerosols.
RESULTS: These experiments will enable us to compare the biological behavior and effects of these aerosols with the data obtained for high-fired /sup 239/PuO/sub 2/ particles inhaled by experimental animals and, thus, to determine whether or not the presence of sodium or the method of /sup 239/PuO/sub 2/ preparation has any significance.
KEYWORDS: PLUTONIUM;SODIUM;TOXICITY;HEALTH HAZARDS;FISSION PRODUCTS;AIR POLLUTION;RADIOACTIVE AEROSOLS;RADIATION MONITORING;SYNERGISM;LMFBR TYPE REACTORS;ANIMALS;INHALATION;METABOLISM

<086083>
TITLE: Toxicology of Inhaled Acid Aerosols
PROJECT NUMBER: 001988
PRINCIPAL INVESTIGATOR: Ballou, J.E.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F973-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);PROCESSING, CONVERSION (70%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/HCl (10%);PARTICULATES/HNO/sub 3/;PARTICULATES/H/sub 2/SO/sub 4/;PARTICULATES/HCl (90%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project will investigate the long-term biological effects in rats following inhalation of inorganic acid aerosols generated from solutions of nitric acid, sulfuric acid, and hydrochloric acid. The object is to supplement our knowledge of the latent effects of acid exposure where little information is now available.
APPROACH: Rats will be exposed by inhalation to graded doses of acid aerosols and the late developing histopathology will be observed in life span studies. The dose-response relationship for lung and bone tumor induction will be of particular interest since earlier studies indicate these lesions may be related to acid inhalation.
RESULTS: Nitric acid and other mineral acids are commonly used reagents in many industries, including the nuclear industry. The carcinogenicity of acid aerosols will be evaluated and compared with other agents, e.g. radionuclides, which are generally considered to be the major hazard. This information will be useful in assessing the overall health hazard of the nuclear industry.
KEYWORDS: EFFLUENTS;NUCLEAR ENERGY;HEALTH HAZARDS;INHALATION;AEROSOLS;AIR POLLUTION;INORGANIC ACIDS;NITRIC ACID;SULFURIC ACID;HYDROCHLORIC ACID;RATS;DOSE-RESPONSE RELATIONSHIPS;EPIDEMIOLOGY;LUNGS;SKELETON;CARCINOGENS;ANIMALS;NEOPLASMS;TOXICITY

<086084>
TITLE: Late Effects of Oil Shale Pollution
PROJECT NUMBER: 001993
PRINCIPAL INVESTIGATOR: Lund, J.E.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
POLLUTANTS: PARTICULATES/Oil shale and spent shale (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Site specific Shale country
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of the study is to identify the potential health hazards which may be associated with exposure to particulates resulting from mining and retorting of oil shale and to evaluate the carcinogenic potential of shale oil fractions shown to have mutagenic activity by the bacterial and cell-culture assay systems in the project ''Mutagenicity of Oil Shale.''
APPROACH: The initial studies to evaluate the fibrogenic potential of oil shale and spent shale particulates and possible carcinogenic activity of these materials are underway. The experimental animals are exposed to the particulates by intratracheal injection in both studies.
RESULTS: Shale oil fractions demonstrated to have mutagenic activity are being prepared to determine their carcinogenic activity in mice. These initial studies will provide data on health effects needed to plan and initiate inhalation exposure studies.
KEYWORDS: EFFLUENTS;OIL SHALE INDUSTRY;ENVIRONMENTAL EFFECTS;PARTICLES;AEROSOLS;HEALTH HAZARDS;CARCINOGENS;MUTAGENS;ANIMALS;AIR POLLUTION;INHALATION;LUNGS;TOXICITY

<086085>
TITLE: Mutagenicity of Oil Shale
PROJECT NUMBER: 001994
PRINCIPAL INVESTIGATOR: Pelroy, R.A.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
POLLUTANTS: ORGANICS/Oil shale (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This program provides a rapid screening procedure which will identify potentially carcinogenic materials in oil shale, or materials formed during the processing of the shale into new shale oil, upgraded shale oil, etc. Such potentially carcinogenic materials (including pure chemicals identified in the various fractions) will then be available for more extensive testing in animals.
APPROACH: We are therefore investigating the development and utilization of bioassays employing microbial and mammalian cells in culture. These assays, used as a screen for mutagenic and carcinogenic effect, may

allow the selection of agents and concentration ranges for evaluation in whole-animal assays. They can be performed at relatively low cost and relatively quickly, allowing evaluation of large numbers of test materials and combinations of materials. Further, since these assays involve cultured cells, they also afford simple biochemical means for studying the mode of action of a given mutagenic and/or carcinogenic substance.
RESULTS: The major output will be a rational and comprehensive assessment of the carcinogenic potential of oil-shale, shale-oil, shale-oil products, etc. by in vitro and in vivo assays.
KEYWORDS: OIL SHALE INDUSTRY;HEALTH HAZARDS;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;BIOLOGICAL EFFECTS;CARCINOGENS;MUTAGENS;ANIMALS;MICROORGANISMS;BACTERIA;MUTAGENESIS;MUTATIONS

<086086>
TITLE: Dose from Particulates in the Lung
PROJECT NUMBER: 001997
PRINCIPAL INVESTIGATOR: Roesch, W.C.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
POLLUTANTS: RADIATION/Alpha (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to apply the statistical concepts characteristic of microdosimetry to the case of point sources of charged particles within lung tissue. Since ionizing radiation deposits energy in the form of charged particle tracks, the specific energy is not constant from one microscopic site to another, but has a variance which depends on the LET of the radiation and the size of the site among other things. When the tracks originate in source particulates, the variation between sites may be even more significant, and may be a major factor in determining biological response.
APPROACH: Because of the non-uniform nature of both the source and the absorber, this problem must be solved by mathematical means. Monte Carlo calculations will be used to determine the energy deposition along the track of an alpha particle. This track structure will serve as input to calculate the specific energy in any size site resulting from any combination of source particle positions, and allowing for the presence of air spaces as well as tissue between source and site. Mathematical model of the lung structure will be developed based on measurements of air and tissue path lengths. Results of studies on the rate of translocation of particles in lung will also be used.
RESULTS: The results of this study will make possible meaningful comparisons of results of inhalation toxicology experiments in different species and under different exposure conditions. This should remove much of the ambiguity in this analysis and help eliminate uncertainties in the estimates of hazards associated with inhaled particulate sources.
PROJECT MILESTONES: (1) July 1976 Complete phenomenological model for single particle source term in H/sub 2/O. (2) September 1976 Complete statistical studies of air-tissue distributions and determine final form of lung model. (3) December 1976 Complete track structure calculations for energy deposited in a site by a single particle. (4) January 1977 Begin biological studies of particulate kinetics in lung. (5) July 1977 Have all significant variables incorporated in a computer program. (6) September 1977 Apply developed concepts to inhalation toxicology. (7) September 1978 Transfer technology to the Dosimetry of Internal Emitters program.
KEYWORDS: LUNGS;AEROSOLS;DOSE-RESPONSE RELATIONSHIPS;HEALTH HAZARDS;LET;BIOLOGICAL EFFECTS;MATHEMATICAL MODELS;TRANSLOCATION;PARTICLES;PLUTONIUM;INHALATION;PATHOLOGICAL CHANGES;RADIONUCLIDE KINETICS;ANIMALS;INHALATION;LUNGS;TOXICITY;AEROSOLS;PARTICLE SIZE;IN VIVO

<086087>
TITLE: Mobilization of Deposited Metals
PROJECT NUMBER: 001999
PRINCIPAL INVESTIGATOR: Smith, V.H.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (90%);NUCLEAR/General (10%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (60%);WASTE MANAGEMENT (10%)
POLLUTANTS:
METALS/Lead;METALS/Mercury;METALS/Arsenic;METALS/Chromium;METALS/Vanadium;METALS/Nickel;METALS/Platinum;METALS/Cobalt;METALS/Selenium;METALS/Thallium (80%);PARTICULATES/Metals in fly ash (15%);ORGANICS/Organic moieties of organometallics (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory (80%);DEVELOPMENT/Laboratory scale (20%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This research project seeks to develop treatments for overexposure of workers or the public to toxicants, particularly metallic or organometallic agents, encountered during non-nuclear energy or fuels research, development or production.
APPROACH: Metal removal agents are being sought from among natural chelating agents, e.g., the siderochromes produced by some microorganisms, and from existing chelators. The candidate agents are tested for their relative chelating ability toward Pb, Cd, Hg, V, Cr, Co, As, Fe, and Tl using chromatography. Chelon and chelate toxicity are evaluated in tissue cell culture systems. If they appear promising further tests are made for the ability of the agents to remove injected or inhaled metallic toxicants from mice or rats. Successful agents will be tested in rodents and dogs to see if they can ameliorate pathological conditions due to acute exposures and to chronic, low-level exposure to the toxicants, as well as being toxicologically evaluated for possible trial in man.
RESULTS: The treatments evolved from this research should provide improved therapy for accidental, acute

overexposures of workers and the public from toxic metals or metalloorganic compounds released or encountered in non-nuclear energy production or research. Further, the treatments should decrease the damage potential from such agents for the chronic, long-term, low-level case.
KEYWORDS: OCCUPATIONS;HEALTH HAZARDS;METALS;ENERGY;CHEMICAL EFFLUENTS;REMOVAL;LEAD;CADMIUM;MERCURY;VANADIUM;CHROMIUM;COBALT;ARSENIC;IRON;THALLIUM;CHELATES;TISSUES;ANIMAL CELLS;BIOLOGICAL REPAIR;MICE;RATS;DOSIMETRY;AIR POLLUTION;ANIMALS;COPPER;MEDICINE;PATHOGENESIS;NICKEL;TOXICITY;THERAPY

<086088>
TITLE: Analog Elements to Predict Transuranic Behavior in the Environment
PROJECT NUMBER: 002004
PRINCIPAL INVESTIGATOR: Weimer, W.C.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, R.L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: METALS/Transuranics (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Satisfactory data on the long-term effects of biogeochemical weathering processes on the biological availability of transuranium elements is presently not available. This program addresses this problem by using naturally occurring elements which behave similar to the transuranic elements and which have been subjected to long-term weathering processes. Concentration ratios for analog elements will be measured from the weathered portions of soils into plants, and these concentration ratios will be compared to corresponding transuranium elements. Extrapolation of these data will allow us to make estimates of the eventual steady-state equilibrium in the environment for soil-to-plant concentrations of transuranic elements.
APPROACH: Plant lysimeters will be spiked with chemical forms of Nd, /sup 241/Am and /sup 244/Cm to compare the soil-to-plant concentration ratios for these elements. Short-term laboratory experiments will be performed using the nitrate form of these isotopes with soils having a significant organic matter content. These studies will allow a determination of the distribution coefficients of these elements in soil-Ca(NO/sub 3/)/sub 2/ systems as a function of equilibrium time and soil pretreatment. Chemical extraction methods will be developed to determine the maximum and minimum extractible concentrations of the analogs in order to define the upper and lower concentration limits of the pool of potentially mobile species. These techniques will be applied to representative soils and associated crops for the determination of the transfer coefficients of the analog elements.
RESULTS: The principal output of this program will be a prediction of the ultimate biological availabilities of transuranic elements in the environment with extrapolations to long-term behavior of these elements.
KEYWORDS: AMERICIUM 241;NEODYMIUM;CURIUM 244;PLUTONIUM;TRANSURANIUM ELEMENTS;RADIONUCLIDE KINETICS;TERRESTRIAL ECOSYSTEMS;SOILS;WATER POLLUTION;AIR POLLUTION;LAND POLLUTION;RADIOECOLOGICAL CONCENTRATION;CROPS;UPTAKE;BIOLOGICAL MODELS;LABELLED COMPOUNDS;AGE DEPENDENCE;PLANTS

<086089>
TITLE: Radioecology of Uranium
PROJECT NUMBER: 002006
PRINCIPAL INVESTIGATOR: Schreckhise, R.G.
ADDRESS: Pacific Northwest Laboratory, Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmtal Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E-(45-1):1830
77 FUNDING: Energy Research and Development Administration FY77:$95,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (30%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determine the uptake of uranium by range and crop plants and to determine the uptake and elimination of uranium in domestic animals and animals which inhabit the shrub-steppe communities.
APPROACH: Plants, grown in soil contaminated with uranium, are maintained under natural field conditions to determine realistic uptake values. Contaminated food stuffs are fed to animals to determine uptake and retention functions.
RESULTS: Data is to be collected to quantify the transfer of uranium from soils to plants, the effect of time on the various processes, and the kinetics of uranium in certain animals. Information obtained in this field study will provide realistic data to be applied to natural conditions in assessing hazards associated with the food chain to man.
PROJECT MILESTONES: (1) Plant uptake studies are to be continued through FY 1979. (2) Animal kinetics studies to be initiated in FY 1977 and completed in FY 1979. (3) The feasibility of doing an ecosystem study is to be determined in FY 1979.
KEYWORDS: URANIUM;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;SOILS;CROPS;FORAGE;DOMESTIC ANIMALS;WILD ANIMALS;INGESTION;FOOD CHAINS;ROOT ABSORPTION;RADIOECOLOGICAL CONCENTRATION;TERRESTRIAL ECOSYSTEMS;DIFFUSION;PLANTS;ANIMALS;METABOLISM;SOILS;ENVIRONMENTAL EXPOSURE PATHWAY

<086091>
TITLE: Quantitative Aspects of Plutonium Field Studies
PROJECT NUMBER: 2011
PRINCIPAL INVESTIGATOR: Gilbert, R.O.
ADDRESS: Battelle-Northwest Laboratory, Systems Department, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-AT(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (30%);ANALYTICAL (70%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To provide quantitative and statistical support and methodology for the design and analysis of plutonium and other transuranic ecosystem and field studies.
APPROACH: Emphasis is being directed toward the evaluation or development of methods for sampling and statistical analyses designed to identify and deal with the very high variability present in plutonium and other transuranic concentrations in environmental samples. The design problem is being considered in terms of the rather different objectives that may be considered in planning field studies, such as the movement and dynamics of plutonium within and between ecosystem components and the estimation of amounts and concentrations in these components and, more generally, sampling to assess the need for ''clean up'' or to evaluate hazards.
RESULTS: Anticipated results are reports and publications directed at radioecologists active in the design and statistical analysis of environmental plutonium and other transuranic studies. These publications are intended tc result in the use of improved statistical methodologies for environmental studies.
PROJECT MILESTONES: We anticipate publishing a report on effective methods for summarizing and reporting plutonium data. A similar report on uses of nonparametric methods in environmental plutonium studies is anticipated. Statistical analyses for the Pu-239 watershed study near Urbana, Ohio should be completed by mid FY 1977, depending on the rate at which chemical analyses are performed. Our work on ratio and linear regression estimators should have progressed to the point of a published report by mid FY 1977. The development of models for describing spatial variability of plutonium concentrations in soil is a longer term project. All of the above reports are expected to result in open literature publications.
KEYWORDS: PLUTONIUM ISOTOPES;TRANSURANIUM ELEMENTS;ENVIRONMENTAL EFFECTS;ENVIRONMENT;ECOSYSTEMS;SAMPLING;STATISTICS;CONTAMINATION;RADIONUCLIDE MIGRATION;AMERICIUM;PLUTONIUM;MEASURING METHODS

<086092>
TITLE: Metal-Membrane Interactions
PROJECT NUMBER: 002118
PRINCIPAL INVESTIGATOR: Schneider, R.P.
ADDRESS: Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E-(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS/Heavy metals (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The goal of this study is to study four regulatory properties of cell membranes which are susceptible to alteration by heavy metals. These data will provide fundamental information needed to predict effects of heavy metals and aid in establishing exposure limits.
APPROACH: (1) The regulation sites and functions of lymphocyte membranes which are important to the immunological response are being examined in vitro. (2) The role of the cell membrane in regulation of cell division via cell-cell contact is being studied in culture brain cells. (3) The induction of exocellular proteases in Neurospora crassa by impermeant protein induces is used as a model system for studying relay of information through the cell membrane. (4) An enzyme (ATPase) on avian leukemia virus is used as marker for studying virus maturation.
RESULTS: We intend to delineate the role of the cell membrane in regulating cell activity involved in immunclogical competance, reception and transmission of external information and interaction with tumor viruses. This information will permit assessment of the susceptibility of these processes to heavy metals from fuel combustion and the pathogenesis likely to arise from their disruption by the metals.
KEYWORDS: CELL MEMBRANES;PHYSIOLOGY;METALS;LYMPHOCYTES;HEAVY ION REACTIONS;MEMBRANE TRANSPORT;IMMUNE REACTIONS;NEUROSPORA;PERMEABILITY;TESTING;BIOLOGICAL EFFECTS;MOLECULAR BIOLOGY;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;ENZYMES;IMMUNOLOGY;VIRUSES;MOLECULAR STRUCTURE;IN VITRO

<086093>
TITLE: Reaction Kinetics of Combustion Processes
PROJECT NUMBER: 002123
PRINCIPAL INVESTIGATOR: Felix, W.D.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
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DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355

TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub 2/;NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/CO/sub 2/ (30%);METALS/Mercury;METALS/Selenium;METALS/Titanium;METALS/Vanadium;METALS/Nickel;METALS/Cadmium (10%);PARTICULATES/Flyash (40%);ORGANICS/PNA's (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Site specific Power plant sites
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The goal of this program is to provide a model whereby the chemical and physical forms of flue gas emissions can be predicted from the given input of coal composition, combustion temperature, flue gas temperature, pressure profiles, precipitation devices and stack conditions. The scope of the model is limited to the physical and chemical transformations which occur from the instance of combustion in the firebox to a point in the plume where chemical and physical transformations of the aerosols are no longer dominated by plume comditions.
APPROACH: Physical and chemical measurements will be made of flyash, char and volatile combustion products in the laboratory and at plant sites for empirical parameter definition within a developing physical model. These data will be compared with model calculations. The initial theoretical model will be developed for a specific 600 MW coal-fired power plant.
RESULTS: The output of this program will be a model directly applicable to technology related to control of emissions from a coal-fired combustion plant. From this program will also proceed the production of information concerning catalytically enhanced reactions basic to the understanding of environmental problems. The end result is expected to be a model applicable to major power plants when given appropriate parameter input.
PROJECT MILESTONES: (1) 8-1-76 Stack sampling at coal combustion plant. (2) 11-1-76 Quadrupole mass spectrometer rated with cell for high temperature reaction studies. (3) 1-2-77 Literature report completed on surface characteristics of fly ash. (4) 7-1-77 Literature report completed on high temperature reaction kinetics of NO to NO/sub 2/ in presence of catalysts. (5) 7-1-78 Aircraft sampling of coal combustion plume.
KEYWORDS: COAL;COMBUSTION;CHEMICAL EFFLUENTS;GASEOUS WASTES;FOSSIL-FUEL POWER PLANTS;AIR POLLUTION;ENVIRONMENTAL EFFECTS;CHEMICAL REACTIONS;STACK DISPOSAL;SAMPLING;FLUE GAS;PLUMES;KINETICS;FLY ASH

<086094>
TITLE: Oil Shale and Tar Sand Effluent Characterization
PROJECT NUMBER: 002126
PRINCIPAL INVESTIGATOR: Fruchter, J.S.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$170,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (40%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (20%)
POLLUTANTS: NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/NH/sub 3/;NOXIOUS GAS/CO and others (20%);METALS/Mercury;METALS/Arsenic;METALS/Fluorine;METALS/Molybdenum;METALS/Selenium;METALS/Tellurium;METALS/Antimony and others (30%);ORGANICS/Toxic and carcinogenic (50%)
CHARACTER OF STUDY: RESEARCH/Applied (70%);DEVELOPMENT/Laboratory scale (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Colorado, Utah, Wyoming
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This study will identify potential pollutants which may reach the environment as a result of emissions from oil shale and tar sand retorting operations. Such a study is necessary at the present time because of currently vigorous interest in oil shale and tar sand tecnology being shown by both private and government sectors.
APPROACH: Effluents from both above-ground and in situ processes will be characterized for a wide spectrum of inorganic, metallorganic and organic compounds and species. A wide variety of analytical methods including gas chromatography-mass spectroscopy, neutron activation, X-ray fluorescence, high pressure liquid chromatography, atomic absorption and plasma DC-emission spectroscopy will be used for the characterization measurements. Effluents to be characterized will include raw oil shale, spent shale, crude shale oil, various shale oil boiling fractions, upgraded shale oil, process water, off-gases, as well as tar sand and crude oil from the sand. Priority will be given to those processes which show promise of early commercialization. On analysis, priority will be given to compounds of elements known or suspected as being carcinogenic, toxic or otherwise harmful. A list of such compounds and elements to be looked for will be formulated and reported as part of the project. Source term calculations will be made for each process.
RESULTS: The outputs of this program will be detailed analyses of effluents from oil shale and tar sand pilot retorting operations for inorganic metallorganic and organic species. The data will be used to make source term calculations. The characterization, data and calculations will be summarized in early reports for each pilot plant discussing the possible environmental problems associated with the commercial operation of each type of process and suggesting the need for abatement procedures where necessary.
PROJECT MILESTONES: (1) December 1976 Collection of samples from various sites (completion). (2) August 1976 Formulation of working lists of toxic and carcinogenic compounds. (3) September 1976-July 1977 Preliminary characterization of samples. (4) March 1977-December 1977 Comprehensive characterization and material balances.
KEYWORDS: ENVIRONMENT;AIR POLLUTION;CHEMICAL EFFLUENTS;SAMPLING;OIL SHALE INDUSTRY;PILOT PLANTS;OIL SAND TAILINGS;OIL SANDS;ENVIRONMENTAL EFFECTS;CHEMICAL COMPOSITION;MEASURING METHODS;TRACE AMOUNTS;QUANTITATIVE CHEMICAL ANALYSIS;AIR POLLUTION MONITORS;DESIGN;PERFORMANCE TESTING;MONITORING;SURFACE AIR;SAMPLING

<086095>
TITLE: Statistical and Epidemiological Considerations and Methodologies for Studies Concerning the Effect of Low-Level Exposures to Environmental Contaminants
PROJECT NUMBER: 2131
PRINCIPAL INVESTIGATOR: Gilbert, E.S.
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AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Our objectives are (1) to evaluate the effects of chronic, low-level radiation exposures on human populations, and (2) to develop adequate statistical and epidemiological methodologies for assessing available data on chronic low-level exposures.
APPROACH: Our tasks include analysis of the Hanford mortality data, expanding the Hanford mortality base to include J.A. Jones construction workers, developing and adapting statistical and epidemiological procedures for analyzing chronic low-level exposures, and critically evaluating other studies and opinions concerning human risks from chronic exposures.
RESULTS: Our major result will be a complete analysis of the Hanford data with particular attention to assessing the effect of occupational exposure on mortality. Current estimates of somatic effects on humans from low-level radiation exposure are based on extrapolation either from a single high level exposure or from animal studies, so it is of critical importance that available data on chronic exposures to human populations be evaluated using the best possible statistical methodology. A second result will be a paper cataloging procedure for handling low-level chronic exposures. This should prove valuable in providing the capability (to ourselves and others) for analyzing available data on chronic exposures.
PROJECT MILESTONES: (1) Report on proportional mortality for Hanford workers Sept. 1976. (2) Report on complete analysis of Hanford data including deaths through 1971, Mid-1977. (3) Report on updated analysis and inclusion of construction workers 1978. (4) Paper on statistical methodologies, Mid-1977. (5) Studies will be evaluated as requests are made.
KEYWORDS: HUMAN POPULATIONS;BIOLOGICAL RADIATION EFFECTS;LOW DOSE IRRADIATION;CHRONIC IRRADIATION;DOSE-RESPONSE RELATIONSHIPS;PERSONNEL;HAPO;MORTALITY;STATISTICS;EPIDEMIOLOGY;DATA COMPILATION;NEOPLASMS

<086096>
TITLE: Restoration of Surface-Mined Lands
PROJECT NUMBER: 002147
PRINCIPAL INVESTIGATOR: Sauer, R.H.
ADDRESS: Pacific Northwest Laboratories, Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: F233-5078
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: VISUAL AESTHETICS/Land disturbance (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Demonstrate the use of unmodified spoil banks to direct precipitation to a strip of topsoil between the spoil banks to increase the effectiveness of natural precipitation so the relatively high value agricultural crops can be cultivated without irrigation. Demonstrate that a combination of surface treatment, unmodified spoil bank shape and crop species can survive and be productive without irrigation in arid areas.
APPROACH: Artificial spoil banks or mounds have been constructed on the Hanford Reservation in one of the driest areas of the U.S. Four mounds of native alluvium, each 100 m long by 5 m high by 20 m wide are oriented perpendicular to the strongest winds (SW) and four similar mounds, 100 m away, are oriented parallel to these winds, forming six valleys. Each valley will be instrumented for precipitation, wind, soil and air temperature, and soil water content, and planted with relatively valuable and drought-resistant crops such as winter wheat, crested wheatgrass, grapes, and ponderosa pine. These crops require irrigation for survival here. Runoff and surface stability of the mound slopes will be modified with various treatments such as rubbersheeting and paraffin. A seventh area away from the mounds will be similarly instrumented and planted. Plant survival and production will be correlated with microenvironment and surface treatment.
RESULTS: Native plants adapted to arid environments, as well as winter wheat and grape vines, were planted in the test areas. All native species grew satisfactorily. A crop of winter wheat was harvested from the valley zone receiving runoff from 6 inches of natural rainfall. Thus, the mound-valley landform is a desirable feature for water conservation in arid climates.
PROJECT MILESTONES: Annual NERP status report.
KEYWORDS: SURFACE MINING;LAND RECLAMATION;DESERTS;LAND USE;AGRICULTURE;WATER RESOURCES;CROPS;CLIMATES;SPOIL BANKS;ATMOSPHERIC PRECIPITATIONS;ENVIRONMENTAL EFFECTS;COAL;SOILS

<086097>
TITLE: Transuranics in the Environment
PROJECT NUMBER: 002915
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$42,000
TECHNOLOGY: NUCLEAR/Fission (100%)
KEYWORDS: TRANSURANIUM ELEMENTS;ENVIRONMENTAL TRANSPORT;TERRESTRIAL ECOSYSTEMS;RADIONUCLIDE MIGRATION

<086100>
TITLE: Oil Shale and Tar Sand Research Materials, Preparation and Documentation
PROJECT NUMBER: 002278
PRINCIPAL INVESTIGATOR: Fruchter, J.S.
ADDRESS: Battelle Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
CHARACTER OF STUDY: RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Colorado, Wyoming, Utah
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This program will prepare and document oil shale and tar sand materials to be used for health effects and environmental exposure studies. This material will also be used for analytical procedure development studies. It will provide uniform and well characterized samples for all workers in ERDA laboratories as well as outside laboratories working in analysis and health environmental effects studies. The quality and reliability of results will be improved because they will be obtained on known and homogeneous samples. All such results will be directly comparable. Research materials to be collected and prepared will include oil shale and specific fractions thereof, spent oil shale, crude shale oil, upgraded shale oil, tar sand and crude oil from tar sand.
APPROACH: The samples will be suitably prepared, stabilized and characterized for a broad spectrum of inorganic, metallorganic and organic species and compounds. A number of analytical techniques will be used for the characterization including gas chromatography-mass spectrometry, high pressure chromatography, fluorospectrometry, neutron activation, X-ray fluorescence and specific ion electrodes.
RESULTS: The outputs of this program will be: reference oil shale; reference spent shale; reference crude shale oil; reference upgraded shale oil; reference tar sand; reference crude oil from tar sand; documentation on the composition of all the above reference materials.
PROJECT MILESTONES: (1) Collection of raw materials September 1976. (2) Preparation of research materials January 1977. (3) Distribution of research materials to other labs January 1977. (4) Initial characterization of research materials July 1977. (5) Final characterization of research materials July 1978.
KEYWORDS: RESEARCH MATERIALS;ENVIRONMENT;AIR POLLUTION;CHEMICAL EFFLUENTS;OIL SHALE INDUSTRY;OIL SANDS;HEALTH HAZARDS;ENVIRONMENTAL EFFECTS;QUANTITATIVE CHEMICAL ANALYSIS;SAMPLING;OIL SHALES;CHEMICAL COMPOSITION;AEROSOLS;ARSENIC;MERCURY;SELENIUM;BORON;TELLURIUM;NITROGEN COMPOUNDS;ANTIMONY

<086102>
TITLE: Environmental Policy, Pacific Northwest Laboratory
PROJECT NUMBER: 2228
PRINCIPAL INVESTIGATOR: Hessel, D.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Wachhole, Bruce W.
TELEPHONE: F233-4365;C(301)353-4365
TYPE OF FUNDING: Contract No.-EY-76-C-06-1830
77 FUNDING: Energy Research and Development Administration FY77:$301,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (40%);GEOTHERMAL/General (10%);SOLAR/General (10%);CONSERVATION/General (10%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (10%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (10%);ELECTRICAL TRANSMISSION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (15%);METALS (15%);PARTICULATES (20%);ORGANICS (15%);RADIATION (20%);NOISE, VIBRATION (5%);HEAT, THERMAL (5%);VISUAL AESTHETICS (5%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Analysis of priority environmental policy issues relevant to development of energy technologies. Analysis will be conducted on ''brush-fire'' issues, as well as on issues of less immediacy.
APPROACH: Conduct specific studies on transuranics in the environment, impact of regulations on ERDA operations and the nuclear option, comparative risks of energy production technologies, and impacts of water pollution control laws and programs on energy development.
RESULTS: Periodic reports on topical issues; monthly progress reports.
KEYWORDS: ENERGY SOURCES;ENERGY DEMAND;ENVIRONMENTAL EFFECTS;DECISION MAKING;PLANNING;PLUTONIUM;TRANSURANIUM ELEMENTS;WATER

<086104>
TITLE: ALAP, Technical Guidelines for Maintaining Occupational Exposures As Low As Practicable
JECT NUMBER: 600017
ICIPAL INVESTIGATOR: Faust, L.G.;Selby, J.M.
ADDRESS: Battelle Memorial Institute, Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Vallario, E.J.
TELEPHONE: F233-3331
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific ERDA Contractors
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective of the research projected ALAP- Technical Guidelines for Maintaining Occupational Exposure As Low As Practicable is to establish a data base which will be used for the preparation of a Manual of Good Practice for maintaining occupational exposures ALAP. This will be accomplished by reviewing existing programs and practices at ERDA contractor installations to identify the problem areas and radiation exposure trends.
APPROACH: The project will be carried out in three phases. The initial phase will be to identify and characterize the activities at ERDA owned facilities that result in ''reasonable avoidable'' radiation exposure to workers. Phase two will be concerned with in-depth analysis of data and methods for exposure reduction. The third phase will be the preparation of a ''Manual of Good Practices'' for maintaining occupational exposures ALAP for use in initiating ALAP programs and for judging the quality of such programs. Specific changes in dosimetry, monitoring methods and record keeping programs that could facilitate future ALAP analysis will be identified.
RESULTS: This study will result in criteria which may be used as assurance of ALAP with respect to radiation worker exposure for on-going programs in general and in particular for inclusion in the design stage of future programs.
PROJECT MILESTONES: (1) Program initiated March 1976 for characterization of activities resulting in personnel exposure. (2) Site visits for data accumulation completed by April 1977. (3) Analysis of exposure data complted by August 1977. (4) Draft of manual of good practices for ALAP submitted for review by April 1978. (5) Manual of good practices for ALAP published by September 1978.
KEYWORDS: PERSONNEL;RADIATION DOSES;RADIATION PROTECTION;MANUALS;DOSIMETRY;RADIATION MONITORING;OCCUPATIONS;ENGINEERING;STANDARDS

<086106>
TITLE: Handbooks of Recommended Practices for Environmental and Effluent Monitoring and Reporting
PROJECT NUMBER: 600029
PRINCIPAL INVESTIGATOR: Corley, J.P.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Elle, Donald R.
TELEPHONE: F233-5622
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$46,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: ORGANICS (90%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (10%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific All ERDA nuclear sites
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Provide recommended methods and procedures for greater comparability among ERDA contractor environmental and effluent radiological monitoring and reporting systems.
APPROACH: Conduct ERDA site interview and report reviews for current practices, literature reviews for state-of-the-art methodology, and workshops and individual site discussions for resolutions of problem areas; provide guides and recommendations reflecting comments received during the review process.
RESULTS: Draft guides (or Handbooks) of recommended methods and procedures for environmental and effluent radiolcgical monitoring and reporting at ERDA sites; provide letter of recommendations for changes in ERDA Manual Chapter 0513.
PROJECT MILESTONES: (1) June 1, 1976 Final revised draft of Environmental Monitoring Guide forwarded to ERDA-DSSC. (2) June 30, 1976 Draft of Effluent Monitoring Guide issued for preliminary comment. (3) December 31, 1976 Revised draft forwarded to ERDA-DSSC for contractor and field office comment. (4) June 30, 1977 Final revised draft on Effluent Monitoring Guide and recommendations forwarded to ERDA-DSSC.
KEYWORDS: GUIDES;ENVIRONMENT;RADIATION MONITORING;US ERDA;NUCLEAR FACILITIES;DATA COMPILATION;DATA TRANSMISSION;RECOMMENDATIONS;RADIOACTIVE EFFLUENTS;DIFFUSION

<086108>
TITLE: Assessment of Criticality Safety
PROJECT NUMBER: 600021
PRINCIPAL INVESTIGATOR: Clayton, E.D.
ADDRESS: Battelle-Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Brinkerhoff, L.C.
TELEPHONE: F233-5631
E OF FUNDING: Contract No.-EY-76-C-06-1830
FUNDING: Energy Research and Development Administration FY77:$23,000
HNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop and apply a systematic method to analyze the criticality safety programs in ERDA facilities.

APPROACH: All of the ERDA contractors who maintain a criticality safety program will be surveyed. The survey will be conducted through site visits in which the individual characteristics of the different criticality safety programs will be determined and a compilation of their operating experience made. A preliminary fault tree will be developed and utilized to prepare questions for the criticality safety survey.
RESULTS: The evaluation of the fault tree will determine the probabilities for various paths leading to an accident. This will allow the most likely pathways to be identified and optimal areas for correlation to be found. A report detailing the results and conclusions of the study will be issued.
PROJECT MILESTONES: Issuance of final report.
KEYWORDS: CRITICALITY;RADIATION PROTECTION;FAULT TREE ANALYSIS;RADIATION ACCIDENTS;TECHNOLOGY ASSESSMENT;NUCLEAR ENERGY;SAFETY STANDARDS;SYSTEMS ANALYSIS

<086109>
TITLE: Oil Shale Aerosol Technology
PROJECT NUMBER: 002299
PRINCIPAL INVESTIGATOR: Cannon, W.C.
ADDRESS: Battelle Pacific Northwest Laboratory, Richland, WA
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-950 0022
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (30%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (50%)
POLLUTANTS: PARTICULATES/Oil shale and aerosols (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this project is to develop the technologies and provide the necessary support for designing the animal inhalation experiment. The technologies developed will primarily concern aerosols of oil shale, spent shale and retort vapor aerosols.
APPROACH: Effort will be made to arrive at the best available technique for dry dust generation of oil shale and spent shale aerosols for animal inhalation studies. The choice of technique will be based on reliability, output and degree of dispersion of aerosolized material. Methods of aerosol characterization by mass concentration and aerodynamic equivalent particle size distribution techniques will be developed for individual characterization of biologically significant components of the oil shale and spent shale aerosols such as silicates, heavy metals and organic compounds.
RESULTS: The output of this research will be methods and techniques for generating and characterizing aerosols of oil-shale related materials and for delivering the aerosols to experimental animals for inhalation toxicological studies.
KEYWORDS: OIL SHALES;ENVIRONMENTAL EFFECTS;AEROSOLS;INHALATION;BIOLOGICAL EFFECTS;LABORATORY ANIMALS;VERTEBRATES;HEALTH HAZARDS;TOXICITY

<086110>
TITLE: Analysis of Nuclear Fuel Cycles
PROJECT NUMBER: 800001
PRINCIPAL INVESTIGATOR: Kabele, T.J.
ADDRESS: Battelle Memorial Institute, Pacific Northwest Laboratory, Richland, WA
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-5028
TYPE OF FUNDING: Contract No.-E(45-1)-1830;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$685,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this program is to identify areas in developing nuclear fuel cycles where inadequate consideration is being given to environmental controls, where inconsistencies and conflicts exist in environmental policy, and where environmental control improvements can be justified on a cost/risk/benefit basis to ensure that funds are not expended for control in instances where neither the potential effects nor public concerns warrant such expenditures.
APPROACH: (1) Environmental control systems and technology in use and under development for controlling radiological and chemical effluents from nuclear energy systems will be described. (2) Physical and chemical form of the input feed and required process materials will be defined to the extent known. (3) Treatment and confinement processes to eliminate or control the release of residual radiologically and chemically toxic materials to the biosphere will be described for adequacy.
RESULTS: Draft report on Treatment and Confinement System Analysis for LWR fuel cycle.
PROJECT MILESTONES: (1) Comparison of LWR environmental impact with current R and D programs. (2) LMFBR Environmental Control Technology Analysis.
KEYWORDS: POWER REACTORS;FUEL CYCLE;ENVIRONMENTAL EFFECTS;RADIOACTIVE WASTE PROCESSING;RADIOACTIVE EFFLUENTS;RADIOISOTOPES

<086111>
TITLE: Disposition of Retired Contaminated Facilities at Hanford
PROJECT NUMBER: 800018
PRINCIPAL INVESTIGATOR: Dorian, J.J.;Debrowski, T.E.
ADDRESS: Battelle Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Glauberman, Harold

TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-RU 040300; c
77 FUNDING: Energy Research and Development Administration FY77:$655,000
HNOLOGY: NUCLEAR/General (100%)
LUTANTS: RADIATION (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The characterization program will be broken down into the following tasks: (1) Perform literature search. (2) Establish type and pattern of in situ sampling. (3) Perform required in situ sampling. (4) Prepare detailed maps and/or drawing.
APPROACH: Collect samples of selected radioactive solid waste disposal sites and the retired reactors will be completed. All samples will be analyzed.
RESULTS: Maintain surveillance and property control of the retired 100-F Area, BNW Laboratory building and waste disposal sites on October 1, 1976.
PROJECT MILESTONES: (1) Review of records completed; listing of all sites and estimated inventories completed. (2) In situ sampling in liquid waste sites initiated; in situ sampling completed in liquid waste sites for which UNI currently has landlord responsibilities; in situ sampling of selected solid waste disposal sites completed; sampling of 100-F biology waste sites completed. (3) Reactor graphite sampling equipment fabrication completed; in situ sampling of retired reactors completed. (4) Periodic documentation of progress of characterization study completed; final report and disposal site maps completed and issued.
KEYWORDS: HAPO;SOLID WASTES;WASTE PROCESSING;MATERIALS RECOVERY;SAMPLING;RADIOACTIVITY;WASTE MANAGEMENT;LIQUID WASTES;RADIOACTIVE WASTE DISPOSAL;RADIATION MONITORING;NUCLEAR FACILITIES;CONTAMINATION

<086112>
TITLE: Energy Material Transport, 1977-2000, System Characteristics and Potential Problems
PROJECT NUMBER: 800032
PRINCIPAL INVESTIGATOR: Loscutoff, W.V.
ADDRESS: Battelle-Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology, Transportation Branch
MONITOR: Sisler, James A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-AT(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$285,000
TECHNOLOGY: FOSSIL FUEL/General (80%);NUCLEAR/General (20%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objectives of this project are to: (1) characterize the present transportation systems for energy materials; (2) project system characteristics through the year 2000; (3) identify possible problems that could occur in energy material transportation; and (4) suggest actions that could be taken to prevent their occurrence. Such identification of potential problems well in advance of their occurrence will serve to reduce the number and severity of potential crises.
APPROACH: The project will include literature searches, workshops, discussions with key personnel in energy and transportation, and analysis of the information obtained.
RESULTS: A primary output of this project will be a ranked list of requirements and tasks which ERDA must face in evaluating the environmental effects and safety of energy materials transportation.
PROJECT MILESTONES: (1) Issue report on Potential Problems in Nuclear Fuel Cycle Materials Transportation 12/15/76. (2) Issue report on characteristics of current Fossil Energy Materials Transportation Systems 9/30/77. (3) Initiate study to identify potential shipping system characteristics for advanced energy materials 10/1/77. (4) Initiate work toward projection of shipping systems and forecast of problems in fossil energy materials shipments in the remainder of the century 10/1/77.
KEYWORDS: RADIOACTIVE MATERIALS;TRANSPORT;FORECASTING;RADIOACTIVE WASTES;ECONOMICS

<086114>
TITLE: Risk Assessment and Testing
PROJECT NUMBER: 800041
PRINCIPAL INVESTIGATOR: Rhoads, R.E.
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$240,000
TECHNOLOGY: NUCLEAR/Fission (100%)
KEYWORDS: PERSONNEL;HEALTH HAZARDS;QUALITY ASSURANCE

<086116>
TITLE: Assessment of Environmental Control Technology for Waste Waters in In-Situ Oil Shale Retorting
PROJECT NUMBER: 800061
PRINCIPAL INVESTIGATOR: Dawson, B.W.
ADDRESS: Battelle Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Grua, Charles
TELEPHONE: F233-5516;C(301)353-5516
TYPE OF FUNDING: Contract No.-EY-76-C-06-1830
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ERGY CYCLE: WASTE MANAGEMENT (100%)
LUTANTS: ORGANICS (20%);SPECIFIED OTHER POLLUTANTS/Solids, oil, greases, ammonia, hydrogen sulfide, fluoride (80%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY

PROJECT DESCRIPTION: This study is designed to assess the capabilities of current technology for treatment and disposal of shale oil development related wastewaters in an environmentally acceptable fashion. Experimental studies will be conducted to evaluate current treatment technology on actual retort water produced by ongoing pilot and demonstration operations for shale oil recovery.
APPROACH: A comprehensive review of the literature disclosed that shale oil retort water, the principal wastewater generated by the pyrolysis recovery process, is heavily polluted with both organic and inorganic constituents and is produced in approximately the same volume as that of oil recovered in in situ operations. Further, in situ recovery methods produce an excess of this wastewater which cannot be used for moisturizing and compacting spent shale as is the case for above-ground retorts. Shale oil retort water differs substantially from other industrial wastewaters but is similar in some respects to wastewaters generated by petroleum refineries and coal conversion and coking plants. Shale oil retort water is generally much higher in dissolved organics than these wastes and tends to have a greater aliphatic/aromatic ratio than coal-derived wastewaters. The processes selected for bench scale experimental studies are essentially patterned after those used to treat petroleum refinery wastewater. The first steps in the processing sequence involve removal of suspended solids, oils, and greases by gravity sedimentation and dissolved air flotation. These steps are followed by steam stripping to reduce the high ammonia content and remove hydrogen sulfide. The waste stream is then treated biologically to remove degradable organics and is clarified by chemical coagulation and filtration prior to removal of refractory organics by activated carbon sorption. A demineralization step, such as reverse osmosis, may also be included to remove excessive dissolved mineral matter.
RESULTS: The performance of a bench scale trickling filter in combination with an activated sludge unit was evaluated with simulated retort water containing a high proportion of readily degradable organic matter (acetic and octanoic acids). These units operated quite effectively together in removing 95% of the organic carbon from the simulated retort water, however trickling filter performance varied between 10 and 50% removal. Although high organic removal was attained by biological treatment alone on the simulated waste, this may not be sufficient to meet discharge criteria because of the unusually high concentrations of organics in retort water. Supplementary treatment such as activated carbon sorption is expected to be required to achieve environmentally acceptable organic residuals for discharge to surface receiving streams. Ammonia removal studies were initiated with a 2 in. diameter steam stripping column packed to a depth of 36 in. with 1/4 in. saddles. A 5 gal sample of retort water from the 6000 kg simulated in situ retort at the Lawrence Livermore Laboratory was fed to the top of the stripping column and countercurrently contacted with steam at a ratio of 1.5 lb of steam to 1 gal of wastewater. The overheads (condensate) from the stripping column were recycled continuously to the feed in order to generate a gaseous ammonia stream and keep volatile organics in the aqueous liquid stream. Preliminary results indicate 99% removal of ammonia without addition of caustic. This removal is sufficient to reduce the ammonia below toxicity levels for biological treatment. Studies on land treatment and disposal of retort water have been completed, and it was concluded that wastewater characteristics and climate are not generally favorable for this disposal method in the oil shale regions of Colorado, Utah and Wyoming. The high concentrations of dissolved salts typically found in retort water are deleterious to vegetation growth and the quality of groundwater beneath a disposal site. The long winters in these regions would require large basins to store the wastewater during freezing weather when land disposal is not possible.
PROJECT MILESTONES: A draft report on land disposal and deep well injection of shale oil wastewaters is scheduled for completion by December 1977. Results of initial bench scale treatability studies will be presented in an interim report scheduled for April 1, 1978. Results of studies of a sodium bicarbonate removal process for alkaline mine waters will be documented in a topical report scheduled for February 1, 1978.
KEYWORDS: OIL SHALES;IN-SITU RETORTING;WASTE WATER;WASTE MANAGEMENT;WATER TREATMENT;BENCH-SCALE EXPERIMENTS;WASTE DISPOSAL;WATER POLLUTION;LAND POLLUTION

<086118>
TITLE: Assessment of Environmental Control Technologies for Koppers-Totzek and Winkler Coal Gasification System
PROJECT NUMBER: 800065
PRINCIPAL INVESTIGATOR: Mudge, L.K.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology Division
MONITOR: Gottlieb, Myron
TELEPHONE: F353-5587
TYPE OF FUNDING: Contract No.-RU-01-01
77 FUNDING: Energy Research and Development Administration FY77:$29,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (10%);PARTICULATES (30%);ORGANICS (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Data on material and energy flows in commercial plants that use either Winkler or Koppers-Totzek gasifiers to generate synthesis gas will be sought by contacting manufacturers of these gasifiers and by searching the literature. The objectives of the study are: (1) to determine if environmental control technologies in commercial use are adequate relative to existing and proposed standards, (2) to identify areas where improved control technologies are needed, and (3) to rank research and development programs in terms of their potential benefit.
APPROACH: Suppliers of the subject gasification system were contacted to obtain material balance information on commercial gasification systems. No data was available which required use of information in the literature to assess the adequacy of control technology used with commercial systems.
RESULTS: A draft final report on technologies used in commercial systems and the adequacy of these technologies will be submitted. Control technologies are well developed; no attempts are made to control release of trace elements.
PROJECT MILESTONES: 30 September 1977 Draft of final report on project issued.
KEYWORDS: COAL GASIFICATION PLANTS;CHEMICAL EFFLUENTS;AIR POLLUTION;POLLUTION CONTROL EQUIPMENT;DESIGN;COST;ENVIRONMENTAL EFFECTS;GASEOUS WASTES;SULFUR COMPOUNDS;COAL GASIFICATION;TECHNOLOGY ASSESSMENT

<086119>
TITLE: Management Program Plan for Environmental Concerns of Compressed Air Energy Storage
ECT NUMBER: 800246
CIPAL INVESTIGATOR: Loscutoff, W.V.
ADDRESS: Battelle Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas W.
TELEPHONE: F233-5511
TYPE OF FUNDING: Contract No.-EY-76C-06-1830
77 FUNDING: Energy Research and Development Administration FY77:$19,000
TECHNOLOGY: CONSERVATION/Energy storage (100%)
ENERGY CYCLE: STORAGE (100%)
POLLUTANTS: PARTICULATES (20%);SPECIFIED OTHER POLLUTANTS/Water contamination (80%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South;COASTS/Northeast;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: The objective of this study is to identify the significant technological environmental concerns associated with compressed air energy storage (CAES), and to provide ERDA Division of Environmental Control Technology with a management program plan to eliminate or mitigate these concerns.
APPROACH: The approach used in this study is to identify potential and likely CAES sites, identify major environmental concerns, identify previous, on-going, and planned related research, and suggest any needed research in order to meet ERDA protocol and directives on environmental issues.
RESULTS: The output of the study will be a management program plan that will be used by ECT in establishing its program of environmental assessment of CAES.
PROJECT MILESTONES: (a) Task 1--Identification of Environmental Concerns for CAES Plants, to be completed August 31, 1977. (b) Task 2--Identification of CAES Environmental Research, Technology and Procedures, to be completed September 15, 1977. (c) Task 3--Program Management Plan, to be completed September 30, 1977.
KEYWORDS: COMPRESSED AIR ENERGY STORAGE;ENVIRONMENTAL EFFECTS;SAFETY;STORAGE FACILITIES;SITE SELECTION;NOISE;SAFETY ENGINEERING;GROUND SUBSIDENCE

<086120>
TITLE: Identification of EHH Standards for Geothermal Programs
PROJECT NUMBER: 600075
PRINCIPAL INVESTIGATOR: Selby, J.M.
ADDRESS: PNL, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Vallario, E.
TELEPHONE: F233-5640
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The drilling phase of geothermal energy development has many safety aspects which must be addressed to identify the safety problems involved and the need for standards. The applicability and completeness of any existent safety standards promulgated by governmental or professional groups must be determined. While the geophysical exploration phase involves environmental and safety impacts to a lesser degree, similar analyses and reviews will be required. This proposal outlines a study that would be accomplished to identify: (1) the existing safety problems, (2) applicable existing standards, (3) the need for specific new geothermal safety standards, (4) the purpose and scope of these proposed standards, and (5) identification of needed data bases.
APPROACH: Generic solutions for assuring personnel safety and environmental protection will be suggested by literature analysis and field consultations with recognized experts.
RESULTS: Specific standards and data base programs will be proposed to deal with generic problems in the geothermal enery program.
PROJECT MILESTONES: Characterization of specific problem areas late FY77; identification of applicable standards early FY78; characterization of specific standards mid FY79.
KEYWORDS: GEOTHERMAL ENERGY;SAFETY STANDARDS;DRILLING;ENVIRONMENTAL IMPACTS;PERSONNEL;SAFETY;DATA ACQUISITION

<086121>
TITLE: Effects of Low Levels of Tritium on Marine Organisms
PROJECT NUMBER: 000643
PRINCIPAL INVESTIGATOR: Roesijadi, G.
ADDRESS: Battelle Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-EY-76-C-06-1830
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
ONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC REAS/Continental shelf
ARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the potential for compartmentalization of tritium in marine eggs, larvae and reproducing adults, and the effects of low levels of irradiation on the organisms' life histories.
APPROACH: Eggs from the shrimp Pandalus danae were exposed to water containing tritium to determine effects on hatching success. Effects of tritium on survival, molting and duration of development of P. platyceros larvae are being measured. Tritium turnover rate at sequential stages of development are being measured on

zoeal stages of the crab Pinnixa occidentalis.
RESULTS: Determinations of stress responses of the organisms by means of physiological and biochemical-enzyme changes.
KEYWORDS: TRITIUM;BIOLOGICAL EFFECTS;AQUATIC ORGANISMS;EGGS;LARVAE;SHRIMP;SURVIVAL TIME;METABOLISM;CRUSTACEANS;LOW DOSE IRRADIATION;CONTAMINATION;RADIOISOTOPES;REPRODUCTION;WATER;ENZYMES;FISHES

<086122>
TITLE: Program Plan Geothermal Liquid Waste Disposal
PROJECT NUMBER: 800186
PRINCIPAL INVESTIGATOR: Defferding, L.J.
ADDRESS: Battelle-Pacific Northwest Laboratories; Battelle Boulevard, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas W.
TELEPHONE: C(202)233-5511
TYPE OF FUNDING: Contract No.-AT(45-1) 1830
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GEOTHERMAL/Hydrothermal (80%);GEOTHERMAL/Geopressurized (20%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (10%);HEAT, THERMAL (15%);SPECIFIED OTHER POLLUTANTS/Saline water (75%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Gulf;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this program is to review the state-of-the-art for disposing of liquid wastes from geothermal, electric and nonelectric installations. A research program plan will then be developed to provide commercially viable techniques for waste disposal.
APPROACH: A review team was assembled from within the Pacific Northwest Laboratory. This team reviewed the available literature and evaluated the existing methods for disposal of liquid wastes from geothermal facilities. The techniques were evaluated from legal, technical, environmental, safety and economic standpoints. During this evaluation, research needs were identified. The results of the evaluation will constitute a state-of-the-art review of disposal methods for geothermal liquid wastes. A research program plan will be written to develop the required technology on information that was identified as lacking during the review task. This program plan will be reviewed by a task force of recognized experts in the geothermal or disposal fields.
RESULTS: The results of this work will be two documents. (1) The state-of-the-art of existing disposal methods; (2) A research program plan to develop commercially viable liquid waste disposal methods within safety and environmental constraints.
PROJECT MILESTONES: Complete draft of state-of-the-art report--September 1977. Complete Research Program Plan--December 1977.
KEYWORDS: GEOTHERMAL FLUIDS;LIQUID WASTES;WASTE DISPOSAL;BRINES;SALINITY;REVIEWS;TECHNOLOGY ASSESSMENT;RESEARCH PROGRAMS;NOISE

<086123>
TITLE: Social Impact Method Evaluation: Pacific Northwest Plants
PROJECT NUMBER: 002136
PRINCIPAL INVESTIGATOR: Schuller, C.R.
ADDRESS: Battelle Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview/Integrated Assessment
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (80%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (20%);RADIATION (20%);NOISE, VIBRATION (20%);HEAT, THERMAL (20%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Project, assess, and evaluate the impact of the development of large-scale energy facilities on host communities and the surrounding regions, and evolve strategies to mitigate undesirable social impacts.
APPROACH: Conduct a time series study of social impacts at Skagit County, Washington, Nuclear Power Plant Site; conduct a retrospective impact case analysis of two or more recently developed western energy sites.
RESULTS: Validation of methods used to project potential impacts.
PROJECT MILESTONES: (1) Social impact scenario end of FY77. (2) Annual progress reports.
KEYWORDS: BRR REACTOR;ENVIRONMENTAL IMPACTS;SOCIAL IMPACT;EVALUATION

<086124>
TITLE: Coordination of Pacific Marine Sciences Programs
PROJECT NUMBER: 002547
PRINCIPAL INVESTIGATOR: Templeton, W.L.
ADDRESS: Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$25,000

TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
IONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC
\REAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC
AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The Division of Biomedical and Environmental Research supports research programs in the marine sciences area at a variety of institutions from Alaska to Southern California. Presently the programs are diverse in disciplines and objectives, and are being conducted independently. Under the charter responsibilities and objectives of ERDA, it is essential that the programs of these diverse contractors become focussed on ERDA's programmatic marine sciences issues and needs.
RESULTS: The functions of the coordinator are: (1) establish liaison between participating scientists through mechanisms of meetings and data exchange, (2) encourage the collection of comparable data that can form the basis of a future data synthesis program for Pacific Coast ecosystems, (3) determine the need for a scientific Advisory Committee and make recommendations to ERDA, (4) identify visible shortcomings in the Pacific Coast programs and make recommendations to ERDA, (5) determine shiptime needs of ERDA programs and coordinate scheduling of R.V. Cayuse with ERDA allocation of ship funds, and (6) establish a continuing and working liaison with other Federal and State agencies responsible for marine coastal programs to assure programs are complementary and not unnecessarily repetitive.
KEYWORDS: MARINE SCIENCE;COORDINATION;PACIFIC OCEAN;OCEANOGRAPHY;RESEARCH PROGRAMS;DATA COMPILATION;RECOMMENDATIONS

<086125>
TITLE: Integrated LNG Safety and Environmental Control Program
PROJECT NUMBER: 800156
PRINCIPAL INVESTIGATOR: Hall, R.J.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Walter, Henry F.
TELEPHONE: F233-5510
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$420,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);STORAGE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The principle issue addressed in this plan is the concern that LNG operations and facilities may present an unacceptable risk to the public. This perception may work to limit the number or capacity of LNG facilities at a time when they are needed. A better understanding of LNG hazards will provide information for the development of sites and control systems about which public judgements regarding acceptability can be more quickly and equitably made. The program is directed toward providing, through research and development, LNG safety and environmental control information for use by industry, regulatory agencies, and the general public.
APPROACH: By conducting adequate background studies and literature searches, and by using the information and opinions of LNG experts, to acquire the pertinent information needed to conduct an R and D program in LNG safety and environmental control.
RESULTS: The LNG Safety and Environmental Control Program Plan was prepared under the direction of ECT. The major part of the Appendices of this Plan were written under the direction of the PNL staff, and the plan was developed from general guidelines guidance from ECT. These Appendices include a State-of-the-Art documentation of past and present LNG safety research.
PROJECT MILESTONES: (1) Project begun October 1976. (2) LNG Safety and Control Workshop December 1976. (3) Draft ready of Integrated LNG Safety and Environmental Control Program Plan August 1977. (4) Approval to publish Program Plan September 1977.
KEYWORDS: LIQUEFIED NATURAL GAS;HAZARDS;CONTROL;SAFETY;INDUSTRY;DATA COMPILATION;RESEARCH PROGRAMS;ENVIRONMENTAL EFFECTS;FOSSIL FUELS;PLUMES;CRYOGENICS

<086126>
TITLE: Radioecology of Waste Management Areas
PROJECT NUMBER: 002532
PRINCIPAL INVESTIGATOR: Schreckhise
ADDRESS: Battelle Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$140,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION/Fission;RADIATION/Transuranics (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Designed to provide information to assure the public that environmental impacts and certain potential human hazards associated with waste management practices are acceptable and to provide information on impacts which are not acceptable so that the operators of Hanford waste management facilities can provide ameliorations or alternatives.
ROACH: (1) Accumulate baseline information on ecosystem structure and function where they are in contact with waste management facilities. (2) Characterize the radiological conditions relative to the ecosystems including transport of radionuclide and possible radiological effects.
RESULTS: (1) Manuscript on comparative dose estimate to small mammal populations in a waste burial ground. (2) Manuscript on lizard distribution and densities. (3) Report on relationship of radionuclide concentrations in Hanford waste ponds to waterfowl clutch size and hatching success. (4) Reports on

structure and function of Hanford ecosystems. (5) Characterization of eight aquatic sites will be reported.
PROJECT MILESTONES: (1) Major site characterization to be completed end of 1978. (2) Radionuclide studies to begin at selected waste management areas and control sites in 1977 to characterize type, distribution, concentration, and transport. (3) Publications on the dose levels and observed effects if any on burrowing animals to be produced at end of FY 1978.
KEYWORDS: WASTE MANAGEMENT;RADIOECOLOGY;ENVIRONMENTAL IMPACTS;HAZARDS;HANFORD PRODUCTION REACTORS;DATA ACQUISITION;ECOSYSTEMS;MAMMALS;LIZARDS;RADIATION DOSES;POPULATIONS;PLUTONIUM;RADIOISOTOPES;PLANTS

<086127>
TITLE: Characterization of 300 Area Burial Ground
PROJECT NUMBER: 800019
PRINCIPAL INVESTIGATOR: Phillips, S.J.
ADDRESS: Pacific Northwest Laboratories, Richland, WA
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-RU04-03
77 FUNDING: Energy Research and Development Administration FY77:$228,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this program is to determine the extent and status of radionuclide migration in the 300 area burial grounds. Detailed evaluations of potential mechanisms which may result in migration of wastes will be conducted and modeled to provide analysis of risks associated with the alternatives of designating these sites for permanent storage and/or removal of wastes.
APPROACH: (1) Geophysical evaluations; (2) sample collection and radiochemical analysis; (3) physical characterization of fluid transport in sediments; (4) fluid migration, fluid modeling; (5) evaluation of biological transport mechanisms; and (6) report.
RESULTS: Technique development is expected to continue. Drilling patterns of select burial grounds will be established and drilling program initiated. Additional arrays of monitoring stations will be emplaced in order to dimensionally quantify fluid transport within burial trench and caisson areas. All data collected will be compiled and analyzed. Quarterly reports will continue.
PROJECT MILESTONES: Determine in situ contamination pattern. Prepare final report.
KEYWORDS: HAPO;RADIOACTIVE WASTE DISPOSAL;GROUND RELEASE;RADIONUCLIDE MIGRATION;UNDERGROUND DISPOSAL;RADIATION MONITORING;SEDIMENTS;SOILS;PLUTONIUM;ENVIRONMENTAL TRANSPORT;SAMPLING;DRILL CORES

<086128>
TITLE: In-Situ Coal Gasification Pollutant and Effluent Characterization
PROJECT NUMBER: 002319
PRINCIPAL INVESTIGATOR: Petersen, M.R.
ADDRESS: Battelle Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Department of Defense, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duhamel, A. Paul
TELEPHONE: F233-4328
TYPE OF FUNDING: Contract No.-EY-76C-06-1830
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SO2;NOXIOUS GAS/CO (25%);METALS/Trace elements (25%);PARTICULATES/Fine particles (25%);ORGANICS/Polynuclear and phenols (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Hanna, Wyoming
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of the program is a characterization study which can be used to identify the compounds formed during in situ coal gasification. The program involves identifying and quantitatively analyzing the spectrum of organic and inorganic components in the product gas, the entrained water vapor, the coal for by products and the gaseous effluents from combustion of the gas. Particular emphasis will be placed on volatile trace elements such as Cu, Zn, Br, Sb, Sc, Hg, Cd and As, and organic compounds such as polynuclear aromatics and phenols.
APPROACH: The inorganic analysis will be carried out using neutron activation, x-ray fluorescence and atomic absorption spectroscopy. The organic compounds will be identified and quantitatively determined using in combination gas chromatography/mass spectrometry and high pressure liquid chromatography.
RESULTS: The sampling methods and analytical methods developed for these studies should be applicable to many of the problems associated with characterization of pollutants from in-situ coal gasification experiments. Secondly, based on samples obtained from in-situ coal gasification a better understanding of the environmental problems associated with in-situ coal gasification will be obtained.
PROJECT MILESTONES: During FY77 representative samples of coal, particulates, gases and liquids will be obtained from the Hanna, Wyoming, in-situ coal gasification site. Initial work on the characterization of up to 40 elements will begin. Initial work on organic components will also commence. Suitable reports will be issued as data becomes available.
KEYWORDS: EFFLUENTS;EMISSIONS;COAL GASIFICATION;ENVIRONMENTAL EFFECTS;GASEOUS WASTES;CHEMICAL EFFLUENTS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;TRACE AMOUNTS;COPPER;ZINC;BROMINE;ANTIMONY;SCANDIUM;MERCURY;CADMIUM;ARSENIC;PHENOLS;HYDROCARBONS

<086129>
TITLE: Environmental Pollutant Characterization by Direct-Inlet Mass Spectrometry
PROJECT NUMBER: 2324
PRINCIPAL INVESTIGATOR: Lagergren, C.R.
ADDRESS: Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No.-EY-76-C-06-1830;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development of a new analytical technique for air sampling and real-time detection, characterization and monitoring of particulate airborne pollutants.
APPROACH: Direct-inlet mass spectrometry.
RESULTS: Development and construction of direct-inlet mass spectrometer system.
PROJECT MILESTONES: Specification and design of the instrument, fabrication of the components, assembly, performance tests.
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;PERFORMANCE TESTING;AEROSOLS;PARTICLE SIZE;AIR POLLUTION;AIR SAMPLERS;CHEMICAL EFFLUENTS;MASS SPECTROSCOPY;ENVIRONMENTAL TRANSPORT

<086130>
TITLE: Toxicology of Sodium
PROJECT NUMBER: 2718
PRINCIPAL INVESTIGATOR: Zwicker, G.M.
ADDRESS: Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: During an accident, high concentrations of sodium hydroxide, carbonate, and perhaps other sodium compounds as well could reach members of the general population for a limited period. Another scenario of interest for purposes of this proposal involves the rupture of a secondary sodium pipe outside of the containment building. Liquid sodium would be sprayed into the air where it would be oxidized and transported to the site boundary. In a relatively humid atmosphere, a large fraction of the sodium would be converted to Na2CO3 which is presumably less toxic than NaOH. In an atmosphere of low relative humidity, more of the sodium would exist as the oxide and hydroxide.
APPROACH: The first part of this project would involve the conceptualization, design, and fabrication of an aerosol generation system and an exposure system for rodents. The second part of this project would involve the whole-body exposure of adult and immature rats to different concentrations of aerosol, probably for periods up to 2 hours.
RESULTS: It is expected that these data will allow us to determine which biological system will be the most limiting in terms of the acute response. Additional experiments will be designed on the basis of the data obtained in this phase of the study.
KEYWORDS: SODIUM;TOXICITY;ACCIDENTS;BREEDER REACTORS;RATS;BIOLOGICAL EFFECTS;AIR POLLUTION;INHALATION;AEROSOLS;LUNGS;METABOLISM

<086131>
TITLE: Biological Effects of Magnetic Fields
PROJECT NUMBER: 2720
PRINCIPAL INVESTIGATOR: Mahlum, D.D.
ADDRESS: Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Magnetic force (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine if magnetic fields can be detected and produce biological damage in developing and adult animals.
APPROACH: Pregnant mice will be exposed at varied times after conception to magnetic fields ranging up to 5000 gauss. The frequency and type of abnormalities will be observed in the offspring. Changes in litter size, behavioral activity and growth will also be determined.
RESULTS: The potential biological impact of magnetic fields will be determined over the range where human exposure may occur in a proposed nuclear fusion plant.
PROJECT MILESTONES: New Project: Animals exposed and early effects data available in FY 1978.
KEYWORDS: MAGNETIC FIELDS;BIOLOGICAL EFFECTS;ANIMALS;MICE;PREGNANCY;TERATOGENESIS;BEHAVIOR;REPRODUCTION;ANIMAL GROWTH;THERMONUCLEAR REACTIONS;ENVIRONMENTAL IMPACTS;PERSONNEL DOSIMETRY;SAFETY;MUTAGENESIS;ELECTROMAGNETIC RADIATION

<086132>
TITLE: Development of a Chemical Reaction, Stability and Transport Model of Oil-Shale Process Wastes in Soil
PROJECT NUMBER: 004111
PRINCIPAL INVESTIGATOR: Routson
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
KEYWORDS: OIL SHALE INDUSTRY;ENVIRONMENTAL EFFECTS;LIQUID WASTES;WASTE DISPOSAL;TERRESTRIAL ECOSYSTEMS;LAND POLLUTION;MONITORING

Energy Research and Development Administration/Albuquerque Operations Office

<087001>
TITLE: Nature of Aerosols
PROJECT NUMBER: 000336
PRINCIPAL INVESTIGATOR: Boecker, B.B.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (50%)
ENERGY CYCLE: EXTRACTION (5%);COMBUSTION IN SITU (5%);COMBUSTION OR END USE (5%);ELECTRICITY GENERATION (80%);WASTE MANAGEMENT (5%)
POLLUTANTS: NOXIOUS GAS (10%);METALS/Oxides (20%);PARTICULATES (20%);RADIATION/Radioactive aerosols (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (80%);DEVELOPMENT/Laboratory scale (20%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Development of methods for the production and characterization of aerosols in the required physicochemical form, including monodisperse aerosols, for inhalation toxiclogy studies is one of the objectives of this project. A second objective is the evaluation of the relative importance of various physicochemical properties on the biologically relevant deposition and dissolution behavior of inhaled materials.
APPROACH: Production of aerosols with the desired properties requires different procedures. Monodisperse aerosols are obtained by centrifugal separation followed by resuspension and nebulization. Vaporization methods are used for the production of ultrafine particles and Ru-1060/sub 4/ aerosols. Methods being developed and studied for aerosol characterization relate to determinations of aerodynamic diameters, real diameters, size distribution, density, chemical form, surface area, electrostatic charge and in vitro dissolution rates. These assessments of physical and chemical properties will be correlated with observed differences in biological behavior.
RESULTS: Based on studies conducted with monodisperse particles of pure and mixed actinide oxides, the relative importance of several physicochemical properties on their dissolution behavior will be assessed and general concepts derived. The stability, coagulation, gas-particle interaction and deposition behaviors of vapor condensation aerosols, Ru-1060/sub 4/-Ru-1060/sub 2/ and ultrafine Pu-2390/sub 2/ will be evaluated. Suitable methods for the determination of charge distribution and surface area of aerosol samples will be developed and used.
PROJECT MILESTONES: (1) Project summary on mixed oxide dissolution studies October 1, 1976. (2) Generation and exposure system developed for /sup 106/RuO/sub 4/ gas April 1, 1977. (3) Generation methods developed for ultrafine particles of /sup 239/PuO/sub 2/ July 1, 1977. (4) Report on self-charging of alpha-emitting aerosols October 1, 1977. (5) Summarize results for gravimetric surface area measurements October 1, 1977. (6) Develop Kr-85 method for surface area determination April 1, 1978. (7) Publish results on behavior of ultrafine /sup 239/PuO/sub 2/ particles July 1, 1978.
KEYWORDS: RADIOACTIVE AEROSOLS;CHEMICAL PREPARATION;INHALATION;TOXICITY;PARTICLE SIZE;TISSUE DISTRIBUTION;ANIMALS;CHEMICAL PROPERTIES;CURIUM 244;CERIUM OXIDES;LABELLED COMPOUNDS;PLUTONIUM 239;PLUTONIUM OXIDES;KRYPTON 85;RUTHENIUM 106

<087002>
TITLE: Radiation Dose Patterns From Inhaled Alpha-Emitting Radionuclides
PROJECT NUMBER: 000337
PRINCIPAL INVESTIGATOR: Mewhinney, J.A.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$332,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION/Alpha-emitting particulates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To assess the hazard represented by inhalation of transuranic aerosols in man, studies are conducted in experimental animals to determine the radiation dose imparted to lung and other tissues and organs after inhalation exposure to aerosols with different characteristics. The effects of different parameters such as particle size, specific activity, chemical form and elemental composition on these dose patterns are being studied to provide needed information for correlation with observed biological effects.
APPROACH: Single acute inhalation exposures of between 15 and 45 minutes duration are conducted using several

experimental animal species. Important parameters under investigation include animal age at inhalation exposure, species, chemical form of the aerosol, aerosol particle size and size distribution and specific activity of the aerosol particles. Serial sacrifice experiments are conducted to elucidate the role of these parameters on the initial respiratory tract deposition, lung retention and rate of translocation of the inhaled material to other body tissues and organs in order to define the pattern of radiation dose imparted as a function of time after inhalation exposure.
RESULTS: The radiation dose pattern data serve as vital input into the interpretation of biological response observed in this Institute's dose-response research using these aerosol forms. The data also will provide interspecies comparisons to assist in the extrapolation of animal data to make human risk estimates of the hazards associated with inhalation of aerosols formed from transuranic radionuclides.
PROJECT MILESTONES: (1) Report radiation dose patterns for Pu-239 O/sub 2/ in Syrian hamsters 1 October 1976. (2) Initiate studies with monodisperse particles of Pu-238 O/sub 2/ and Pu-239 O/sub 2/ in Fischer rats 1 December 1976. (3) Report radiation dose patterns for different particle sizes of Pu-238 O/sub 2/ and Am-241 O/sub 2/ in Syrian hamsters 1 March 1977. (4) Initiate study of particle size effects for monodisperse Pu-239 O/sub 2/ particles inhaled by Beagle dogs 1 April 1977. (5) Report current status of lung microdosimetry studies 1 July 1977. (6) Initiate studies with laboratory animals exposed to ultrafine aerosols of Pu-239 O/sub 2/ 1 October 1977. (7) Summarize results from study of particle size effects for Pu-238 O/sub 2/ inhaled by Beagle dogs 1 July 1978.
KEYWORDS: ALPHA PARTICLES;INHALATION;RADIATION DOSES;TRANSURANIUM ELEMENTS;RADIOACTIVE AEROSOLS;LUNGS;PARTICLE SIZE;AGE DEPENDENCE;RESPIRATORY SYSTEM;RETENTION;DATA;RADIATION HAZARDS;METABOLISM;TOXICITY;PLUTONIUM 238;PLUTONIUM 239;BEAGLES

<087003>
TITLE: Dose-Response Relationships for Inhaled Alpha-Emitting Radionuclides
PROJECT NUMBER: 000338
PRINCIPAL INVESTIGATOR: Boecker, B.B.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$1,043,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (20%);WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION/Alpha-emitting particulates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: There currently exists major concern over the adverse human health effects that would accompany extensive use of nuclear power systems utilizing alpha-emitting radionuclides in their fuel cycle. This project will provide quantitative dose-response information from laboratory animals exposed to alpha emitters encountered in this technology to assess the potential hazard to man.
APPROACH: Several animal species will be exposed by inhalation to graded levels of selected alpha-emitting radionuclides and observed over their lifespan. The experimental design will provide information on the influence of particle size, particle number, specific activity and cumulative local dose on the nature and time distribution of biological effects occurring in lung and other critical tissues. Of primary concern is the occurrence of cancer and those dose patterns which maximize this effect.
RESULTS: Studies currently under way will first provide data on the influence of particle size and particle number on early to intermediate forms of lung injury from inhaled Pu-238O/sub 2/ and Pu-239O/sub 2/. Of major interest will be the results obtained from continued longer-term observations of animals with lower lung burdens and the manner in which the patterns of alpha irradiation (uniform versus quite nonuniform) may influence the development of lung cancer.
PROJECT MILESTONES: (1) Expose rats to graded activity levels of monodisperse or polydisperse aerosols of Pu-239 O/sub 2/ and maintain for lifespan observation 1 January 1977. (2) Expose rats to graded activity levels of monodisperse or polydisperse aerosols of Am-241 O/sub 2/ and maintain for lifespan observation 1 April 1977. (3) Submit results of dose-response study with Syrian hamsters exposed to Pu-238 O/sub 2/ for publication 1 June 1977. (4) Complete exposures for one-half of total complement of dogs planned for the dose-response studies involving 0.75, 1.5 or 3.0 mu m particles of Pu-239 O/sub 2/ 1 July 1977. (5) Initiate a limited dose-response study with Rhesus monkeys exposed by inhalation to monodisperse particles of Pu-239 O/sub 2/ 1 December 1977. (6) Report status of dose-response study involving Beagle dogs exposed to monodisperse aeroscls of Pu-238 O/sub 2/ 1 April 1978. (7) Complete exposure of all dogs currently planned for inclusion in the Pu-239 O/sub 2/ dose-response study using 0.75, 1.5 or 3.0 mu m particles 1 July 1978.
KEYWORDS: RADIOISOTOPES;NUCLEAR POWER PLANTS;FUEL CYCLE;HEALTH HAZARDS;ALPHA PARTICLES;INHALATION;BIOLOGICAL RADIATION EFFECTS;LUNGS;RADIATION DOSES;NEOPLASMS;PLUTONIUM 238;PLUTONIUM 239;AEROSOLS;TOXICITY;AMERICIUM 241;BEAGLES;MONKEYS

<087004>
TITLE: Pathogenesis of Radiation-Induced Disease Caused by Inhaled Radionuclides
PROJECT NUMBER: 000339
PRINCIPAL INVESTIGATOR: Jones, R.K.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(29-2)-1013
FUNDING: Energy Research and Development Administration FY77:$665,000
TECHNOLOGY: NUCLEAR/General (20%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (80%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);ELECTRICITY GENERATION (70%)
POLLUTANTS: RADIATION/Radioactive particulates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: This project is aimed at providing detailed information on the injury and repair responses of the irradiated lung. Included are studies on (1) the functional changes in the lung resulting from chronic radiation injury, (2) morphologic and cytologic alterations occurring as part of the injury response, and (3) the biochemical alterations which lead to late-occurring diseases.
APPROACH: Closely interrelated in vitro and animal inhalation exposure studies will be conducted utilizing selected beta-gamma or alpha-emitting radionuclides encountered in nuclear power operations. Subsequent evaluation of the pathogenesis of changes in the injured lungs include biochemical, morphological, physiclogical, immunological and cytogenetic methodology.
RESULTS: The results of this research will delineate the significant tissue and cellular alterations which lead to serious lung diseases. These include changes in pulmonary clearance, collagen metabolism, pulmonary physiology, chromosomal structure, lung lipids, and changes in specific pulmonary cell types. The major emphasis will be on the pathogenesis of chronic, debilitating diseases and lung cancer which result from the local pulmonary deposition of alpha-emitting radionuclides. Of particular interest will be the delineation of events associated with transformation to neoplastic cells.
PROJECT MILESTONES: (1) Complete exposures for plutonium pathogenesis study 1 November 1976. (2) Delineation of local cell changes from inhaled alpha emitters 1 August 1977. (3) Identification of changes in immune responses from inhaled alpha emitteres 1 February 1978. (4) Definition of changes in collagen metabolism which leads to pulmonary fibrosis 1 June 1978.
KEYWORDS: LUNGS;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL REPAIR;RADIATION INJURIES;MORPHOLOGICAL CHANGES;RESPIRATORY SYSTEM DISEASES;INHALATION;RADIOISOTOPES;IMMUNE REACTIONS;BIOCHEMISTRY;PATHOGENESIS;ALPHA PARTICLES;AEROSOLS;PLUTONIUM;COLLAGEN;METABOLISM

<087005>
TITLE: Therapy for Inhaled Radionuclides
PROJECT NUMBER: 000340
PRINCIPAL INVESTIGATOR: Muggenburg, B.A.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISICN: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: P233-5355
TYPE OF FUNDING: Contract No.-E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$205,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: TRANSPORTATION (20%);STORAGE (20%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (20%);WASTE MANAGEMENT (20%)
POLLUTANTS: PARTICULATES/Radioactive (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is directed toward the development and evaluation of methods to prevent or treat radiation-induced disease. Objectives are to evaluate methods to remove radioactive material from the body; to demonstrate prevention of radiation-induced disease after radionuclide removal; to develop methods to treat delayed effects of radiation; and to evaluate the biomedical risks of these treatments.
APPROACH: Experiments will be done in beagle dogs and hamsters. Exposures will be single, acute and by inhalation to fission product and alpha-emitting radionuclides. Short-term experiments to evaluate treatments to remove radionuclides will be 2 to 3 months duration. Experiments to evaluate treatments to prevent or alter radiation disease will run 6 months to several years. Experiments will evaluate the relative removal of radionuclides from animals or the prevention of disease or altered disease endpoint and extended life span.
RESULTS: Removal of radionuclides by lung lavage in combination with chelation treatment will be demonstrated. The role of the alveolar macrophage in the removal process will be further defined. The effect of removal of inhaled radionuclides on induced diseases, particularly cancer, and effect of treatment on induced diseases will be evaluated.
PROJECT MILESTONES: (1) Lung lavage treatment risk assessment completed 1 October 1976. (2) Lung cell, particle and lavage interaction study completed 1 January 1977. (3) Treatment of radiation induced lung fibrosis completed 1 March 1977. (4) Lavage removal of alpha-emitting particles completed 1 July 1977. (5) Summary report on the therapeutic use of lavage completed 1 November 1977. (6) Prevention of disease by removal of alpha- or beta-emitting particles initiated 1 January 1978. (7) Macrophage-particle interaction used to increase lavage efficacy 1 July 1978.
KEYWORDS: RADIOISOTOPES;PLUTONIUM 238;PLUTONIUM 239;RESPIRATORY SYSTEM DISEASES;RADIOINDUCTION;REMOVAL;THERAPY;LUNGS;TRANSLOCATION;LAVAGE;INHALATION;DOGS;AEROSOLS;NEOPLASMS

<087006>
TITLE: Exposure to Internal and External Radiation
PROJECT NUMBER: 000474
PRINCIPAL INVESTIGATOR: Westendorf, W.H.;Bigler, W.A.
AFFILIATION: Mound Lab., Miamisburg, Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHCNE: P233-5355
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$22,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: NOXIOUS GAS/Nickel carbonyl (2%);METALS/Beryllium (2%);ORGANICS/Numerous (2%);RADIATION/Gamma/neutron/x-ray/alpha (94%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To provide data and information to the DBER funded group conducting the epidemiological study of lifetime health and mortality experience of employees of ERDA contractors.
APPROACH: Compile data and information required by the study group to establish the relationships, if any, between mortality patterns and levels of radiation exposures.
RESULTS: Determination of the presence or absence of any lasting biological effects on human populations of the low level occupational radiation exposures received by atomic energy workers over long periods of time.
PROJECT MILESTONES: Compilation of radiation exposure data and employee personnel, work history, and

industrial hygiene information through calendar year 1976 completed and submitted to study group by 9/30/77. Submission of updated information and data previously submitted to include calendar year 1977 by /30/78.
ORDS: PUBLIC HEALTH;MORTALITY;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;HEALTH AZARDS;MAN;EPIDEMIOLOGY;NEOPLASMS;HUMAN POPULATIONS;PERSONNEL

<087007>
TITLE: Chronic Inhalation Exposures to Radionuclides
PROJECT NUMBER: 000477
PRINCIPAL INVESTIGATOR: Lundgren, D.L.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-ERDA E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$286,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION/Radioactive particulates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is the objective of this project to compare the radiation dose pattern and resulting biological effects following repeated inhalation exposure with those following a single acute inhalation exposure.
APPROACH: The effect of repeated inhalation eposures on radiation dose patterns is being studied in beagles repeatedly exposed to Cs-137 labeled fused aluminosilicate particles (FAP). The deposition and retention of these particles is being determined during and after each exposure. The biological effects of repeated bimonthly inhalation exposure of beagles, mice and Syrian hamsters to Ce-144-FAP or Ce-144 O/sub 2/ is being studied. In other biological effects studies, mice and Syrian hamsters are being exposed bimonthly to Pu-239 O/sub 2/.
RESULTS: It is expected that additional data on the long-term retention of Cs-137-FAP in Beagle dogs will be obtained. The study of the biological effects of the repeated exposure of mice to Ce-144 O/sub 2/ will be completed. All repeated exposures of Syrian hamsters to either Ce-144 O/sub 2/ or Pu-239 O/sub 2/ will have been completed and preliminary data on the dosimetry and pulmonary histopathological changes obtained. Repeated inhalation exposures of mice to Pu-239 O/sub 2/ will also be completed with the mice being held for life span observation. Additional studies of the effects of repeated inhalation exposure of Beagle dogs for up to 10 years and rats for 1 year to either Pu-239 O/sub 2/ or Ce-144-FAP will have been initiated.
PROJECT MILESTONES: (1) Report early retention, dosimetry and biological effects for beagle dogs exposed repeatedly to Ce-144 FAP 1 October 1976. (2) Complete repeated exposures of mice to Pu-238 O/sub 2/ 1 January 1977. (3) Initiate repeated inhalation exposure of dogs to Ce-144 FAP Aerosols (10-year study) 1 January 1977. (4) Initiate repeated inhalation exposure of dogs to mono-disperse Pu-239 O/sub 2/ aerosols 1 April 1977. (5) Complete repeated exposures of Syrian hamsters to Pu-238 O/sub 2/ 1 July 1977. (6) Report biological effects of mice and Syrian hamsters exposed to Ce-144 O/sub 2/ 1 October 1977. (7) Report on biological effects of repeated inhalation exposures of Syrian hamsters to Pu-238 O/sub 2/ 1 July 1978.
KEYWORDS: INHALATION;CERIUM 144;PLUTONIUM 239;CESIUM 137;BEAGLES;RADIATION DOSES;CHRONIC IRRADIATION;ACUTE IRRADIATION;COMPARATIVE EVALUATIONS;LUNGS;NEOPLASMS;HAMSTERS;MICE;AEROSOLS;TOXICITY

<087010>
TITLE: Radiation Dose Patterns from Inhaled Beta-Gamma Radionuclides
PROJECT NUMBER: 001434
PRINCIPAL INVESTIGATOR: Snipes, M.B.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-ERDA E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$307,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION/Beta-gamma emitting particulates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to develop information defining dose patterns to lung and other tissues after inhalation of beta-gamma-emitting particulates by various animal species. Emphasis is placed on study of the influence of different physical, chemical and biological parameters of the aerosol and the exposed subject.
APPROACH: Experimental animals including mice, rats, Syrian hamsters, Beagle dogs, subhuman primates and ponies are typically exposed once, briefly, to a selected radioactive aerosol. Retention and metabolic patterns for the inhaled aerosol are defined for that animal species and exposure condition. Results are used to produce models to assist in defining radiation dose to critical tissues in animal dose-response studies. Dosimetric measurements are also made to study the distribution of radiation dose within and near tissues of importance.
RESULTS: Results will be used to construct models predicting the retention and metabolic patterns for inhaled adionuclides in experimental animals and man. Dose pattern information provides a needed input for the efinition of dose-response relationships in experimental animals and the needed extrapolations to human exposure situations. Additional data on the retention and metabolic patterns for specific particle sizes, uniformity of deposition, retention and dose patterns for inhaled radionuclides and additional data pertinent to the consequences of inhaling radionuclides will be available for use by individuals setting radiation protection standards and conducting hazard analyses.
PROJECT MILESTONES: (1) Initiate study of particle size effects on long-term pulmonary retention in

laboratory animals 1 November 1976. (2) Initiate study of behavior of Ru-106 O/sub 4/ gas inhaled by rodents 1 April 1977. (3) Report on the uniformity of pulmonary radiation dose in dogs that inhaled insoluble Sr-90/Y-90 1 July 1977. (4) Report on fractional energy absorption of beta emitters deposited i small organs and tissues 1 October 1977. (5) Initiate new radiation dose pattern studies with Ru-106 compounds using Beagle dogs 1 January 1978. (6) Progress report on particle size effects on pulmonary retention in laboratory animals 1 June 1978. (7) Report on Pm-147-labeled particulate distribution patterns in the lungs of dogs 1 September 1978.
KEYWORDS: RADIOISOTOPES;INHALATION;BETA PARTICLES;GAMMA RADIATION;LUNGS;RADIATION DOSES;RADIOACTIVE AEROSOLS;MICE;RATS;HAMSTERS;BEAGLES;PRIMATES;RETENTION;METABOLISM;BIOLOGICAL MODELS;DOSE-RESPONSE RELATIONSHIPS;PARTICLE SIZE;CERIUM 144;STRONTIUM 90;RUTHENIUM 106;CESIUM 134;ANIMALS;TOXICITY

<087011>
TITLE: Dose-Response Relationships for Inhaled Beta-Emitting Radionuclides
PROJECT NUMBER: 001435
PRINCIPAL INVESTIGATOR: Hahn, F.F.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$607,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (10%);ELECTRICITY GENERATION (80%);WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION/Beta-emitting particles (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective is to identify dose-related health effects resulting from inhaled beta-emitting radionuclides.
APPROACH: Animals have been exposed by inhalation to graded activity levels of selected beta-emitting radionuclides with different physical parameters which result in different radiation dose patterns in the body. They are being maintained for their lifespans to determine the resulting pathologic and carcinogenic effects of inhaled radionuclides. Beagle dogs have been exposed once to graded levels of aerosols of soluble or insoluble forms of Y-90, Y-91, Cs-137, Ce-144 or Sr-90. Initial body burdens range from those which cause acute injury and early deaths to those which may result in no discernible effects. The influence of age is being studied in dogs exposed when immature or aged. Syrian hamsters and mice have been exposed to Ce-144O/sub 2/ to determine differences in species response to inhaled beta-emitting radionuclides.
RESULTS: These studies will determine the relative importance of dose rate versus cumulative dose in causing pulmonary injury and late-occurring diseases, such as lung cancer, in a relatively large, long-lived species. They will also permit correlation between tumor types and local radiation dose. Multispecies comparisons will strengthen extrapolation of data to man. These results will provide needed input for hazard analyses.
PROJECT MILESTONES: (1) Add additional blocks of immature dogs to dose-response study with insoluble Ce-144 1 October 1976. (2) Initiate dose-response study with Fischer 344 rats exposed to insoluble Ce-144 1 October 1976. (3) Report on dose-response relationships to Syrian hamsters exposed to Ce-144 O/sub 2/ 1 January 1977. (4) Report on the early and intermediate biological effects in Beagle dogs exposed to Ce-144 Cl/sub 3/ or Y-91 Cl/sub 3/ 1 April 1977. (5) Complete dose-response exposures of all immature dogs to insoluble Ce-144 1 November 1977. (6) Initiate preliminary dose-response study with Rhesus monkeys exposed to insoluble Ce-144 1 March 1978. (7) Summarize results for BALB/c mice exposed to insoluble Ce-144 1 September 1978.
KEYWORDS: YTTRIUM 90;YTTRIUM 91;CESIUM 137;CERIUM 144;STRONTIUM 90;BEAGLES;HAMSTERS;MICE;INHALATION;BIOLOGICAL RADIATION EFFECTS;DOSE-RESPONSE RELATIONSHIPS;AEROSOLS;NEOPLASMS;LUNGS;TOXICITY

<087012>
TITLE: Applied Health Protection Considerations for Inhaled Radioactive Aerosols
PROJECT NUMBER: 001437
PRINCIPAL INVESTIGATOR: Cuddihy, R.G.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$62,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (70%);COMBUSTION OR END USE (30%)
POLLUTANTS: RADIATION/Inhaled lanthanides and actinides (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Efforts will be directed toward analyzing, developing and promoting the use of appropriate aerosol sampling metals for radioactive aerosols, determiing their physical-chemical characteristics and incorporating this information into current models for describing metabolism and dosimetry for inhaled radionuclides.
APPROACH: Efforts within this project are being directed toward development of mathematical models of the metabolism and dosimetry of inhaled radionuclides, identifying the most important aerosol characteristics which influence metabolism and dosimetry, reviewing information on aerosol samplers to identify the most useful devices for characterization and to apply these methods to existing problems surrounding nuclear industrial operations.
RESULTS: A new generalized model for describing retention and dosimetry of inhaled radioactive aerosols will be developed using experimental animal studies and similar information in humans where available. This model will incorpcrate aerosol particle size and solubility measurements. Experience gained in integrating

these measurements and analyses will be used to formulate and promote improved field sampling techniques and be available for analyzing specific accidental releases as they may occur from nuclear industrial perations.
ECT MILESTONES: (1) Models for describing the metabolism and dosimetry for inhaled lanthanides and uthenium 1 January 1977. (2) Models for describing the metabolism and dosimetry for inhaled actinides, especially plutonium, americium and curium 1 January 1977. (3) Recommendations for aerosol sampling devices useful in industrial environments to size particles and determine their solubility will be summarized 1 January 1978.
KEYWORDS: PLUTONIUM ISOTOPES;AMERICIUM ISOTOPES;CURIUM ISOTOPES;CERIUM ISOTOPES;LANTHANUM ISOTOPES;EUROPIUM ISOTOPES;RUTHENIUM ISOTOPES;NIOBIUM ISOTOPES;INHALATION;DOSIMETRY;METABOLISM;RADIOACTIVE AEROSOLS;MATHEMATICAL MODELS;RADIATION PROTECTION;COMPUTER CODES

<087013>
TITLE: Plutonium Aerosols in Industrial Operations
PROJECT NUMBER: 001446
PRINCIPAL INVESTIGATOR: Newton, G.J.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, R.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(29-2)-1013
77 FUNDING: Energy Research and Development Administration FY77:$62,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (10%);ELECTRICITY GENERATION (90%)
POLLUTANTS: RADIATION/Plutonium and transplutonium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Plutonium aerosols are produced in routine operations in the nuclear industry. These aerosols could be accidentally released from their normal containment vessels or enclosures and be inhaled by personnel working nearby. These aerosols are being characterized to provide needed input to hazard analyses for these activities.
APPROACH: This research involves field measurements of plutonium aerosols within safety enclosures at selected industrial sites. Samples are used to assess: radioactive aerosol concentration, aerodynamic and geometric size distributions, physical density and shape factors, electrostatic charge distribution and in vitro dissolution characteristics.
RESULTS: Studies of plutonium aerosols formed during mixed oxide fuel fabrication will be completed. Plants to be studied are Westinghouse-Hanford, Kerr-McGee and Babcock and Wilcox. Major effort will be in characterizing aerosols at various plutonium-uranium oxide powder mixing operations and centerless grinding operations. If commercial reprocessing starts, these plants will also be studied. Studies at Rocky Flats, Colorado and Mound Laboratories will characterize aerosols as formed in fabrication of nuclear weapons and SNAP devices. Anticipated results are respirable sized plutonium aerosols at concentrations 10/sup 6/ to 10/sup 10/ times MPC/sub a/ that exhibit plutonium solubility characteristics 10/sup 4/ times as soluble as pure Pu-239 O/sub 2/. Lung retention half-times of approximately 150 days are predicted in the event of an inhalation accident.
PROJECT MILESTONES: (1) 1 October 1976 Publication of HEDL Studies. (2) 1 November 1976 Publication of Kerr-McGee Studies. (3) 1 November 1976 Sample at Rocky Flats, Colorado. (4) 1 February 1977 Publication of Babcock and Wilcox Studies. (5) 1 February 1977 Sample at Mound Laboratory, Ohio. (6) 1 October 1977 Publication of mixed oxide fuel studies. (7) 1 February 1978 Publication of Rocky Flats Studies. (8) 1 August 1978 Publication of Mound Laboratory Studies.
KEYWORDS: PLUTONIUM 239;RADIOACTIVE AEROSOLS;NUCLEAR FACILITIES;INHALATION;RADIATION MONITORING;MAN;HEALTH HAZARDS;BIOLOGICAL RADIATION EFFECTS;TOXICITY

<087014>
TITLE: Project Da Vinci
PROJECT NUMBER: 1520
PRINCIPAL INVESTIGATOR: Luna, R.E.
ADDRESS: Sandia Laboratories, Division 5443, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Moses, Harry
TELEPHONE: F233-5572
TYPE OF FUNDING: Contract No.-AT(29-1)-789
77 FUNDING: Energy Research and Development Administration FY77:$122,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: TRANSPORTATION (50%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (40%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Project Da Vinci is a series of instrumented balloon flights to investigate the transport and transformation of pollutants on a time scale of days and over distances of a few hundred kilometers. The objectives of the program are to: (1) elucidate the chemical and physical processes which transform primary pollutants to other forms which are potentially more damaging to man and (2) develop and verify models which can be used to predict the observed transformation and the interregional impacts of such sources of aged pollutants.
APPROACH: The balloon payload contains a complement of equipment for direct measurement of principal gaseous pollutants as well as filter and grab sampling systems for particulate and other stable trace chemical species in the atmosphere. In addition, supporting measurements of temperature, humidity, solar uv flux, and other basic data are made to establish the flight environment; and measurements of relative motion of the balloon with respect to the air mass and of turbulent properties in the near vicinity are also made. The balloon payload is sufficiently large that flights lasting as long as 36 to 48 hours are possible.

This implies continuous characterization of the air parcel over distances ranging from 500 to 700 kilometers from its source.
RESULTS: Da Vinci data should be most useful in documenting the interregional impacts of pollutants emanating from power plants and other diverse sources. Understanding the mechanism by which transformations occur, the principal species involved, and the resultant concentrations should provide means for defining the sources of rural ozone and acid rain, for example, and suggest possible control measures to minimize adverse consequences.
PROJECT MILESTONES: (1) Nov. 1, 1976 Publish Summary and Data Report for Da Vinci II and III. (2) Mar. 1, 1977 Publish interpretive report on Da Vinci II and III.
KEYWORDS: AIR POLLUTION;MONITORING;BALLOONS;SAMPLING;METEOROLOGY;MEASURING INSTRUMENTS;PLUMES;ENVIRONMENTAL TRANSPORT;CHEMICAL REACTION KINETICS;POWER PLANTS;GASEOUS WASTES

<087019>
TITLE: Somatic Cell Chromosome Changes in Humans Exposed to Radon-222 and Plutonium-239
PROJECT NUMBER: 007049
PRINCIPAL INVESTIGATOR: Brandom, W.F.
ADDRESS: Department of Biological Sciences, University of Denver (Colorado Seminary), Denver, CO 80210
AFFILIATION: Denver Univ., Colo. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Parker, Dean R.
TELEPHONE: C(301)353-3681
TYPE OF FUNDING: Contract No.-E(29-2)-3639
77 FUNDING: Dow Chemical Co. Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Radon and plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Rocky Flats
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Underground uranium miners are at increased risk of lung cancer and the radiotoxicity of plutonium has been confirmed in animal experiments. The objective of our research is to seek a biological dose-response in workers exposed to daughters of Radon-222 and Plutonium-239. The biological response we use for uranium miners and plutonium workers is the prevalence of chromosome breaks and rearrangements in cells of workers with different estimated exposures to the radionuclides and controls. The biological response results are compared to demographic, medical history, and physical dose estimate data. The somatic cell chromosome mutation rates may provide a biological indication of a toxicological problem.
APPROACH: The test system used is the readily obtained, radiosensitive, human peripheral blood lymphocytes. The lymphocytes are grown in vitro for one cell cycle. The cells are arrested at metaphase and the chromosomes banded and analyzed for dicentric, ring, inversion, translocation, and deletion aberrations. After analysis, the worker (or control) is assigned to an appropriate exposure group based on physical dose estimates of exposure or burden. The prevalence of aberrations/100 cells is plotted against physical dose estimates. In addition to the population studies, individuals with aberrations markedly in excess of control levels or with any heritable chromosomal variation are so appraised. Exposure conditions are by inhalation in the miners and by inhalation or wound in the Pu-workers. The radiation is usually chronic.
RESULTS: Biological Endpoints: Although, in the state of the art, health risks should not be deduced from the somatic cell chromosome aberrations study, this is one kind of testing for potential mutagenicity. In addition, the biological dose-response indicator is yielded directly from the men's cells and with a biological directness that cannot be obtained with physical dose methods. A biological dose-response is evolving in these two worker populations, but implications go beyond workers in a carefully controlled nuclear industry and include concern for nuclide waste safety for long periods of time. The relationship, if any, with biomedical late-effects will only be determined at an undefined later time. For now, we have observed a model biological response measure that may be useful for other non-nuclear, energy producing pollutants.
PROJECT MILESTONES: The evolution of a biological dose-response to low-level, chronic in vivo irradiation required a sufficient population and cell sample. We have attained this milestone in both the uranium miner and plutonium worker populations. A future milestone would be the confirmation of a biological dose-response at the lowest estimated exposure levels in both the miners and plutonium workers, thereby revealing a test sensitivity not fully anticipated in the beginning of the study.
KEYWORDS: CYTOGENETICS;URANIUM MINERS;PLUTONIUM 239;RADON 222;DAUGHTER PRODUCTS;TOXICITY;PERSONNEL;MINERS;CHROMOSOMAL ABERRATIONS;RADIOINDUCTION;DOSE-RESPONSE RELATIONSHIPS;BIOLOGICAL INDICATORS;LYMPHOCYTES;GENETICS;IN VIVO;MUTATIONS

<087021>
TITLE: Analysis of Ocean Bed Disposal
PROJECT NUMBER: 800002
PRINCIPAL INVESTIGATOR: Anderson, D.R.;Talbert, D.M.
ADDRESS: Sandia Laboratories, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-E(29-1)-789
77 FUNDING: Energy Research and Development Administration FY77:$1,000,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION/Solidified HLW (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Far West;HYDROGRAPHIC AREAS/Deep ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;ECT
PROJECT DESCRIPTION: Ultimate objective of the program is the development and proof of a capability for the emplacement of high-level wastes into the submarine geologic formations of the deep oceans.
APPROACH: Define the disposal medium and the adjacent media, the natural processes, and the processes that

would be either altered or imposed by the presence of a high-level radioactive waste package.
RESULTS: Accomplishment of the objective.
PROJECT MILESTONES: (1) 1980 Assessment of concept from effects data. (2) 1985 Assessment of concept from engineering data. (3) 1990 Fully developed concept and assessment based on a pilot demonstration.
KEYWORDS: RADIOACTIVE WASTE DISPOSAL;MARINE DISPOSAL;FEASIBILITY STUDIES;PLUTONIUM;RADIOACTIVE WASTES;SAFETY

<087023>
TITLE: Package Failure from Malevolent Attack
PROJECT NUMBER: 800036
PRINCIPAL INVESTIGATOR: Suber, L.A. Jr.
ADDRESS: Sandia Laboratories, Division 1754, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Sisler, James A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-E-(29-1)-789
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (40%);FULL SCALE DEMONSTRATION (60%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental;COASTS/Other coasts Unspecified;HYDROGRAPHIC AREAS/Other hydrographic areas All
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Determine vulnerability of selected radioactive material packages to malevolent attack, quantify resulting contamination, if any, and determine practical measures for improving package resistance to attack.
APPROACH: (1) Categorize various packages by structure, contents and frequency of use. (2) Determine likely modes of adversary attack. (3) Conduct simulated attacks on model and full scale packages to determine damage. (4) For attacks likely to result in dispersion of radioactive material, conduct tests with suitable instrumentation to measure quantity and distribution of dispersed material. (5) Through analysis and test, investigate methods of improving package resistance to attack.
RESULTS: (1) Document threshold of attack above which package is breached and radioactive material is scattered. (2) Provide a prior information on magnitude of dispersal problem which can be expected if attack occurs for use in emergency planning. (3) Provide methods of improving package designs for attack resistance. (4) Provide checklist of most effective/appealing attack modes for use by security personnel engaged in planning, training and operations.
PROJECT MILESTONES: (1) Conduct air drop tests mid FY 75. (2) Conduct obsolete cask explosive tests begin FY 75, complete late FY 76. (3) Define package characterization begin mid Fy 76, complete FY 76A. (4) Conduct adversary simulation analysis begin mid FY 76, complete early FY 77. (5) Conduct simulated attack testing begin FY 76A, complete mid FY 77. (6) Conduct dispersal tests and analysis FY 77.
KEYWORDS: ADVERSARY;RADIOACTIVE MATERIALS;PACKAGING;SABOTAGE;CONTAMINATION;RADIATION MONITORING;AEROSOLS;PLUTONIUM;TRANSPORT

<087024>
TITLE: Study of Physical Parameters of Transportation Accidents
PROJECT NUMBER: 800037
PRINCIPAL INVESTIGATOR: Dennis, A.W.
ADDRESS: Sandia Laboratories, Division 1282, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Sisler, James A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-E-(29-1)-789
77 FUNDING: Energy Research and Development Administration FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (75%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To quantify the severities of transportation accidents on a probability of occurrence basis.
APPROACH: Collect available data, support and build analytical models of missing data. Analyze data.
RESULTS: Final report of study findings.
PROJECT MILESTONES: (1) Initial study report distribution August 1, 1976. (2) Final report, large container October 1, 1976. (3) Final report, waterways October 1, 1977.
KEYWORDS: ENVIRONMENTS;CASKS;TRANSPORT;ACCIDENTS;DATA ACQUISITION

<087025>
TITLE: Full Scale Vehicle Testing Program
PROJECT NUMBER: 800043
PRINCIPAL INVESTIGATOR: Yoshimura, H.R.
ADDRESS: Sandia Laboratories, Division 5432, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Brobst, William A.; Sisler, James A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-AL-3617A
77 FUNDING: Energy Research and Development Administration FY77:$830,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)

REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: (1) Conduct of full scale truck impact test Oct. 30, 1976. (2) Conduct of full scale grade crossing test Dec. 31, 1976. (3) Conduct of full scale impact and fire test of a special rail car FY 77 or FY 78.
APPROACH: Full scale hazardous material packaging systems will be exposed to a series of extreme full scale transportation accidents that will be carried out under laboratory controlled conditions. This test series will measure the response of actual hardware to real accident conditions. Prior to each full scale test, analyses and scale model tests will be conducted as necessary to predict the results of the full scale test and to understand the response of the packaging system.
RESULTS: These tests will provide a means for assessing the validity of ERDA's analytical and scale modeling techniques. Instrumentation will be used to measure accident parameters in extreme accident transportation environments. Full scale crash tests are spectacular events and will create considerable public and media interest. This high level of interest will be useful in that the public will gain knowledge and understanding of the processes used to assure public safety.
KEYWORDS: REPLICA SCALE MODELING;SPENT FUEL CASKS;DESTRUCTIVE TESTING;VEHICLES;ACCIDENTS;DATA ACQUISITION;PLUTONIUM;SAFETY;TRANSPORT

<087026>
TITLE: Maintenance of a Transportation Environmental Data Bank
PROJECT NUMBER: 800049
PRINCIPAL INVESTIGATOR: Foley, J.T. Jr.;Davidson, C.A.
ADDRESS: Sandia Laboratories, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Sisler, James A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-E-(29-1)-789
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Collect, store, and make available for use, data concerning the intensity and duration of environmental parameters generated in the transportation of energy materials. Both normal and abnormal (accident) situations will be evaluated.
APPROACH: (1) Dispense data presently stored in the ERDA Transportation Environmental Data Bank (established FY 75). (2) Review and store new data from standard sources. (3) Search for and store missing data from new sources. (4) Conduct or recommend new data gathering endeavors to obtain data unobtainable from 1 or 2 above. (5) Perform analyses of data from 3 above to place it in most useful form.
RESULTS: (1) A ready source of transportation environmental data will be maintained on a continuing basis. (2) Gaps of needs for new data will continue to be identified and reported. (3) New data sources will be located and reported. (4) Recommendations will be developed for possible regulatory actions where accident reporting can be improved. (5) Data and data needs will be reviewed and recommendations will be developed for laboratory tests to acquire needed data.
PROJECT MILESTONES: (1) Acquisition of initial ship accident data Aug. 15, 1976. (2) Distribution of report, Transportation Accident Data Needs (Parameter Study) Sep. 30, 1976. (3) Second report, Transportation Accident Data Needs to include Accident Data Sources, Recommendations for Regulatory Actions, Recommendations for Tests to acquire data Sep. 30, 1977. (4) Semi-annual reports Sep. 30, 1976.
KEYWORDS: ENVIRONMENTS;NORMAL;ABNORMAL);RADIOACTIVE MATERIALS;TRANSPORT;SAFETY;CASKS;TESTING;DATA;INFORMATION SYSTEMS;PACKAGING;MATERIALS HANDLING

<087027>
TITLE: Transport of and Containers for Radioactive Materials - Films
PROJECT NUMBER: 800050
PRINCIPAL INVESTIGATOR: Colgan, R.C.
ADDRESS: Sandia Laboratories, Division 3153, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Brobst, William A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-E-(29-1)-789
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To produce films (motion pictures) on the packaging and shipping of radioactive materials. To provide motion picture coverage of Sandia tests and projects being conducted for the Transportation Staff/ECT/ERDA, and provide and/or coordinate motion picture coverage of other ERDA laboratories or multi-laboratory projects in this area.
APPROACH: Prepare a film specification sheet on a specific topic defined by the Transportation Staff. This sheet will define the film's purpose, content, audience, length and production analysis. It will be followed by a film treatment (more completely stating what and how material will be presented), then, a shooting script and photography to gain the needed visuals, followed by a narration script, narration, editing, interlock and optical-track prints.
RESULTS: In FY 76 and 76T, production of a 30-minute, sound, color film, ''The Indispensable Element,'' on the packaging of radioactive materials. Production of two sound films (shot by Aerojet Nuclear Co.) on the retrieval and storage of transuranic wastes. Production of a sound film, ''Ship with Care,'' for use in the ERDA traveling exhibit on packaging and shipping of radioactive materials. Production of several silent, interim report films on Sandia's testing of spent fuel casks. In FY 77, the production of an information film for use with non-technical public audiences on the overall testing program for the various types of radioactive-material containers and casks.
PROJECT MILESTONES: For the review and approval of the Transportation Staff and other technical consultants,

there will be significant milestones during the production, such as film specification sheet, treatment, narration script (with some scene description) and interlock. Other significant milestones will be the completion of given areas of work, such as Research, Photography, Editing, Animation Art and Photography, Conforming and Release (optical-track) Prints.
KEYWORDS: FILMS;RADIOACTIVE MATERIALS;PACKAGING;TRANSPORT;SPENT FUEL CASKS;TESTING

<087032>
TITLE: Determination of the Environmental Impacts of In Situ Coal Gasification on Groundwater Quality
PROJECT NUMBER: 800071
PRINCIPAL INVESTIGATOR: Fischer, D.D.
ADDRESS: Laramie Energy Research Center, U.S. ERDA, P.O. Box 3395, Laramie, WY 82071
AFFILIATION: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Gottlieb, Myron
TELEPHONE: F353-5510
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$208,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (40%);PARTICULATES (10%);ORGANICS (40%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Far West;COASTS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas Groundwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Determination of the impacts of in situ coal gasification on groundwater quality within the target coal seam and adjacent to the target coal seam.
APPROACH: Pre- and post-test aquifer characterization and groundwater sampling and analyses will determine changes in groundwater flow patterns as well as changes in groundwater quality with quantification of contaminant concentrations as functions of time and distance from the gasified area.
RESULTS: (1) Model predictions of dispersion of contaminants leached from the gasified area. (2) Site specific data for the Hanna, Wyoming, site where the tests are being conducted.
PROJECT MILESTONES: (1) Pre-test aquifer characterization and water quality determinations--Completed. (2) In situ coal gasification test conducted--Completed. (3) Post-test water sampling and analyses--Oct 77 to Mar 79. (4) Data interpretation and dispersion modeling--Jan 78 to Jun 79. (5) Final report quantifying results--Jun 79.
KEYWORDS: COAL GASIFICATION;ENVIRONMENTAL EFFECTS;GROUND WATER;WATER QUALITY;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;IN-SITU GASIFICATION

<087035>
TITLE: Environmental and Fire Hazards of Materials Used for Solar Heating and Cooling
PROJECT NUMBER: 800171
PRINCIPAL INVESTIGATOR: Brannon, P.J.;Ley, K.J.;Russell, J.C.;Harrah, L.A.
ADDRESS: Sandia Laboratories--Division 5443, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Boehm, Douglas
TELEPHONE: F233-5587
TYPE OF FUNDING: Contract No.-E(29-1)-789
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: SOLAR/Direct heat - cool (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The primary purpose of this project is to compile a list of SHAC materials (working fluids, storage media, insulations, and other materials) and to examine them from the viewpoints of toxicity, fire safety, economics, and engineering properties. Included in the list will be commonly used materials with similar properties for comparison. This list is to be suitable for distribution to the public and is envisioned to be used by the homeowner as a guide for selecting, using, and disposing of SHAC materials.
APPROACH: A complete literature and manufacturer survey or a preliminary chemical analysis as last resort will be made to determine the composition of the working fluids, storage media and solid materials. Discretion will be exercised in selecting the detail of the analysis for each candidate material. Those not immediately found to be of minimal environmental consequence will be investigated further in Phase II.
RESULTS: The data compiled in FY 77 will be presented in a written report to ERDA for issue to the general public. The language used in the report will be understandable to the average homeowner. Those materials for which insufficient composition and toxicity data are available will be studied further by experimental means.
PROJECT MILESTONES: October 1--Submission of draft report for ERDA review; January 31--Final report.
KEYWORDS: EMISSIONS;SOLAR HEATING SYSTEMS;SOLAR COOLING SYSTEMS;MATERIALS;WORKING FLUIDS;THERMAL INSULATION;TOXICITY;HAZARDS;FIRES;ECONOMICS;ENVIRONMENTAL EFFECTS;CARCINOGENS;WASTES

<087036>
TITLE: Assessment of the Radiological Impact of Western Coal Utilization
PROJECT NUMBER: 800118
PRINCIPAL INVESTIGATOR: Styron, C.E.
ADDRESS: Mound Laboratory, P.O. Box 32, Miamisburg, OH 45342
AFFILIATION: Monsanto Research Corp., Miamisburg, Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Witmer, Fred E.
TELEPHONE: F233-5517
TYPE OF FUNDING: Interagency agreement-IAG-D5-E681
77 FUNDING: Energy Research and Development Administration FY77:$60,000; Environmental Protection Agency FY77:$30,000; Federal Energy Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: RADIATION/Pu;RADIATION/Po;RADIATION/Pb;RADIATION/U;RADIATION/Th (100%)
CHARACTER OF STUDY: RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This study is designed to provide an indication of the potential environmental impact of radionuclides mobilized from combustion of Western coal in electric generating plants. Specific objectives involve (1) an assessment of the radionuclides U-234 and U-238, Po-210, Pb-210, Ra-226, and Th-230 in samples of coal from major Western mines as well as coal, ash, stack effluents, air, soil, and vegetation associated with a power plant using Western coal; (2) an evaluation of radiation doses to populations; and (3) a determination of the need for further research.
APPROACH: In this preliminary study, the samples described above are prepared for and analyzed by alpha pulse height spectrography. The data will be used to close the radionuclide balance for a power plant and in modeling radiation dose to the population adjacent to the power plant. The predicted population dose, projected future use of Western coal, and problems identified as significant but not fully addressed in the preliminary study will be used in evaluating the need for further research.
RESULTS: (1) Data will be obtained on concentrations of U-234 and U-238, Po-210, Pb-210, Ra-226 and Th-230 in coal from major Western mines; mobilization of these radionuclides during combustion; deposition on surrounding terrain; and partitioning to ash residues. (2) Estimates will be made of radiation dose to people residing in the area and/or feeding on crops from the area. (3) An evaluation will be made of the need for further research.
PROJECT MILESTONES: (1) Modifying analytical procedures and developing quality control for analysis of U-234 and U-238, Po-210, Pb-210, Ra-226, and Th-230 in coal, bottom ash, fly ash, air (filters), soil and vegetation. (2) Analysis of samples from major Western mines and one power plant for specified radionuclides. (3) Close radionuclide balance for power plant. (4) Evaluation of population dose estimates. (5) Synthesis of information and generation of report.
KEYWORDS: COAL INDUSTRY;ELECTRIC GENERATORS;ENVIRONMENTAL IMPACTS;COMBUSTION;RADIOACTIVE WASTES;COAL MINES;GASEOUS WASTES;AIR POLLUTION;SOILS;PLANTS;POWER PLANTS;HUMAN POPULATIONS;RADIATION DOSES;DATA ANALYSIS;URANIUM 234;URANIUM 238;POLONIUM 210;LEAD 210;RADIUM 226;THORIUM 230

<087037>
TITLE: Seabed Disposal Program
PROJECT NUMBER: 002221
PRINCIPAL INVESTIGATOR: Anderson, D.R.
ADDRESS: Sandia Laboratories, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D. Heyward
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-E(29-1)-789
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION/Solidified HLW (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Far West;HYDROGRAPHIC AREAS/Deep ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Ultimate objective of the program is the development and proof of a capability of disposing high-level wastes into the submarine geologic formations of the deep oceans.
APPROACH: Define the disposal medium and the adjacent medium, the natural processes, and the processes that would be either altered or imposed by the presence of a high level radioactive waste package.
RESULTS: Accomplishment of the objective.
PROJECT MILESTONES: (1) 1980 Assessment of concept from effects data. (2) 1985 Assessment of concept from engineering data. (3) Fully developed concept and assessment based on a pilot demonstration.
KEYWORDS: GEOLOGIC STRUCTURES;SEAS;SEA BED;RADIOACTIVE WASTES;ENVIRONMENTAL EFFECTS;RADIOACTIVE WASTE DISPOSAL;UNDERGROUND DISPOSAL;PLUTONIUM;SAFETY

<087038>
TITLE: Office of Environmental Policy, Sandia Laboratories
PROJECT NUMBER: 002229
PRINCIPAL INVESTIGATOR: Snyder, W.A.
ADDRESS: P.O. Box 5800, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Wachholz, Bruce W.
TELEPHONE: F233-4365;C(301)353-4365
TYPE OF FUNDING: Contract No.-EY-76-C-04-0789
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: NUCLEAR/General (100%)

ENERGY CYCLE: EXTRACTION (100%)
---LUTANTS: RADIATION (50%);SPECIFIED OTHER POLLUTANTS/Toxic substances (50%)
RACTER OF STUDY: ANALYTICAL (100%)
IONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To analyze the relationships among technical, environmental, health, economic and societal factors and regulations as they affect energy research, development, and demonstration policy decisions or affect commercialization of developed energy systems.
APPROACH: Conduct specific studies on the environmental constraints to uranium supply and the impact of regulation of toxic substances on ERDA programs and operations.
RESULTS: Periodic topical reports and monthly progress reports.
KEYWORDS: ENERGY SOURCES;DECISION MAKING;URANIUM;ENVIRONMENTAL EFFECTS;NUCLEAR FUELS;TOXICITY;LEGAL ASPECTS;POLLUTION LAWS;REGULATIONS;ENVIRONMENT;SOCIO-ECONOMIC FACTORS;RESEARCH PROGRAMS

<087039>
TITLE: The Effect of Low Frequency Electromagnetic Fields on Biological Systems
PROJECT NUMBER: 2836
PRINCIPAL INVESTIGATOR: Wayland, J.R. and Brannen, J.P.
ADDRESS: Sandia Laboratories, P.O. Box 5800, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn
TELEPHONE: C(301)353-3681
TYPE OF FUNDING: Contract No.-E(29-1)789;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$140,000
TECHNOLOGY: CONSERVATION/End use (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/60-Hertz electric field (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Evaluate genetic changes due to electric fields.
APPROACH: The project involves a joint effort by investigators at the Sandia Laboratories in Albuquerque and the Los Alamos Scientific Laboratory (LASL). In the LASL effort, mammalian cells are exposed in vitro (conducting medium) to 60-Hertz electric fields to evaluate possible genetic changes or perturbations of cell replication, growth, or survival. Effects on chromosome structure will also be investigated. These experimental activities will be closely integrated with a theoretical study at Sandia of rate processes in both exposed and unperturbed systems. A study of bioeffects of 60-Hertz magnetic fields will be added during the next year.
KEYWORDS: ELECTROMAGNETIC RADIATION;ELECTRIC FIELDS;BIOLOGICAL EFFECTS;HEALTH HAZARDS;BIOLOGICAL REPAIR;GENETIC RADIATION EFFECTS;CELL DIVISION;DNA;RNA;CHROMOSOMAL ABERRATIONS;MUTAGENESIS

<087040>
TITLE: Low BTU Gasifier-Biological Characterization of Field Collected Effluents
PROJECT NUMBER: 2676
PRINCIPAL INVESTIGATOR: Carpenter, R.L.
ADDRESS: Inhalation Toxicology Research Institute, P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, Murray
TELEPHONE: C(301)353-3683
TYPE OF FUNDING: Contract No.-EY-76-C-04-1013;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (67%)
POLLUTANTS: NOXIOUS GAS (30%);METALS/Trace (10%);PARTICULATES (30%);ORGANICS/Including organic metallics;ORGANICS/PAH (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Methods are under development to obtain aerosol and gas samples from low Btu coal gasifiers in order to predict possible fugitive and stack emissions. The high temperatures and pressures present requires development of methods to sample and characterize aerosols from hot gas streams.
APPROACH: Following method development, aerosol samples will be obtained for chemical, physical and biological characterization and toxicological evaluation. Emphasis will be placed on characterizing potential organic, organometallic and trace metal emissions. Deposition-retention studies in rodents using material from gasifier streams will determine the lung burden buildup and removal rates of metals from lung. Particulate samples will be subjected to in vitro dissolution studies for correlation with dissolution rates in lung. Analysis of the dissolved fraction of effluent samples as well as in vivo data will be used to determine dissolution kinetics of a number of elements. Analysis of lung deposition-retention patterns for organics will require the use of serial sacrifice studies with lungs and other organs analyzed for exposure material and metabolites. Tissues will be digested and extracts subjected to high performance liquid chromatography to separate and quantitate materials of interest.
RESULTS: These data will assist in selecting specific materials for more definitive health risk assessment studies.
KEYWORDS: LOW BTU GAS;BIOLOGICAL EFFECTS;ENVIRONMENTAL TRANSPORT;ORGANIC COMPOUNDS;COAL;AEROSOLS;GASEOUS WASTES;RATS;METALS;METABOLISM;IN VITRO;IN VIVO;LUNGS;DEPOSITION;TOXICITY;COAL GASIFICATION;ENVIRONMENTAL IMPACTS;HYDROCARBONS

<087041>
TITLE: Lung Cell Injury from NOx
PROJECT NUMBER: 2491
PRINCIPAL INVESTIGATOR: Pfleger, R.C.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (30%);PARTICULATES (50%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;OS
PROJECT DESCRIPTION: To determine the physiological and biochemical basis for acute and delayed lung damage resulting from acute and chronic exposure of experimental animals to NOx, SOx, particulates and associated hydrocarbons from stack effluents of conventional power plants.
APPROACH: Uses rodents exposed to carefully controlled levels of noxious gases with and without fly-ash particulates of respirable sizes. Heavy emphasis on lung surfactants including their synthesis. Correlations of lung surfactant biochemistry, collagen, and elastin synthesis and physiological and pathological changes resulting from acute and chronic exposure.
RESULTS: An evaluation of dose-response relationship for acute and chronic exposure. These data will be used to derive risk estimates for acute and delayed toxicity for atmospheric pollutants indicated.
PROJECT MILESTONES: (1) FY-1977 and 1978 Complete acute exposures and report evaluation for short-lived rodents. (2) FY-1979 Begin chronic exposures. (3) FY-1980 Report evaluation of acute and chronic effects for short-lived rodents.
KEYWORDS: NITROGEN OXIDES;METABOLISM;HEALTH HAZARDS;LUNGS;PATHOLOGICAL CHANGES;RATS;FLY ASH;SURFACTANTS;SULFUR DIOXIDE;AEROSOLS;PARTICLES;HYDROCARBONS;DISEASES;IN VIVO;TISSUES

<087042>
TITLE: FBC--Biological Characterization of Field Collected Effluents
PROJECT NUMBER: 2670
PRINCIPAL INVESTIGATOR: Carpenter, R.L.
ADDRESS: Inhalation Toxicology Research Institute, P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Collect field effluents pre and post stack control from fluidized bed combustors under various operating conditions. Characterize aerosol emissions (gaseous and particulate). Evaluate the distribution, retention and solubilization in vivo in experimental animals. Define the lung dose for FBC effluents.
APPROACH: Collect effluents from Morgantown Energy Research Center FBC combustor and characterize particulates physically and chemically (size and chemical constitution). Expose rodents to characterized particulates of respirable aerodynamic diameter. Evaluate distribution and refining of particulates and noxious gases.
RESULTS: Prediction of the chemical dose to the respiratory system for gaseous and particulate components of FBC effluents.
PROJECT MILESTONES: (1) FY-1977-1978 Obtain samples of effluents of MERC Experimental Combustor. (2) FY-1978-1979 Chemically and physically characterize gaseous and particulate components of effluents.
KEYWORDS: FLUIDIZED-BED COMBUSTION;HEALTH HAZARDS;BIOASSAY;FLY ASH;FLUE GAS;AEROSOLS;IN VIVO;LUNGS;PARTICLE SIZE;CHEMICAL COMPOSITION;RODENTS;INHALATION

<087043>
TITLE: FBC Early Indicators of Damage for Inhaled Effluents
PROJECT NUMBER: 2672
PRINCIPAL INVESTIGATOR: Henderson, R.F.
ADDRESS: Inhalation Toxicology Research Institute, P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (50%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Biologically identify and characterize by short term cellular screening the candidate chemical agents in FBC effluents for animal toxicological evaluation.
APPROACH: Use rapid in-vitro and in-vivo screening methods to determine the relative toxicities of gaseous, particulate and particulate associated organics to establish priorities among chemical components for subsequent animal bioassay. The preliminary tests will be microbial screens (Ames method) followed by alveolar macrophage screening and biochemical changes in lung epithelial cells obtained by lavage.
RESULTS: Preliminary toxicity, mutagenicity and carcinogenicity information to select and reduce the number

of chemical agents for which more expensive animal toxicological testing will be required.
PROJECT MILESTONES: (1) FY-1977-1978 Screen samples of FBC effluents by microbial methods for toxic agents. (2) FY-1979 Begin in-vivo animal screening for cytotoxic agents.
YWORDS: FLUIDIZED-BED COMBUSTION;FLUE GAS;FLY ASH;IN VITRO;IN VIVO;CHEMICAL EFFLUENTS;BIOASSAY;TOXICITY;MUTAGENS;CARCINOGENS;AEROSOLS;INHALATION;PATHOGENESIS;HEALTH HAZARDS

<087044>
TITLE: FBC-Kinetics of Lung Cells in Response to Inhaled Pollutants
PROJECT NUMBER: 2673
PRINCIPAL INVESTIGATOR: Hackett, N.A.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: METALS (30%);PARTICULATES (40%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To define the cellular and physiological basis for development of latent damage to respiratory system from inhalation of toxic airborne pollutants from FBC.
APPROACH: Use cytokinetic measurements of lung epithelial cells. Increased cell turnover for critical cells is used to evaluate early damage and the prelude to latent damage hyperplastic and neoplastic progression.
RESULTS: A correlation of lung cell changes with physiological and pathological changes in animals exposed to selected airborne pollutants especially trace metals and particle-associated hydrocarbons.
KEYWORDS: FLUIDIZED-BED COMBUSTION;CHEMICAL EFFLUENTS;LUNGS;DOSE-RESPONSE RELATIONSHIPS;INHALATION;AIR POLLUTION;HEALTH HAZARDS;METALS;HYDROCARBONS;PHYSIOLOGY;PATHOLOGICAL CHANGES;ENVIRONMENTAL IMPACTS

<087045>
TITLE: FBC--Influence of Inhaled Pollutants on Pulmonary Defense Mechanisms
PROJECT NUMBER: 2674
PRINCIPAL INVESTIGATOR: Eice, D.E.
ADDRESS: Inhalation Toxicology Research Institute, P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: METALS (25%);PARTICULATES (50%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Define role of trace metals and hydrocarbons associated with fine particulates on pulmonary clearance and defense mechanisms.
APPROACH: Measure changes in mucocilliary function, pulmonary macrophages in animals exposed to airborne particles from FBC +- control technology. Use model and radiolabelled infectious organisms to evaluate phagocytosis and destruction by macrophages.
RESULTS: Evaluation of loss of function of lung clearance mechanisms resulting from acute and chronic inhalation exposure of toxic FBC effluents.
KEYWORDS: FLUIDIZED-BED COMBUSTION;AEROSOLS;FLY ASH;FLUE GAS;RESPIRATORY SYSTEM DISEASES;ANIMALS;AIR POLLUTION CONTROL;MACROPHAGES;LUNG CLEARANCE;TOXICITY;HEALTH HAZARDS;HYDROCARBONS;IN VIVO;PATHOGENESIS;ANIMAL CELLS;IMMUNE REACTIONS

<087046>
TITLE: FBC--Chronic Respiratory Diseases from Inhaled Effluents
PROJECT NUMBER: 2675
PRINCIPAL INVESTIGATOR: Mauderly, J.L.
ADDRESS: Inhalation Toxicology Research Institute, P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: METALS (25%);PARTICULATES (50%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Determine dose response for acute and chronic exposure of rodents to mixtures of gaseous and particulate effluents from FBC. Emphasis will be on latent diseases including cancer.
APPROACH: Expose rodents to fly ash in combination with SO/sub x/ and NO/sub x/ emissions from FBC. Early studies will include acute exposures, based on results at chronic low level.
RESULTS: Risk estimates for latent diseases.
EYWORDS: FLUIDIZED-BED COMBUSTION;FLUE GAS;FLY ASH;AEROSOLS;TOXICITY;CARCINOGENS;RESPIRATORY SYSTEM DISEASES;DOSE-RESPONSE RELATIONSHIPS;RODENTS;SULFUR OXIDES;NITROGEN OXIDES;IN VIVO;PATHOGENESIS;HEALTH HAZARDS

<087047>
TITLE: Toxicology of Solar Heating and Cooling Materials
PROJECT NUMBER: 002679
PRINCIPAL INVESTIGATOR: Hobbs, C.H.
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Albuquerque, N.Mex. (USA). Albuquerque Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: SOLAR/General (100%)
KEYWORDS: SOLAR HEATING SYSTEMS;SOLAR COOLING SYSTEMS;MATERIALS;TOXICITY;WORKING FLUIDS;SAFETY ENGINEERING;AIR POLLUTION;HAZARDOUS MATERIALS;INHALATION;AEROSOLS

<087048>
TITLE: Grumman Engineering Analysis Energy Conservation
PROJECT NUMBER: 002834
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Albuquerque, N.Mex. (USA). Albuquerque Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$58,000
TECHNOLOGY: CONSERVATION/General (100%)
KEYWORDS: ENERGY CONSERVATION;RESEARCH PROGRAMS

<087049>
TITLE: Evaluation of Long Term Effects/Thermal
PROJECT NUMBER: 007233
PRINCIPAL INVESTIGATOR: Sublette, C.
AFFILIATION: Eastern New Mexico Univ., Portales (USA)
MONITORING AGENCY: Energy Research and Development Administration, Albuquerque, N.Mex. (USA). Albuquerque Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: THERMAL POLLUTION;CHRONIC INTAKE;BIOLOGICAL EFFECTS;ENVIRONMENTAL EFFECTS;WATER POLLUTION;AIR POLLUTION;THERMAL EFFLUENTS;NEW MEXICO

<087050>
TITLE: Carcinogenic Effects of Energy Related By-Products
PROJECT NUMBER: 7446
PRINCIPAL INVESTIGATOR: Yuhas, J.M.
ADDRESS: University of New Mexico Medical Center, Albuquerque, NM
AFFILIATION: New Mexico Univ., Albuquerque (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$105,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Develop in-vivo/in-vitro model test system for predicting human risk from carcinogens in coal conversion processes.
APPROACH: (1) Develop in-vitro lung cell cultures from rodents. (2) Develop in-vitro lung cell cultures from human. (3) Compare in-vivo/in-vitro cell transformation to cancer state in rodents. (4) Measure human cell transformation frequency. (5) Predict cancer frequency humans.
RESULTS: Improve methods for extrapolating experimental risk (cancer) to man.
KEYWORDS: CARCINOGENS;HEALTH HAZARDS;COAL INDUSTRY;AIR POLLUTION;PARTICLES;AEROSOLS;ENERGY CONVERSION;RATS;CARCINOGENESIS;BIOLOGICAL MODELS;NEOPLASMS;MAN;METABOLISM

<087501>
TITLE: Regulation of Flowering and Other Plant Growth Processes
PROJECT NUMBER: 000193
PRINCIPAL INVESTIGATOR: Lang, A.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468

TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$111,000
TECHNOLOGY: GENERAL SCIENCE (100%)
HARACTER OF STUDY: RESEARCH/Laboratory (100%)
EGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
ESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project is dealing with problems of plant growth and differentiation, with strong emphasis on its control by environmental factors, and their relations to hormone effects. It is thus related to Project No. 194, ''Environmental Control of Plant Development and its Relation to Hormones,'' but uses different ''systems'' and different approaches, and is presently primarily concerned with a problem of flowering not covered by that project, namely, the existence of transmissible materials in plants inhibitory to flowering, which together with the flower promoting ''floral stimulus'' investigated under Project No. 194 may determine when and under which environmental conditions the plant forms flowers, fruits and seeds.
APPROACH: The main approach has been grafting experiments between flowering and non-flowering plants in the nightshade family. If successful these will be continued using different plants, in order to assess how widespread the phenomenon is. In parallel, work will be initiated at extraction and identification of the inhibitory materials, and on their interaction with the flower-promoting ones.
RESULTS: While there is considerable, although still purely physiological evidence for flower-promoting, hormone-like substances in plants (floral stimuli or florigen) the existence of antagonistic, flower-inhibitory substances has, despite some evidence to this effect, not been explored in depth. The project is expected to settle this problem. If confirmed, such inhibitory substances (''anti-floral stimuli,'' ''anti-florigen'') may be an important factor in the regulation of flowering and, hence, fruit and seed production in plants.
PROJECT MILESTONES: While there is considerable, although still purely physiological evidence for flower-promoting, hormone-like substances in plants (floral stimuli or florigen) the existence of antagonistic, flower-inhibitory substances has, despite some evidence to this effect, not been explored in depth. The project is expected to settle this problem. If confirmed, such inhibitory substances (anti-floral stimuli, anti-florigen) may be an important factor in the regulation of flowering and, hence, fruit and seed production in plants.
KEYWORDS: FLORA;ENVIRONMENTAL PHYSIOLOGY;PLANTS;PLANT GROWTH;CELL DIFFERENTIATION;PLANT GROWTH REGULATORS;FLOWERS;INHIBITION;HORMONES;REPRODUCTION

<087502>
TITLE: Environmental Control of Plant Growth and Development through Hormones
PROJECT NUMBER: 000194
PRINCIPAL INVESTIGATOR: Zeevaart, J.A.D.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$101,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine which hormones function in plants as intermediaries between perception of an environmental factor and the morphological expression. Specific cases under investigation: (1) Flower formation: objective is to identify the floral stimulus (florigen), the material that is transmitted from an induced leaf to a vegetative bud, where it causes flower formation and the formation of which is regulated by environmental conditions (photoperiod, temperature). (2) Stem growth: to determine the nature of the gibberellins that mediate stem growth in rosette plants as induced by long photoperiods; to determine if the effective hormone level is controlled by compartmentation.
APPROACH: (1) Phloem exudates of Perilla are chemically analyzed and tested for flower-inducing activity. (2) Gibberellins are isolated and identified by gas chromatography-mass spectroscopy. If possible, the hormones are radioactively labeled and their metabolism studied. Compartmentation is investigated by isolating various organelles and determining the distribution of endogenous gibberellins. (3) Abscisic acid biosynthesis and metabolism are studied in leaves in situ as well as when detached from the plant. Localization of abscisic acid and its metabolites will be studied in leaves by cell fractionation.
RESULTS: (1) Identification of the floral stimulus in plants will resolve one of the outstanding problems in Plant Biology, and would undoubtedly have extensive applications in Agriculture. (2) Understanding of the mechanisms by which the photoperiod controls stem growth via gibberellins. (3) Production of abscisic acid in response to stress is common in plants, but the mechanism by which the biosynthesis is triggered is not known. Moreover, most of the abscisic acid in a leaf appears to be physiologically inactive, so that knowledge of its distribution in various cell compartments is essential for understanding its physiological effects.
PROJECT MILESTONES: (1) Identification of gibberellins in spinach Jan. 1977. (2) Sites of abscisic acid biosynthesis and metabolism at the subcellular level Jan. 1978. (3) Localization and sites of interconversion of gibberellins June 1978.
KEYWORDS: FLORA;ENVIRONMENTAL PHYSIOLOGY;PLANTS;PLANT GROWTH;PLANT GROWTH REGULATORS;HORMONES;ENVIRONMENTAL EFFECTS;BIOSYNTHESIS;METABOLISM;REPRODUCTION

<087503>
TITLE: Mechanisms of Action of Plant Hormones
PROJECT NUMBER: 000195
PRINCIPAL INVESTIGATOR: Kende, H.J.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$138,000
TECHNOLOGY: SOLAR/Biomass (40%);CONSERVATION/General (10%);GENERAL SCIENCE (50%)

POLLUTANTS: NOXIOUS GAS (33%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To obtain information on the site and mechanism of action of three of the five major plant hormones: cytokinins, ethylene, gibberellins, at the molecular and cell level. A major part of the project deals with the regulation of aging in plants by ethylene and cytokinins. Of particular interest are the positive feedback mechanism by which ethylene induces its own synthesis during senescence, the localization and characterization of the ethylene-synthesizing system in plant cells, and the effect of ethylene on cell membranes.
APPROACH: Studies (1) on the fate of radioactively labeled gibberellins and cytokinins in the tissue; (2) on the interaction of these hormones with cellular components, especially their binding to particular components, using hormones and hormone analogs of different biological activity; (3) on rapid effects of ethylene on cell structures.
RESULTS: (1) Characterization and cellular localization of the site of action of plant hormones; identification of primary hormonal response. (2) Understanding, in molecular terms, of regulation of hormonal levels, as a premise for regulation of hormone-controlled plant responses.
PROJECT MILESTONES: (1) Identification of a hormonal binding site in plants Dec. 1976. (2) Identification on how ethylene biosynthesis is induced and regulated Mar. 1977. (3) Elucidation of the cellular events of ethylene action Sept. 1977.
KEYWORDS: FIORA;PLANT GROWTH;PLANT GROWTH REGULATORS;HORMONES;BIOLOGICAL LOCALIZATION;ETHYLENE;BIOSYNTHESIS;GIBBERELLIC ACID;AGE DEPENDENCE;PLANTS;ENZYMES;MOLECULAR BIOLOGY

<087504>
TITLE: Enzymatic Mechanisms of Polysaccharide and Glycoprotein Synthesis in Plants
PROJECT NUMBER: 000196
PRINCIPAL INVESTIGATOR: Delmer, D.P.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$109,000
TECHNOLOGY: SOLAR/Biomass (33%);CONSERVATION/Energy storage (34%);GENERAL SCIENCE (33%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Identification and characterization of cellulose synthesis in high plants. (2) Study of the synthesis of other plant cell wall polysaccharides. (3) Study of glycoprotein synthesis in plants.
APPROACH: Characterization of substrates and intermediates in cellulose, other polysaccharide and glycoprotein biosynthesis, in vivo and in vitro, using labeled compounds and inhibitors. Studies on the regulation of these processes, using hormones, metabolites and other compounds known to interfere with cellulose formation, or having this potential.
RESULTS: Information on the biosynthesis of cellulose (precursors, intermediate products, ''packaging'' of the cellulose molecules) and its regulation, and similar information on biosynthesis of other cell wall polysaccharides and of glycoproteins in plants. The latter will serve primarily to supplement the project on cellulose biosynthesis as these syntheses have common features, but the work on glycoprotein has also interest for problems of optimization of fertilizer utilization by crops (further information listed in item No. 96).
PROJECT MILESTONES: (1) In vitro synthesis of cellulose--FY 1977. (2) Regulation of cellulose synthesis--FY 1978. (3) Understanding of regulation of glycoprotein synthesis--FY 1978.
KEYWORDS: PLANT CELLS;CELL WALL;BIOSYNTHESIS;CELLULOSE;POLYSACCHARIDES;GLUCOPROTEINS;BIOCHEMISTRY;BIOMASS;ENZYMES;METABOLISM;PLANTS

<087505>
TITLE: Regulation of Protein Formation in Plants, Significance in Growth Regulation
PROJECT NUMBER: 000197
PRINCIPAL INVESTIGATOR: Filner, P.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: CONSERVATION/General (35%);CONSERVATION/Improved conversion efficiency (35%);GENERAL SCIENCE (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To characterize the regulation of the pathways of nitrogen and sulfur assimilation, and the integration of the regulation of these pathways in plants, to learn how plants coordinate the activities of functionally convergent pathways with each other and with the demand for their common product, mainly, protein. Specific objectives are to determine how plants regulate the assimilation of nitrogen from different sources (nitrate, ammonia, urea), and how this is inter-related with assimilation of sulfur.
APPROACH: The experimental system is cultured plant (tobacco) cells, as a relatively uniform material in which presumably all cells are engaged in similar metabolic activities. The cells are grown with various nitrogen sources, and the patterns of the activity of assimilatory enzymes and accumulated metabolites are studied. Variant (''mutant'') cell lines with altered nitrogen and sulfur metabolism will be isolated.
RESULTS: Determination of the physiological conditions for optimization of the utilization of bound nitrogen

(and bound sulfur) by plants.
PROJECT MILESTONES: Evaluation of effectiveness of resistance to selenate (a sulfate analog) as selection criterion for mutant plants with altered, more efficient nutrient utilization will be completed in FY 1978.
YWORDS: PRODUCTIVITY;PLANT CELLS;CELL CULTURES;NITROGEN;SULFUR;UPTAKE;ENZYMES;PHYSIOLOGY;METABOLISM;PLANTS;POLLUTION;SOILS

<087506>
TITLE: Plant Cell Wall Protein
PROJECT NUMBER: 000199
PRINCIPAL INVESTIGATOR: Lamport, D.T.A.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$64,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is concerned with determining the structure, function and metabolism of extensin, the hydroxyproline-rich protein present in the primary cell walls of most green plants. Extensin is a glycoprotein in which the hydroxyproline hydroxyl group is glycosidically linked to short arabinose oligosaccharides, while the serine hydroxyl group is glycosidically attached to galactose. Both of these glycopeptides linkages could function as cross links between the cell wall polysaccharides, and extensin may have a crucial function in cell wall growth and hence plant growth in general. Also being studied is the structure of soluble hydroxyproline-rich glycoproteins, to determine which polysaccharides (if any) are attached to extensin before insertion into the wall structure.
APPROACH: Most of the current work is devoted to the determination of the structure of extensin (including polysaccharide attachment) from cell walls of higher plants, using in vitro cell cultures.
RESULTS: Ultimately, we expect to describe how extensin fits in to the overall plant cell wall structure, and what role it has in plant growth.
PROJECT MILESTONES: (1) Unequivocal demonstration of polysaccharide attachment to extensin FY 1977. (2) Complete amino acid sequence of extensin FY 1978.
KEYWORDS: PLANTS;CELL WALL;PROTEINS;METABOLISM;GLUCOPROTEINS;MOLECULAR STRUCTURE;CELL CULTURES;POLYSACCHARIDES;MOLECULAR BIOLOGY;BIOCHEMISTRY;PLANT CELLS

<087507>
TITLE: Developmental Biology of Nitrogen-Fixing Algae
PROJECT NUMBER: 000200
PRINCIPAL INVESTIGATOR: Wolk, C.P.
ADDRESS: MSU/ERDA Plant Reseach Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$169,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas Fresh water
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The project is dealing with fixation of atmospheric nitrogen (N/sub 2/) by bluegreen algae (cyanobacteria), the ultimate objective being bioengineering of a symbiosis between these microorganisms and crop plants which will be independent of supply of nitrogenous fertilizers. N/sub 2/ fixation in these organisms is closely tied in with cellular differentiation and interaction, and this interaction provides a model for the interactions essential for a successful symbiosis between an N/sub 2/-fixing organism and a higher plant. Therefore, the project includes studies on the origin and physiological bases of these cell interactions.
APPROACH: (1) Studying, with the radioisotopes N-13 and C-14, the substances passing from cell to cell (The production of N-13 at high specific activity and purity has been accomplished in cooperation with the MSU Cyclotron Laboratory); (2) isolating mutants which will help in attaining the above objectives; (3) identifying substances produced by the algae and controlling their differentiation; (4) determining the major biochemical differences between the different cell types in the algae. We hope to be able (5) to introduce appropriately mutated algal cells into plant cells in tissue culture.
RESULTS: The symbioses sought should produce protein-rich food without need for nitrogen-containing fertilizer. Elucidation of developmental interactions could help in developing new medical practices in the areas of organ regeneration and cancer.
PROJECT MILESTONES: FY 1977 (1) Determination of details of pathway of initial metabolism of N-13/sub 2/; (2) Isolation and characterization of auxotrophic mutants suitable for symbiosis; (3) Identification of substances passing from cell to cell; (4) Initial characterization of substance stimulating spore formation. FY 1978 (1) Attempts at creating symbiosis, using auxotrophs; (2) Attempts at transfer of genetic information relating to nitrogen fixation.
KEYWORDS: ALGAE;NITROGEN FIXATION;PLANTS;SYMBIOSIS;CARBON 14;TRACER TECHNIQUES;NITROGEN 13;BACTERIA;NEOPLASMS;NUTRIENTS;METABOLISM;PLANT TISSUES

<087508>
TITLE: Physics and Physiology of Environmental Relationships of Plants
PROJECT NUMBER: 000201
PRINCIPAL INVESTIGATOR: Raschke, K.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$185,000
TECHNOLOGY: SOLAR/Biomass (15%);CONSERVATION/General (15%);CONSERVATION/Improved conversion efficiency (45%);CONSERVATION/Energy storage (15%);SPECIFIED OTHER TECHNOLOGIES/Stress adaptation (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project deals with the exchange of mass and energy between plants and environment, taking into consideration both normal and stressed environments, and environments marginal for plant growth. The work is centered on the stomatal mechanism, as the prime and specific control mechanism of the plant for the regulation of the exchange of mass and energy with the environment.
APPROACH: (1) Analysis of the gas exchange of leaves by a computer controlled gas analysis system. (2) Computer modeling of energy and water exchange by plants. (3) Biochemical and biophysical analysis of the metabolism of guard cells, including roles of CO/sub 2/ and of abscisic acid, both of which interact and play an important role in the requisition of the stomatal movements.
RESULTS: (1) Elucidation of the processes in the plant which (a) trigger the production or release of the stress hormone ABA, (b) affect the transfer of ABA to the guard cells, (c) are responsible for the action of ABA on guard cells Fiscal Year 1977. (2) Elucidation of the biophysical and biochemical mechanisms underlying the transductor and effector functions of the guard cells Fiscal Year 1977. (3) Elucidation of the functioning of the stomatal control system in the optimization of plant behavior in response to variations in the plant's environment Fiscal Year 1978. (4) Development of first realistic models of water and energy exchange in plants, based on (2) and (3) Fiscal Year 1978.
PROJECT MILESTONES: (1) Preparation of review on stomatal action July 1975. (2) Demonstration of interrelations between abscisic acid and CO/sub 2/ in stomatal mechanism March 1976. (3) Elucidation of the fate of CO/sub 2/ within the stomatal apparatus Sept. 1976.
KEYWORDS: STRESS;PRODUCTIVITY;PLANTS;PHYSIOLOGY;CARBON DIOXIDE;WATER;HORMONES;OPTIMIZATION;SOLAR ENERGY CONVERSION;MATHEMATICAL MODELS;PHOTOSYNTHESIS;LAND RECLAMATION;REVEGETATION;PREFERRED SPECIES;WATER REQUIREMENTS;STOMATA;BIOADSORBENTS;WATER POLLUTION CONTROL;SORPTIVE PROPERTIES;GENETIC VARIABILITY;CLEANING

<087509>
TITLE: Physical Biochemistry of Biological Membranes
PROJECT NUMBER: 000202
PRINCIPAL INVESTIGATOR: Haug, A.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA). Cyclotron Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$96,000
TECHNOLOGY: SOLAR/Biomass (50%);GENERAL SCIENCE (50%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas Streams, lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The project consists in studies of the composition and properties of cell membranes; how these are changed by environmental factors, particularly heat; and how these changes are in turn influenced by other conditions, such as presence of certain metal ions, acidity, etc. The rationale is that cell membranes are ubiquitous structures of cells and of many cell components (organelles), and are the first to be affected by any environmental, chemical and physical, factors. They are known to be labile structures and thus play undoubtedly an essential, but very poorly understood, role in the earliest responses of organisms to environment and environmental stress.
APPROACH: Analysis of cell membrane composition (lipids, proteins) and properties by physical and chemical methods in ''normal'' and stressed environments. Fluidity of membrane lipids has been used as a major parameter as it was found to be constant under a variety of environmental conditions. At present, the principal materials are simple unicellular ''model'' organisms (mycoplasmas); extension of the work to other organisms including higher plants is being initiated.
RESULTS: Understanding of early environmental effects on plants: nature of the primary lesion(s); by what conditions, particularly certain metal ions and acidity, they may be modified or limited; existence of repair and/or adaptive mechanisms. Results may be applicable also to man and animals since the principles of cell membrane composition and structure are quite similar in all organisms.
PROJECT MILESTONES: Understanding of early environmental effects on plants: nature of the primary lesion(s); by what conditions they may be modified or limited; existence of repair and/or adaptive mechanisms. Results may be applicable also to man and animals since the principles of cell membrane composition and structure are quite similar in all organisms.
KEYWORDS: STRESS;CELL MEMBRANES;ENVIRONMENTAL EFFECTS;BIOLOGICAL ADAPTATION;BIOLOGICAL REPAIR;LIPIDS;PLANT CELLS;BIOCHEMISTRY;MOLECULAR STRUCTURE

<087510>
TITLE: Molecular and Cellular Radiobiology
PROJECT NUMBER: 000206
PRINCIPAL INVESTIGATOR: Magee, J.L.;Thomas, J.K.
ADDRESS: Radiation Laboratory, Notre Dame, Notre Dame, IN
AFFILIATION: Notre Dame Univ., Ind. (USA). Radiation Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Blaunstein, R.
TELEPHONE: F233-4327
TYPE OF FUNDING: Contract No.-AT(11-1)-38;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$56,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Excited states and ions or electrons are generally produced in the radiolysis of a liquid system. These states in themselves are of great interest to the field of chemistry and, in many cases, a pulse radiolytic technique is the most convenient way of generating many species for subsequent study.
APPROACH: Three approaches or general areas of research are pursued to varying degrees at different times in the research grcup. Area 1. Experiments are carried out to understand more fully the details of the processes involved in the radiolysis of a liquid system. Area 2. Within a certain level of understanding the ''known'' radiolytic events in a system may be used to probe the system so that changes produced in the system by additives may be explained. Area 3. Photolysis experiments, especially those carried out by pulse laser technique, are often useful in interpreting analogous experiments in the radiolysis of the same system. The group has published several pieces of work in this line. For example, excited states may be positively identified via flash photolysis and the data used to assess the radiolytic damage in similar systems. Electrons may be generated by a two-photon photolysis technique and their physical properties established. These parameters can be subsequently used in radiolytic experiments.
RESULTS: In biological systems various membrane studies are underway. Red blood cells, membrane of E. Coli, mammalian cells and neuron systems are being studied. The factors affecting the transport of material across the membranes is of prime importance. Pulse radiolysis will also be used to determine the chemically active groups on the surface of membranes. OH radicals and e/sub aq//sup -/ produced in the aquecus phase will react with the membrane surface to give radicals that on identification will give information regarding the cell surface. A program of irradiation of various E. Coli cells is underway. The survival of these cells after CO/sup 60/ gamma irradiation is being studied. The various additives that affect the membranes are being used to determine their effect on cell survival. A flow system to add the solutes at short periods (10/sup -3/ sec) before or after irradiation has been constructed.
KEYWORDS: AQUEOUS SOLUTIONS;RADIOLYSIS;PHOTOLYSIS;CELL MEMBRANES;ANIMAL CELLS;PERMEABILITY;IONS;DIFFUSION;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;MOLECULAR BIOLOGY

<087511>
TITLE: Radiation Cytogenetics of the Yellow-fever Mosquito, Aedes aegypti
PROJECT NUMBER: 000208
PRINCIPAL INVESTIGATOR: Rai, K.S.
ADDRESS: Radiation Laboratory, University of Notre Dame, Notre Dame, IN 46556
AFFILIATION: Notre Dame Univ., Ind. (USA). Radiation Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Divison of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-38;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION/Ionizing (50%);SPECIFIED OTHER POLLUTANTS/Chemosterilant (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objectives of this research project are: (1) accumulation of basic cytogenetic information following irradiation and chemosterilant treatment in the yellow-fever mosquito, Aedes aegypti, and (2) possible application of knowledge thus gained for genetic control purposes. Areas currently active include cytogenetic analysis of radiation-induced translocations, developmental basis of mutagen-induced sexual sterility and manipulation of chromosomal mechanisms for mosquito control. A particular emphasis is being placed on the use of chromosomal translocations for genetic control purposes. A sex-linked translocation homozygote was tested for the principle of population replacement under laboratory conditions. Several double translocation heterozygotes were synthesized and evaluated for genetic control. In addition, the sex-ratio distorter gene was combined with a double translocation heterozygote. Males of this stock will be used for field releases at the W.H.O. unit in Delhi, India.
RESULTS: Fertility of a double translocation system was related to the disjunctional chromosomal segregation. Also trisomy for the longest chromosome was observed. In addition, considerable progress was made on the ultrastructure and differentiation of female gametogenesis.
KEYWORDS: FOSSIL FUELS;IRRADIATION;GENETIC RADIATION EFFECTS;POPULATION DYNAMICS;CYTOLOGY;MOSQUITOES;MALARIA;GENETIC CONTROL;EPIDEMIOLOGY;FERTILITY;STERILITY;CHEMOSTERILANTS;GENETIC EFFECTS

<087512>
TITLE: Chromosome Studies in Myeloproliferative Disorders
PROJECT NUMBER: 000343
PRINCIPAL INVESTIGATOR: Rowley, J.D.
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AFFILIATION: Franklin McLean Memorial Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, Walter W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Contract No.-E(11-1)69
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: (1) For hematologic disorders, the objective is to determine the role of chromosomal changes in the development of human leukemia. (2) For human environmentally induced tumors, the objective is to determine whether specific chromosomal patterns are related to particular etiologic agents.
APPROACH: (1) We are establishing the types and frequency of chromosomal abnormalities in various hematological disorders such as leukemia, preleukemia, and other chronic myeloproliferative disorders. We have also studied a few patients with acute leukemia, who previously had lymphomas or multiple myeloma treated with x ray and/or chemotherapy. For all of these disorders, we hope to identify consistent patterns of abnormalities, and then to determine whether these can be correlated with any previous exposure to various environmental carcinogens. (2) We also have recently begun work on chromosomal analysis of thyroid cancer associated with a history of irradiation in childhood. This project will attempt to determine whether there are consistent patterns in these thyroid cancers and whether the patterns are similar to or different from those seen in thyroid carcinoma that arise ''spontaneously.'' Other environmentally induced tumors will also be examined as the opportunity arises.
RESULTS: (1) We will be able to compare the chromosomal patterns in acute leukemia arising de novo with that of CML in the blast phase, and with those observed in patients with a previous history of polycythemia vera, treated lymphoid malignancy, or other treated cancer. We can tell whether similar patterns are seen in all leukemias, or whether those arising in patients with an apparently successfully treated lymphoid neoplasm are different. If they are different, we will see whether the patterns correlate with either the initial malignancy or with the type of treatment used. (2) We will be able to compare chromosomal patterns in thyroid cancer presumably caused by various agents and determine whether the patterns are different for different agents.
PROJECT MILESTONES: (1) 1978 Determining chromosomal patterns in 20 patients with acute leukemia who previously had successfully treated lymphoid neoplasms. (2) 1978 Correlate with previous disease and treatment. (3) 1977 Determine whether chromosomal patterns exist in thyroid cancers. (4) 1978 Determine whether the patterns are agent specific.
KEYWORDS: LEUKEMIA;CHROMOSOMAL
ABERRATIONS;NEOPLASMS;ETIOLOGY;RADIOTHERAPY;CHEMOTHERAPY;THYROID;PATIENTS;BLOOD;CARCINOGENS;GENETICS;MAN;X RADIATION

<087517>
TITLE: Covalent Structural Analysis of Proteins
PROJECT NUMBER: 000349
PRINCIPAL INVESTIGATOR: Heinrikson, R.L.
ADDRESS: 920 E. 58th Street, Chicago, IL 60637
AFFILIATION: Franklin McLean Memorial Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-69
77 FUNDING: Energy Research and Development Administration FY77:$58,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The determination of protein covalent structures and the elucidation of relationships between these structures and the function of the proteins in question. The enzyme rhodanese is probably most pertinent to the goals of ERDA since it is a detoxifying liver enzyme which renders cyanide harmless. It is widespread in nature and we have determined its covalent structure and certain facts regarding its function.
APPROACH: Our approach to sequence analysis is based largely upon automated Edman degradation of intact derived proteins and large fragments generated there from by chemical and enzymic cleavage procedures. Probes at residues essential to function are made by chemical modification.
RESULTS: Rhodanese: Now that we have the sequence and with the expectation of having soon the 3-dimensional enzyme structure, we hope to have a model to serve as a basis for understanding the molecular events of enzymic catalysis in this chemically well-defined system. We are now in a position to study residues of catalytic importance and to initiate a survey at rhodaneses in other systems. It may be possible to relate industrial cyanide poisoning to levels of rhodanese in human subjects.
PROJECT MILESTONES: (1) Mechanistic studies of rhodanese through covalent structure analysis of yeast inorg. pyrophophatase 1977; snake venom phospholipases 1976; bapolipoprotein (human serum) 1978.
KEYWORDS: PROTEIN SEQUENCE;PROTEINS;MOLECULAR
STRUCTURE;ENZYMES;METABOLISM;CATALYSIS;MAN;CYANIDES;TOXICITY;BIOCHEMISTRY;HEART;SULFUR COMPOUNDS

<087521>
TITLE: Mechanisms in Transplantation and Tumor Immunology
PROJECT NUMBER: 000357
PRINCIPAL INVESTIGATOR: Wissler, R.W.;Fitch, F.W.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-69
77 FUNDING: Energy Research and Development Administration FY77:$184,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (33%);ORGANICS (33%);RADIATION (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of the research activities is to characterize the mechanisms that regulate cell-mediated and humoral immune responses. The ultimate goal is to develop rational approaches for the selective manipulation of these responses in order to inhibit growth of tumor, to favor acceptance of bone marrow grafts, and to prevent allergic reactions to environmental materials. The effect of carbon monoxide on atherogenesis is also being explored.
APPROACH: SV40 virus-induced hamster tumor and transplantable Morris rat hepatoma are the two model tumor systems. Graft-versus-host reactivity and mixed leukocyte culture responses are the model systems for evaluating reactivity to histocompatibility antigens. Conjugation of lipid to antigen and other ''adjuvants'' are being used to enhance development of cell-mediated responses. The role of anti-idiotypic

(anti-receptor) antibodies in regulating both cellular and humoral responses is being determined.
RESULTS: Selective intervention in the immune response should enable successful transplantation of allogeneic lymphoid cells and bone marrow as well as specific treatment of progressively growing tumors.
--OJECT MILESTONES: Basic animal research efforts will require several years before clinical trials are feasible.
KEYWORDS: NOXIOUS GASES;IMMUNE REACTIONS;NEOPLASMS;GROWTH;INHIBITION;BONE MARROW;TRANSPLANTS;ANTIGENS;ANTIBODIES;GRAFT-HOST REACTION;AIR;ANIMALS;IMMUNOLOGY;PATHOGENESIS;TISSUES

<087524>
TITLE: Lymphocyte Transformation as a Model System
PROJECT NUMBER: 000361
PRINCIPAL INVESTIGATOR: Jacobson, L.O.;Yachnin, S.
ADDRESS: University of Chicago, Chicago, IL
AFFILIATION: Chicago Univ., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-AT(11-1)-69;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$203,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We are continuing the investigation of the primary structure of the subunits of the phytohemagglutinin molecular as well as the structure and sequence of the carbohydrate side chains on the protein backbone. We are isolating the human alpha-fetoprotein from fetal sources as well as the body fluids of adult patients with malignant hepatoma. We are studying the confirmation and primary structure of the human alpha-fetoprotein as well as studies of its biological functions particularly in regard to its role as an immunosuppresive and immunoregulatory agent during fetal life.
APPROACH: We are continuing our efforts to isolate the peptide obtained by the digestion of phytohemagglutinin with trypsin. This digestion has accomplished after the protein has been citraconylated. We plan to study the amino acid composition in sequence of each peptide isolated as well as to study the structure of the second carbohydrate side chain found on the molecule. We isolate the human alpha-fetoprotein by means of immunoadsorbent affinity chromatography. We have already begun a study of its amino acid composition on sequence and plan to continue these studies. In addition we assess its ability to suppress human lymphocyte transformation utilizing in vitro cultures of peripheral blood human lymphocytes stimulated by various mitogenic substances such as poke week mitogen, phytohemagglutinin, Concanavalin A, anti-thymocyte serum and the mixed lymphocyte culture. We plan to study the role of sialic acid moieties present on the alpha-fetoprotein molecule with respect to its biological activity as well as to determine the relative effectiveness of various electrophoretic variants of alpha-fetoprotein with regard to their ability to suppress lymphocyte transformation.
RESULTS: With respect to the structure of phytohemagglutinin our ultimate aim is to accomplish the resolution of the complete amino acid sequence of this protein as well as the composition and structure of its carbohydrate side chains. We hope by this to arrive at some insights with regard to the mechanisms by which such mitogenic proteins interact with cell membranes. We intend to characterize the mechanism by which human alpha-fetoprotein acts as a potent immunosuppressant and to determine whether or not this effect is mediated by affecting the interaction of the cell membrane with the stimulatory substances or by suppressing some subsequent event that derives from a stimulus of the cell surface translated into the cells interior.
PROJECT MILESTONES: (1) To determine the amino acid sequence of the phytohemagglutinin molecular together with its carbohydrate side chains. (2) To isolate and study the biological properties of the electrophoretic variants of human alpha-fetoprotein. (3) To determine the role of sialic acid present on human alpha-fetoprotein and its biological activity. (4) To determine the mechanism of action by which human alpha-fetoprotein inhibits the response of human lymphocytes to mitogenic stimuli and acts as an immunosuppressive agent.
KEYWORDS: LYMPHOCYTES;CYTOLOGY;MUTAGENESIS;PATHOLOGICAL CHANGES;IMMUNOLOGY;FETUSES;GENETIC CONTROL;MAN;ANIMAL CELLS;ANEMIAS;BLOOD CELLS;BIOLOGICAL MODELS;IN VITRO

<087525>
TITLE: Control of RNA and Protein Synthesis in Normal and Virus Infected Cells
PROJECT NUMBER: 000363
PRINCIPAL INVESTIGATOR: Weiss, S.B.
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AFFILIATION: Franklin McLean Memorial Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-69
77 FUNDING: Energy Research and Development Administration FY77:$273,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Over the past few years, we have detected and physically mapped some 16-18 tRNA genes in the chromosome of T5 phage. The tRNA genes are clustered in a 13,800 nucleotide segment of T5 DNA. Our objectives, both immediate and in the near future, are as follows: (1) to refine our tRNA map so that each tRNA gene along the T5 DNA molecule is precisely ordered; (2) to isolate the T5 DNA segment containing all the tRNA genes; (3) to determine if the mechanism of tRNA transcription, in vitro, follows the order of tRNA gene arrangements in the T5 chromosome; and (4) to examine the possibility of tRNA control of protein synthesis using a phage-infected in vitro translation system.
APPROACH: Refinement of the T5 tRNA map will be carried out by the detection of isoacceptor tRNA species and mapping their gene position; by preparing small T5 tDNA-containing fragments (with restriction enzymes) for hybridization with T5 tRNAs, and by electron microscopic examination of specific tRNA.DNA hybrids. Isolation procedures for preparing T5 tDNA segments have already been partially successful using S1 nuclease, however, larger quantities of material are needed. This tDNA segment will be used as a template for RNA polymerase. Appropriate identification of specific tRNAs synthesized will be done by hybridization-competition or nucleotide sequence analysis. In vitro protein synthesis studies using ribosomes from T5 infected cells is underway.
RESULTS: We expect to gain important information about tRNA gene arrangement in T5 DNA and how the

transcription of these genes are regulated. Since tRNAs play an intimate role in the process of translation, their assembly directly affects, and regulates, the rate of protein synthesis. The order of tRNA transcription can also function to regulate protein synthesis and we would like to know whether RNA polymerase initiates tRNA synthesis at one or several different tRNA promotor sites when a cluster of tRNA genes are encountered in a single chromosome. The presence of a T5-specific tRNA/sup F Met/ species suggests the possibility that perhaps it plays a special role for the initiation of T5 proteins. The information gathered from these studies should help us to better understand the relationship between DNA transcription and protein synthesis, a process that is basic not only to the expression of genetic information but to its proper control and regulation.
PROJECT MILESTONES: (1) The arrangements of tRNA genes in T5 bacteriophage 1977-1978. (2) The translational mechanism for T5 tRNA genes 1978-1979. (3) The nucleotide sequence of T5 initiator tRNA/sub F//sub Met/ 1977-1978. (4) The role of T5 tRNA/sub F//sup Met/ in protein synthesis 1976-1977.
KEYWORDS: CELL REGULATIONS;GENE ARRANGEMENT;TRANSCRIPTION;RNA;PROTEINS;BIOSYNTHESIS;VIRUSES;GENES;NUCLEOTIDES;DNA;CONTROL;HYBRIDIZATION;POLYMERASES;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;GENETICS

<087526>
TITLE: Mitochondrial Nucleic Acids and Protein Synthesis
PROJECT NUMBER: 000364
PRINCIPAL INVESTIGATOR: Rabinowitz, M.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-69
77 FUNDING: Energy Research and Development Administration FY77:$128,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our objectives are: to elucidate and map the genes and genetic content of the mtDNA, to understand the control of mtDNA transcription, and to understand how the mitochondrial and nuclear genomes interreact to form a functional mitochondrion. We also are trying to evaluate the mechanisms by which heart myofibrils are assembled and degraded, and the effect of a growth stimulus or the removal of such a growth stimulus on muscle protein synthesis and turnover. From the understanding of mitochondrial biogenesis and of heart muscle protein synthesis and turnover we hope to be able to explain mechanisms of cardiac hypertrophy and atrophy and the changes in mitochondria that occur after hormonal administration.
APPROACH: We are attempting to map yeast mtDNA using restriction endonuclease digestion, deletion mapping with petite mutants, electron microscopic tRNA or rRNA hybridization, and genetic analysis. We are also isolating messenger RNAs from wild type and mutant yeast for analysis of the control of RNA transcription. With regard to muscle proteins we are measuring turnover rates by mathematical analysis of the kinetics of labeling of product and precursors. We are isolating in pure form calcium-activated neutral protease and will evaluate its participation in protein turnover. We are also evaluating the transcriptive control of mitochondrial and myosin messenger RNAs.
RESULTS: We hope to derive a complete genetic map of mitochondrial DNA. We also hope to define the messenger rRNA and tRNA, transcripts of mitochondrial DNA and elucidate the mechanisms by which transcription is controlled. We hope to establish the mechanisms by which the mitochondrial genome and its synthetic systems are specifically interreacting with the nuclear and cytoplasmic genetic and synthetic systems. We also hope to determine whether precursor pools of myosin light and heavy chains exist and mechanisms by which their turnover is effected. We hope to evaluate the role of calcium-activated neutral protease on protein turnover. We expect to isolate messenger RNA for myosin light and heavy chains, and for some mitochondrial components in heart and to generate complementary DNA probes. We will use these to evaluate the control of transcription, and protein synthesis in heart muscle before and after cardiac hypertrophy has been produced experimentally.
PROJECT MILESTONES: Restriction endonuclease mapping of yeast mitochondrial DNA January 1977. (2) Mapping of tRNA and ribosomal RNA cistrons, and structural genes of mitochondrial DNA July 1977. (3) Cloning of mitochondrial DNA restriction fragments in plasmids and E. coli and evaluating transcription and translation products January 1977. (4) Elucidation of gene products of yeast mitochondrial DNA July 1977. (5) Electron microscopic mapping of mitochondrial tRNAs January 1978. (6) Elucidation of interreaction between nuclear and mitochondrial genomes July 1979. (7) Evaluation of the role of calcium-activated protease in cardiac muscle protein turnover January 1978. (8) Elucidation of the control of turnover of mitochondrial proteins July 1979.
KEYWORDS: MITOCHONDRIAL BIOGENESIS;MUSCLE PROTEINS;NUCLEIC ACIDS;PROTEINS;BIOSYNTHESIS;MITOCHONDRIA;GENES;DNA;GENETICS;HEART;MUSCLES;YEASTS;NUCLEASES;HYBRIDIZATION;METABOLISM;ELECTRON MICROSCOPY;MYOSIN;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;RNA

<087527>
TITLE: The Initiation of Protein Synthesis and the Specific Role of Ribosomes in the Overall Process of Protein Synthesis
PROJECT NUMBER: 000366
PRINCIPAL INVESTIGATOR: Nakamoto, T.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L., Jr.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-69
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: In order to increase our understanding of the basic mechanism of protein synthesis, we are continuing our efforts to determine how the initiator site of messenger RNA (mRNA) is selected and the precise sequence in which the various components interact in the E. coli bacterial system. Specifically, we hope to obtain more definitive evidence on various aspects of the initiation process, particularly, since two important conclusions regarding the process had been based on suggestive but inconclusive

evidences. The first conclusion was that a complex of the 30S ribosomal subunit with mRNA and the initiator tRNA is an cbligatory intermediate in the initiation of protein synthesis, and the second, was that initiation factor IF-3 functions specifically to recognize and select the initiator site of natural mRNA. Our study also includes a search for new factors which may participate in the initiation reaction. In terms of long range goals, our work additionally includes the related problem of translational control, a study which should be facilitated by new knowledge gained through our current efforts.

APPROACH: The work involves careful examination of the requirements and kinetic analysis of the overall reaction, as well as the partial reactions, of the process of initiation. The study is being carried out mainly with purified and defined components. For example, we are presently measuring the rates with which initiation complexes are formed using purified initiation factors and ribosomal subunits, N-formylmethionyl-tRNA or N-acetylphenylalanyl-tRNA as initiator tRNA, and MS2 RNA, or synthetic RNAs with limited initiator codons, as mRNA.

RESULTS: Kinetic studies on the formation of an initiation complex of the 30S ribosomal subunit with mRNA and N-formylmethionyl-tRNA, the natural initiator tRNA, are essentially complete. The results show unequivocably that a complex of the 30S subunit is an obligatory intermediate in the initiation of protein synthesis. A comparison of the efficiency of viral mRNA and of synthetic RNAs, with appropriate base compositions, should help in determining whether ribosomes recognize specific mRNA sites and provide insight into the mechanism by which the initiator site is selected in protein synthesis. By careful kinetic studies, we also expect to increase our understanding of how all of the components known to be involved function in the process, and perhaps even discover additional components of the reaction. Presently, we are investigating the function of two new protein factors which appear to stimulate the formation of an active initiation complex of the 70S ribosomes from that of the 30S ribosomes.

PROJECT MILESTONES: (1) August 1971 Discovered two 50S ribosomal proteins which were essential for the interaction of elongation factors EF-G and EF-T with the ribosomes. (2) November 1973 Showed that initiator factor IF-3 was not as specific for mRNA as generally believed. The factor stimulated the formation cf the 30S initiation complex with synthetic RNA and either fMet-tRNA or AcPhe-tRNA as initiator tRNA. (3) January 1975 Obtained kinetic evidence for the obligatory formation of an initiation complex of the 30S ribosomal subunit, mRNA and initiator tRNA.

KEYWORDS: PROTEINS;BIOSYNTHESIS;RIBOSOMES;ESCHERICHIA COLI;RNA;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;ENZYMES;GENETICS;IN VITRO

<087528>
TITLE: Lipoprotein-Cell Interactions
PROJECT NUMBER: 000369
PRINCIPAL INVESTIGATOR: Scanu, A.M.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L., Jr.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-69
77 FUNDING: Energy Research and Development Administration FY77:$189,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is planned to carry out studies on lipid-lipid, lipid-protein and protein-protein interactions in model and biological systems with particular reference to the low- and high-density lipoproteins (LDL and HDL) of human serum and cell membranes (blood granulocytes and cultured skin fibroblasts). The main purpose of the proposed studies is to define the physico-chemical basis for the lipoprotein-cell interactions since we consider this information essential for the understanding as to how lipoproteins regulate lipid metaboism within the cell and how cells secrete fat-soluble products into the surrounding body fluids. The investigation will continue to be concerned with the above systems under physiological conditions and once the basic mechanisms are sufficiently well clarified, extend the studies to an analysis of those factors expected to affect structure of lipoproteins, transport of lipids, organization of cell surface, cell proliferation and metabolism.

APPROACH: An integrated approach relying on physical, chemical and immunological methods will be used. Through the work of the past few years this laboratory has helped to define a number of the properties of circulating lipoproteins and of their apoproteins. Preliminary work was also conducted on isolated blood granulocytes and cultured skin fibroblasts, both of which systems were found to have cholesterol biosynthesis and egress regulated by serum lipoproteins. By using these systems it is now planned to define the surface topology of both lipoproteins and cells by using chemical (cross-linking agents, specific mcdifications of functional groups, etc.), enzymatic (proteolytic enzymes, phospholipases, triglyceride hydrolipase etc.) and immunological approaches. In the latter respect specific antibodies raised against each of the LDL and HDL apoproteins will be used. Tracer techniques will also be used to label the protein and lipid constituents of lipoproteins and membranes. Finally, whenever required, spectroscopic techniques will also be carried out by taking advantage of instrumentation available to this laboratory (nuclear magnetic resonance, small-angle x-ray scattering, circular dichroism, etc.).

RESULTS: The results to be obtained are expected to be of importance both from the basic and health-applied aspects. Very little is currently known on the exact mode whereby lipid exchange between lipoproteins and cell membranes and also on the structural requirements underlying the receptor-mediated effects by lipoproteins on cell metabolism. Fat-soluble substances which include hydrocarbons or other toxic agents are likely to be transported in association with lipoproteins and from them transferred to the cells. Thus, our proposed studies will provide results not only of strict physico-chemical importance, but ought to give an insight on the mechanisms underlying potentially pathological processes such as, for instance, the accelerated cell growth which is in common to both cancer and atherosclerotic processes.

KEYWORDS: LIPOPROTEINS;LIPIDS;ANIMAL CELLS;CELL PROLIFERATION;METABOLISM;BIOCHEMISTRY;FIBROBLASTS;IMMUNE REACTIONS;BLOOD;HEART;MAN;MEDICINE

<087530>
TITLE: Radiation Toxicology
PROJECT NUMBER: 000371
PRINCIPAL INVESTIGATOR: Casarett, G.W.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles F.

TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E-(11-1)-3490;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$558,000
TECHNOLOGY: NUCLEAR/General (70%);GENERAL SCIENCE (30%)
POLLUTANTS: PARTICULATES (5%);RADIATION (90%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Elucidate nature of reversible and unreversed radiation injury in cells, tissues, and organs; study radioprotective and therapeutic agents. (2) Develop experimental basis for biological dosimetry. (3) Investigate carcinogenic potential of alpha radiation from inhaled radon gas. (4) Elucidate physiological perturbations in animals exposed to electromagnetic radiation.
APPROACH: (1) Radiation injury is studied in vivo (rodents) using correlated multidisciplinary methodology (ranging from subcellular to actuarial). (2) Biological dosimetry is explored by correlating functional changes with energy absorbed in tissues of animals exposed to ionizing radiation. (3) Potentiation by radon of chemically induced lesions in the lung is studied in rats. (4) Neuroendocrine assays in rats and dogs are used to study effects of x-rays and microwaves.
RESULTS: (1) The Casarett theory that ionizing radiation induces long-term degenerative effects via increased endothelial permeability, fibrotic changes, and microcirculatory impairment will be further evaluated; this will include acquisition of data on macro-molecules in connective tissues and improved insights into protection and remediation. (2) Effects of ionizing radiation (from both external and internal sources) on hematopoietic function will be evaluated in several species of animals in relation to the radiation dosimetry problem. (3) Insights into the possible cocarcinogenic or potentiating action of radon alpha radiation will be obtained. (4) Biological risks, thresholds of responses, and implications for man will be assessed relative to exposure to ionizing electromagnetic radiation, microwaves, and ELF fields emanating from high voltage transmission lines.
PROJECT MILESTONES: (1) Begin in-depth literature review of biological effects of ELF electric and magnetic fields asscciated with high voltage power lines Dec. 1975. (2) Characterization of x-ray-induced pituitary/thyroid cancer in the rat Dec. 1976. (3) Complete studies on cocarcinogenic mechanisms of radiation induction (x-rays plus antithyroid agents) of thyroid cancer Sept. 1977. (4) Evaluate hypothalamic-pituitary-adrenal sensitivity threshold for microwave exposure (in rats) Dec. 1977. (5) Develop neutron dosimetry techniques for in vivo dosimetry and for personnel monitoring Jan. 1978. (6) Finish rodent studies on the quantitative relationship between neutron dose and hematopoietic response Jan. 1978. (7) Finish testing of Casarett theory regarding mechanism of radiation induction of delayed and permanent degenerative changes and the therapeutic potentials of several types of chemical agents Sept. 1979.
KEYWORDS: BIOLOGICAL RADIATION EFFECTS;PATHOGENESIS;RADIATION INJURIES;RADON;DRUGS;ELECTROMAGNETIC RADIATION;BIOCHEMISTRY;CONNECTIVE TISSUE;DUSTS;NEOPLASMS;EGGS;FROGS;CHICKENS;COLLAGEN;METABOLISM;TRIIODOTHYRONINE;FIBROSIS;RADIOINDUCTION

<087531>
TITLE: Mutagenesis and DNA Repair
PROJECT NUMBER: 000372
PRINCIPAL INVESTIGATOR: Sherman, F.
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AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-3490
77 FUNDING: Energy Research and Development Administration FY77:$410,000
TECHNOLOGY: NUCLEAR/General (5%);SOLAR/General (5%);GENERAL SCIENCE (90%)
ENERGY CYCLE: ELECTRICITY GENERATION (10%)
POLLUTANTS: ORGANICS (20%);RADIATION (60%);HEAT, THERMAL (5%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (15%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Continue developing the yeast cell as a eukaryotic model for defining genetic phenomena such as mutation, regulation, suppression, recombination, damage, and repair in terms of specific chemical processes. (2) Utilize the well-characterized yeast model to identify molecular alterations in DNA caused by such carcinogens as X-rays, alpha-particles, uv, alkylating agents, etc. (3) Utilize cultured mammalian cells to define and explain adverse effects of external stresses in relation to DNA damage and repair, chromosome damage and repair, cell progression, and mitotic delay.
APPROACH: (1) Using genetic analysis of the cycl gene in yeast and precise determinations of chain sequence in the gene product (iso-1-cytochrome c), it is possible to deduce nucleotide changes associated with mutations. This method will be used to study environmental mutagens and also the error-prone or mutagenic system of DNA repair in yeast. (2) Other repair studies in yeast will explore enzymatic removal of alkyl groups from DNA after exposure of cells to MMS, EMS, or nitrosoguanidine. (3) Repair and related processes will be studied in cultured mammalian cells using synchronized cell populations. Specific inhibitors will be used to ''isolate'' stage-dependent processes. DNA double strand breaks will be correlated with cell survival.
RESULTS: (1) Development of a more completely characterized and more useful eukaryotic genetic model (the yeast, S. cerevisiae). (2) Complete description of the types of base-pair changes that are associated with the mutagenic action of the several chemical agents listed above. (3) Improved understanding of DNA damage and repair and of pollutant-induced alterations in the cell replication cycle.
PROJECT MILESTONES: (1) Using yeast model, improve methods for obtaining yeast cycl mutants that are defective in iso-1-cytochrome c Jan. 1976. (2) Using ionizing radiation and other stresses to alter the replicative cycle in mammalian cells, conduct studies of DNA-repair and other properties of post-arrest G-2 cells June 1976 to April 1977. (3) Begin using defined cycl mutants (yeast) with known pathways of reversion for testing the specificity of mutagenic agents Jan. 1977. (4) Develop a reasonably complete model for the organization of DNA in the mammalian chromosome; perform precise analysis of the effects of ionizing radiation on the molecular weight of chromosomal DNA in the mammalian cell 1977-78. (5) Using the yeast model, obtain a more complete description of the action of mutagens by characterizing numerous forward mutations and deducing nucleotide sequences that are stable and immutable in Jan. 1977.
KEYWORDS: YEASTS;DNA;STRAND BREAKS;MUTANTS;DNA REPLICATION;GENETICS;BIOLOGICAL REPAIR;CARCINOGENS;ENZYMES;GAMMA RADIATION;MUTAGENESIS;ULTRAVIOLET RADIATION;X RADIATION

<087532>
TITLE: Genetic Regulation and Nucleic Acid Chemistry
PROJECT NUMBER: 000373
NCIPAL INVESTIGATOR: Wiberg, J.S.
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AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-3490
77 FUNDING: Energy Research and Development Administration FY77:$139,000
TECHNOLOGY: NUCLEAR/General (5%);GENERAL SCIENCE (95%)
ENERGY CYCLE: ELECTRICITY GENERATION (5%)
POLLUTANTS: ORGANICS (10%);RADIATION (90%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Using the bacterial virus, coliphage T/sub 4/, as an experimental model, develop a better understanding of how genes are expressed and how the process of expression is controlled. (2) Evaluate the usefulness of the T/sub 4/-E. coli combination as a test or model system for evaluating the response of mammalian cells to environmental agents. (3) Working with molecular model systems, characterize the nature of radiation damage in DNA. (4) Develop a better understanding of how replication is regulated in prokaryotes and eukaryotes and how cell division is affected by environmental agents.
APPROACH: (1) In the coliphage study, use is being made of the biochemical-genetics approach in which T/sub 4/ mutants are produced and characterized in order to deduce the exact intracellular roles of specific genes. (2) Electron spin resonance (ESR) and electron nuclear double resonance (ENDOR) are used to detect free-radical species formed by ionizing radiation in DNA constituents. (3) In order to elucidate mechanisms whereby DNA replication is regulated, experiments are being conducted with E. coli to determine the timing of protein synthesis (incorporation of labeled precursors) and the timing of protein involvement in the replicative process.
RESULTS: (1) Purify and study DNases presumed to be controlled by genes 46, 47, and das of T/sub 4/; show that the product of gene regA is normally bound to ribosomes and, if such proves to be true, purify and characterize the gene product. (2) Complete characterization of free radical products formed in irradiated 3'-cytidylic acid and 5'-deoxycytidylic acid; utilization of this information to devise a general scheme for radiation damage in DNA. (3) Information on identification and function of specific proteins involved in DNA and cell replication of E. coli (prokaryote model) and mouse leukemia cells (eukaryote model).
PROJECT MILESTONES: (1) A significant milestone will be reached by the end of this summer (1976) with the publication of several reports outlining a scheme of radiation damage. (2) Demonstration that genes 46 and 47 of T/sub 4/ coliphage control the structure of DNase involved in recombination June 1977. (3) Delineation of mode of action of the T/sub 4/ das and reg A genes December 1977. (4) Discovery of new T/sub 4/ mutants affected in other regulatory processes December 1977. (5) Significant accomplishments are also expected in the study of factors that regulate the replication of prokaryotes (E. coli) and eukaryotes (mouse leukemia cells). However, it is difficult to make specific predictions and formats of milestones are omitted.
KEYWORDS: ESCHERICHIA COLI;BACTERIOPHAGES;BIOCHEMICAL REACTION KINETICS;MUTATIONS;GENETICS;GENETIC CONTROL;MOLECULAR BIOLOGY;DNA;RNA;NUCLEIC ACIDS;NEOPLASMS;ENZYMES;GAMMA RADIATION;X RADIATION

<087536>
TITLE: Membrane Biophysics and Toxicology
PROJECT NUMBER: 000377
PRINCIPAL INVESTIGATOR: Goldstein, D.A.
ADDRESS: University of Rochester, Medical School, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-3490
77 FUNDING: Energy Research and Development Administration FY77:$246,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (80%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Elucidate nature of divalent cation bending to membrane surfaces and nature and regulation of divalent cation transport in membrane systems. (2) Elucidate mechanisms by which hormones regulate and other agents impair metabolic function (including membrane transport) in bone cells. (3) Develop mathematical models describing membrane phenomena and function. (4) Develop clearer insights into the manner in which certain toxic metals (including cadmium and mercury) and other chemical agents alter membrane processes and function.
APPROACH: (1) Binding and transport of Ca/sup ++/ and Mg/sup ++/ are being studied in mitochrondria (rat liver) as a model using radiotracer methods in conjunction with spin resonance (EPR) techniques that utilize the Mn/sup ++/ ion as a Ca/sup ++/ analog. (2) Ca/sup ++/ + Mg/sup ++/ - ATPase (from rabbit muscle) is studied as a model for Ca/sup ++/ transport and its relation to muscle contraction. (3) Ca/sup ++/-carriers are isolated from membranes and characterized. (4) Cells isolated from fetal rat bone are studied in suspension, before or after fractionation by centrifugation. (5) Mathematical models are developed in collaborative studies as circumstances may require. (6) Interactions of environmental agents (e.g., Hg/sup ++/, CH/sub 3/HgCl, Cd/sup ++/, Pb/sup ++/, etc.) with membrane structures and accompanying functional alterations are explored using approaches discussed above.
RESULTS: (1) Further characterize divalent cation transport in mitochondria. (2) Test Gorey-Chapman theory of ''diffuse double layers'' for Mn/sup ++/ binding to phospholipids and ion exchange resins. (3) Obtain evidence for or against hypothesis that local anesthetics act by displacing divalent cations from membranes. (4) Determine dose requirements, time course, and cell type selectivity for the action of parathyroid hormone and calcitonin on separate bone cell types. (5) Clarify structure and function of Na/sup +/+K/sup +/-ATPase, Ca/sup ++/ + Mg/sup ++/ - ATPase, Ca/sup ++/-ionophores, and other membrane components essential to transport activity. (6) identify effects of CH/sub 3/HgCl and heavy metals on structure and function of membrane components essential to transport activity.
PROJECT MILESTONES: In view of the basic nature of this research, the work is essentially open-ended and

typically proceeds via a large number of small experimental steps, each of which is important to the success of the study. Hence, it is difficult to identify milestones or decision points and predict their time of occurrence in a meaningful way.
KEYWORDS: CELL MEMBRANES;ANIMAL CELLS;CHEMICAL BONDS;CATIONS;BIOCHEMISTRY;PHYSIOLOGY;METABOLISM;BONE TISSUES;ENZYMES;HEART;HYDROCARBONS;KIDNEYS;TISSUES;TOXICITY;MATHEMATICAL MODELS;UPTAKE

<087537>
TITLE: Chemical Toxicology
PROJECT NUMBER: 000378
PRINCIPAL INVESTIGATOR: Weiss, B.;Zaties, V.G.
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DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-3490;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$226,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS (15%);METALS (50%);PARTICULATES (15%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Generate reliable dose-effect data for mercury and other energy-related pollutants using behavioral base lines in animal models. (2) Evaluate in animal systems the inhalation toxicity of mercury vapor and cinnabar (H/sub 2/S) dust, both singly and in combination. (3) Use animal models to study the toxicity of other airborne substances as well as toxicity associated with the carbon-fluorine bond (e.g., fluoroacetate).
APPROACH: (1) Substances such as methylmercury, lead, or organic solvents are administered to trained animals to produce measurable deficits in performance (vision, tactile response, or counting ability). (2) Standard toxicological procedures are used to study metabolism, tissue dose, response parameters, and pathophysiology in animals exposed to other toxic agents.
RESULTS: (1) Using trained monkeys exposed to low levels of methylmercury, there will be further collection of data on both visual discrimination and count discrimination tasks. New methods of measuring behavioral responses in primates will be developed. (2) Data obtained from the more routine animal testing will better define hazards associated with the inhalation of mercury vapor, the inhalation of fluorospar (alone and in combination with hydrogen fluoride vapor), and exposure to other agents of interest.
PROJECT MILESTONES: (1) The relationship between the brain distribution of mercury and the neurotoxicity displayed by three animal species will be reported in FY 1977. (2) Study of dose-response in rats exposed to fluoroacetate will be completed in July 1977; preliminary microsomal studies to be completed in Dec. 1977. (3) Study of animals exposed to HF+ fluorospar by inhalation should be completed by Jan. 1978.
KEYWORDS: POLLUTION;HEALTH HAZARDS;BEHAVIOR;MERCURY;INHALATION;METABOLISM;TOXICITY;SODIUM COMPOUNDS;VISION;MONKEYS;BIRDS;ETHANOL;RATS;BIOLOGICAL EFFECTS;GUINEA PIGS;FLUORIDES;METHYLMERCURY;BIOCHEMISTRY;NEUROLOGY;PATHOGENESIS

<087539>
TITLE: Health Studies: Exposure to External and Internal Radiation; Low-Level Plutonium, Transplutonium and Fission Products and Other Elements Studies
PROJECT NUMBER: 000439
PRINCIPAL INVESTIGATOR: Rieben, M.
ADDRESS: University of Utah, Salt Lake City, UT
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: P233-5468
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$361,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The general services group is a multi-purpose division and provides the following services to the laboratory: administration, microphotography, biostatistics and equipment development and repair. The bio-statistics section is a most important program; more and more it is becoming the centralized data collection center for the intra-laboratory groups and for inter-laboratory (i.e., Davis, Argonne, Battelle, Lovelace, etc.) relationships and communications. The other two sections, microphotography and equipment development and repair, are intra-laboratory organizations and provide services only within this laboratory.
APPROACH: Through following of proper business procedures, to provide the necessary required business administration as requested by the US ERDA. To provide scientific assistance as required in the fields of microphotography, biostatistics and equipment development and repair and the state of the art in each of these fields allows.
RESULTS: The proper services provided by this group will assist in bringing about the results expected in the scientific groups of the laboratory.
PROJECT MILESTONES: (1) Plutonium-toxicity-young adult beagles, low-level study 1984-85. (2) Radium-toxicity-young adult beagles, low-level study 1982. (3) Plutonium-toxicity-puppies-pilot study 1984. (4) Plutonium/radium-toxicity-puppies study designed, not yet implemented. (5) Plutonium/radium-toxicity/biopsy, old adult beagles full implementation by 1979. (6) Radium-228 (mesothorium)-toxicity-young adults finished within 5 years. (7) Thorium-228 (radiothorium)-toxicity-young adults finished within 5 years.
KEYWORDS: BIOSTATISTICS;ADMINISTRATION;RESEARCH PROGRAMS;LABORATORY EQUIPMENT;DESIGN;PHOTOGRAPHY;STATISTICS;DATA PROCESSING;PLUTONIUM;RADIUM;TOXICITY;BEAGLES

<087540>
TITLE: Health Studies: Exposure to External and Internal Radiation; Low-Level Plutonium, Transplutonium and Fission Products and Other Elements Studies
PROJECT NUMBER: 000441
PRINCIPAL INVESTIGATOR: Jee, W.S.S.
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AFFILIATION: Utah Univ., Salt Lake City (USA). Coll. of Medicine
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DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: F388-2191;C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-119
77 FUNDING: Energy Research and Development Administration FY77:$156,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Plutonium and transplutonium element (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This laboratory is involved mainly in studies of the health effects of low levels of radionuclides of the nuclear fuel cycle, Pu-239, Am-241, Cf-249, Cf-252 and other transuranic elements such as curium-243/244 and einsteinium-253 to predict the toxicity of these radionuclides to man.
APPROACH: The conceptual relationship by which the results obtained in beagles can be extrapolated to man is given by the equation: Beagle plutonium-239 toxicity/Beagle radium-226 toxicity approximately Human plutonium-239 toxicity/Human radium-226 toxicity. If the left hand side of the equation and the denominator of the right side are both known, it is theoretically possible to solve for the toxicity of plutonium-239 in man. Other radionuclides may be substituted for plutonium, e.g., americium, californium and others. Likewise, mesothorium may be substituted for radium-226.
RESULTS: The results expected are to have the ability to predict toxicity of nuclides (Pu, Am, Cf, etc.) in man at various ages.
PROJECT MILESTONES: (1) Plutonium-toxicity-young adult beagles, low-level study 1984-1985. (2) Radium-toxicity-young adult beagles, low-level study 1984. (3) Plutonium-toxicity-puppies-pilot study 1982. (4) Plutonium/radium-toxicity-puppies, study designed, not implemented. (5) Plutonium/radium-toxicity/biopsy-old adult beagles, full implementation by 1979. (6) Radium-228 (mesothorium)-toxicity-young adults, finished within 5 years. (7) Thorium-228 (radiothorium)-toxicity-young adults, finished within 5 years.
KEYWORDS: PLUTONIUM 239;AMERICIUM 241;CALIFORNIUM 249;CALIFORNIUM 252;CURIUM 243;CURIUM 244;EINSTEINIUM 253;TOXICITY;MAN;FORECASTING;BEAGLES;RADIUM 228;THORIUM 228;IN VIVO;NEOPLASMS;PATHOGENESIS;SKELETON

<087541>
TITLE: Radiation Chemistry Group, Assessment Evaluation and Control of Radiation Exposure to Man and His Environment-Exposure to Internal and External
PROJECT NUMBER: 000442
PRINCIPAL INVESTIGATOR: Stevens, W.
ADDRESS: Utah University
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$153,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The function of the chemistry group is to determine the retention, distribution (whole body and intra-organ) of the various radionuclides being studied within the laboratory, especially Pu-239.
APPROACH: Studies of the biological endpoints, acute and chronic, which occur following the injection of these various nuclides, will continue.
RESULTS: The principal endpoints are life-shortening and osteogenic sarcomas, with other pathological changes contributing to death in the higher doses. These observed effects are being correlated with the radiation dose.
PROJECT MILESTONES: (1) Plutonium-toxicity-young adult beagles, low-level study 1984-85. (2) Radium-toxicity-young adult beagles, low-level study 1982. (3) Plutonium-toxicity-puppies-pilot study 1984. (4) Plutonium/radium-toxicity-puppies-study designed, not yet implemented. (5) Plutonium/radium-toxicity/biopsy-old adult beagles full implementation by 1979. (6) Radium-228 (mesothorium)-young adult beagles finished within 5 years. (7) Thorium-228 (radiothorium)-toxicity-young adult beagles finished within 5 years.
KEYWORDS: RETENTION;BEAGLES;INJECTION;TISSUE DISTRIBUTION;RADIUM 226;RADIUM 228;STRONTIUM 90;THORIUM 228;URANIUM 233;NEPTUNIUM 237;PLUTONIUM 238;PLUTONIUM 239;AMERICIUM 241;CURIUM 243;CURIUM 244;CALIFORNIUM 249;CALIFORNIUM 252;EINSTEINIUM 253;BERKELIUM 249;BIOLOGICAL RADIATION EFFECTS;INTERNAL IRRADIATION;PATHOLOGICAL CHANGES;MUTATIONS;TOXICITY;DOSE-RESPONSE RELATIONSHIPS

<087542>
TITLE: Radiation-Clinic-Pathology, Assessment Evaluation and Control of Radiation Exposure to Man and His Environment-Exposure to External and Internal
PROJECT NUMBER: 000443
PRINCIPAL INVESTIGATOR: Taylor, G.N.
ADDRESS: Utah University
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$574,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Provision of animal care and veterinary services for a beagle colony of approximately 850 animals. (2) Evaluation of the health status of each animal at sufficiently frequent intervals to define the radiation induced and/or spontaneous syndromes. (3) Radionuclide distribution studies in soft tissues. (4) Evaluation of liver toxicity induced by Pu-239.
APPROACH: To continue to provide the required animal care so as to be able to continue the provision of experimental animals as required and to continue the updating of the data base on the current animals in the various studies being pursued in the laboratory.
RESULTS: Improved understanding of the effects of internally-deposited radionuclides on the skeleton and soft tissue structure of the experimental animals and the potential like effects on man.
PROJECT MILESTONES: (1) Plutonium-toxicity-young adult beagles, low-level study 1984-85. (2) Radium-toxicity-young adult beagles, low-level study 1982. (3) Plutonium-toxicity-puppies-pilot study 1984. (4) Plutonium/radium-toxicity-puppies-study designed but not implemented. (5) Plutonium/radium-toxicity-biopsy-old adult beagles full implementation by 1979. (6) Radium-228 (mesothorium)-toxicity-young adults finished within 5 years. (7) Thorium-228 (radiothorium)-toxicity-young adults finished within 5 years.
KEYWORDS: LABORATORY ANIMALS;DOGS;MICE;PLUTONIUM 239;TOXICITY;LIVER;CARCINOGENESIS;RADIUM 226;CALIFORNIUM 249;CALIFORNIUM 252;BIOLOGICAL RADIATION EFFECTS;INTERNAL IRRADIATION;PATHOLOGICAL CHANGES;BONE TISSUES;TOXICITY

<087543>
TITLE: Health Studies: Exposure to External and Internal Radiation; Low-Level Plutonium, Transplutonium and Fission Products and Other Elements Studies
PROJECT NUMBER: 000445
PRINCIPAL INVESTIGATOR: Mays, C.W.
ADDRESS: University of Utah
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$149,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Evaluation of the retention, distribution and dosimetry of internally deposited radionuclides. (2) Prediction of the radiation risk to humans from occupational and environmental exposure. (3) Safe removal of radionuclides from the body. (4) Assistance to US ERDA and other organizations on questions of the risk to man from radiation, especially plutonium.
APPROACH: (1) Experimental evaluation of the metabolism and dosimetry of internally deposited radionuclides in beagles and mice by total body counting and tissue analysis. (2) Predicting the effect of Pu-239 in man from the observed toxicity of Ra-224 and Ra-226 in man and the ratio of Pu/Ra toxicity in experimental animals. (3) Establish experimentally the optimum dosage and protraction of various decorporation agents (such as Zn-DTPA) in removing toxic metals from the body and the prevention of the redeposition of these elements from lung or wound to bone and liver. (4) Providing current information to US ERDA on the predicted health effects from Pu and other radiation sources to man.
RESULTS: Improved understanding of the metabolism of internally deposited radionuclides and their expected effects on man: in particular, better estimates of Pu risk to bone, liver and lung.
PROJECT MILESTONES: (1) Plutonium-toxicity-young adult beagles, low-level study 1984-85. (2) Radium-toxicity-young adult beagles, low-level study 1982. (3) Plutonium-toxicity-puppies-pilot study 1984. (4) Plutonium/radium-toxicity-puppies-study designed, not yet implemented. (5) Plutonium/radium-toxicity/biopsy-old adult beagles full implementation by 1979. (6) Radium-228 (mesothorium)-young adult beagles finished within 5 years. (7) Thorium-228 (radiothorium)-toxicity-young adult beagles finished within 5 years.
KEYWORDS: PLUTONIUM 239;RADIUM 226;BEAGLES;SKELETON;RADIATION DOSES;INTERNAL IRRADIATION;TISSUE DISTRIBUTION;METABOLISM;INJECTION;BONE TISSUES;AGE DEPENDENCE;PATHOLOGICAL CHANGES;CARCINOGENESIS;RADIOINDUCTION;DOSE-RESPONSE RELATIONSHIPS;EXTRAPOLATION;MAN;RADIONUCLIDE KINETICS;SAMPLING;AUTOPSY;BIOLOGICAL RADIATION EFFECTS;RADIATION DOSE DISTRIBUTIONS;ENVIRONMENT;TOXICITY

<087544>
TITLE: Regulation of Complex Metabolic Pathways in Normal and Neoplastic Tissues
PROJECT NUMBER: 000478
PRINCIPAL INVESTIGATOR: Deuel, T.F.
ADDRESS: Box 420, The University Chicago Hospitals, Chicago, IL 60637
AFFILIATION: Franklin McLean Memorial Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-69
77 FUNDING: Energy Research and Development Administration FY77:$44,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The regulation of two ''branch point'' enzymes, glutamine synthetase and PRPP synthetase, is being examined in normal and neoplastic tissues. Factors responsible for in vitro and in vivo regulation are being characterized, and cell culture systems are used for further definition of cellular and external mediators of the overall control of the enzymes. We are examining the in vitro regulation of purified human erythrocyte adenylate (AMP) deaminase, the specific binding of AMP deaminase to the inner surface of the erythrocyte membrane, and residues on both the enzyme and the membrane responsible for the enzyme-membrane binding. The objectives of the laboratory are to describe, characterize, and compare enzyme regulation in normal and neoplastic cells, to determine the mechanisms whereby such regulation is achieved, and to probe normal membrane function. The results of these studies will provide well defined systems to be used for the screening of potential pollutants as well as the mechanisms by which specific pollutants act both in vivo and in vitro.

APPROACH: The approach to be used in all of the proposed studies is biochemical. Enzymes have been or are being purified to homogeneity for detailed kinetic and structural studies. Antibodies against purified enzymes will be used to study enzyme levels and enzyme protein degradative rates. Human skin fibroblasts and hepatoma cells will be used for more detailed studies of cell regulation. Purified erythrocyte membranes are being used to study the binding of purified human erythrocyte adenylate deaminase.
:SULTS: Glutaminase will be tried to see whether analogous response in glutamine synthetase-specific activity is seen in normal liver and in rat hepatomas in response to the specific deprivation of L-glutamine as is seen in protein starvation of the host animals. Further studies will be done to provide a greater definition of the characteristics of the normal liver cells and hepatomas in short-term cultures, especially as modified by L-glutamine concentration and glucocorticoids in the growth media. We expect that studies on the active transport of L-glutamine will be completed during 1978. We also expect the sequence analysis of the ''active site'' peptide of B. subtilis glutamine synthetase to be completed during 1978. We expect further characterization of isolated adenylated deaminase during 1977. Amino acid analysis, N-terminal amino acid(s) determination, and sedimentation velocity and gel filtration studies at differing salt concentrations will be initiated. Studies characterizing the kinetics of binding of the isolated erythrocyte enzyme to the erythrocyte membrane will be done, and we expect the initial experiments in this area to be completed in 1977. Studies to identify the peptide(s) binding the enzyme to the membrane will be initiated. We anticipate characterizing the binding process of enzyme to the erythrocyte membrane in greater detail. Other enzymes will be tested also to
PROJECT MILESTONES: Glutamine Synthetase: (1) Characterization of enzyme induction process 1/1/77. (2) Measurement of enzyme degradation rate in cultured cells 7/1/77. Adenyate Deaminase: (1) Characterization of enzyme subunit structure 7/1/77. (2) Characterization of enzyme and erythrocyte membrane binding 7/1/77. PRPP Synthetase: (1) Characterization of the effect of purine and pyrimidines on the levels of PRPP synthetase in cultured cells 1/1/77. (2) Characterization of the effect of purine analogs on the levels of PRPP synthetase in cultured cells 7/1/77.
KEYWORDS: TISSUES;NEOPLASMS;METABOLISM;LIGASES;CELL CULTURES;ENZYMES;BIOCHEMICAL REACTION KINETICS;ERYTHROCYTES;FIBROBLASTS;TUMOR CELLS;BIOCHEMISTRY;BLOOD

<087546>
TITLE: Study of Erythropoietin: Structure, Mode of Action, Mechanism of Differentiation and Possible Clinical Applications
PROJECT NUMBER: 000488
PRINCIPAL INVESTIGATOR: Yachnin, S.
ADDRESS: 950 E. 59th Street, Chicago, IL 60637
AFFILIATION: Franklin McLean Memorial Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)69
77 FUNDING: Energy Research and Development Administration FY77:$216,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To purify the hormone erythropoietin, study its chemical and biological properties, its mechanism of action as the primary inducer of red blood cell formation, to test its clinical effectiveness and to investigate the general problem of blood cell differentiation.
APPROACH: Fractionate the crude proteins of plasma and/or urine to isolate erythropoietin by chromatographic methods. Develop methods for study of red cell differentiation in bone marrow cell cultures. Purify and study other hemopoietic inducing factors.
RESULTS: Isolation in mg. quantities of pure human erythropoietin, determination of chemical and physical properties, determination of usefulness in replacement therapy and understanding of molecular mechanisms of cell differentiation.
PROJECT MILESTONES: (1) September 1976 Purification of human erythropoietin. (2) April 1977 Clinical trial of erythropoietin.
KEYWORDS: LYMPHOCYTES;PHYTOHEMAGGLUTININ;MOLECULAR STRUCTURE;PROTEINS;FETUSES;HEPATOMAS;IMMUNE REACTIONS;IMMUNOSUPPRESSION;PEPTIDES;TRYPSIN;AMINO ACIDS;CELL MEMBRANES;BIOLOGICAL MODELS;ANIMALS;BIOCHEMISTRY;BLOOD;MAN;IMMUNOLOGY

<087547>
TITLE: Acquisition of Environmental Information Through Light and Heat Perception
PROJECT NUMBER: 001353
PRINCIPAL INVESTIGATOR: Poff, K.L.
ADDRESS: MSU/ERDA Plant research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA). ERDA Plant Research Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$101,000
TECHNOLOGY: SOLAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (10%)
POLLUTANTS: HEAT, THERMAL (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Object: To gain an understanding of the mechanisms whereby organisms (particularly plants) obtain information concerning the state of their environment through the reception of light or of heat. The research is focussed on the earliest events of environmental perception: the sites or materials in the cells which take up the environmental ''signal'' and transform (''transduce'') it into a biochemical ''message'' which ultimately results in the response.
PPROACH: Measurement of the physiological responses of the organism to light (e.g., establishment of an action spectrum) or to heat, to determine characteristics of the particular sensory transducer involved. These characteristics are then used to identify the sensory transducer. An assay has been developed for a photosensory transducer for blue light responses and is now being used to monitor steps in the purification of the photoreceptor pigment. Work is carried out using higher plants as well as ''model''

lower organisms (cellular slime molds).
RESULTS: This work is expected to identify the photo- and thermo-sensory transducers of plants. This information will provide an entry into the mechanism for heat and light detection, and procedures whereby one can control the responses by plants to heat or to light, and thus adapt them to stress conditions, i.e., unusual environment such as can be the consequence of increased energy production and new technologies.
PROJECT MILESTONES: (1) Identification of blue-light receptor in plants FY 1978. (2) Characterization of the heat transducer in slime molds FY 1978.
KEYWORDS: ENVIRONMENTAL PHYSIOLOGY;SENSORY TRANSDUCTION;PLANTS;BIOLOGICAL MODELS;BIOCHEMISTRY;BIOLOGICAL STRESS;TEMPERATURE EFFECTS;VISIBLE RADIATION;PHYSIOLOGY;THERMAL EFFLUENTS;ENVIRONMENTAL EFFECTS

<087548>
TITLE: Characterization of Gaseous Molecular Pollutants Emitted by Energy Generation Sources
PROJECT NUMBER: 001359
PRINCIPAL INVESTIGATOR: Fassel, V.A.
ADDRESS: Ames Laboratory, ERDA, Ames, IA 50011
AFFILIATION: Ames Lab., Iowa (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-ENG-82
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/General (80%);FOSSIL FUEL/Oil Shale (15%);FOSSIL FUEL/Biomass - pyrolysis (5%)
ENERGY CYCLE: EXTRACTION (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (80%)
POLLUTANTS: PARTICULATES (20%);ORGANICS (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (60%);DEVELOPMENT/Laboratory scale (40%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The broad objectives of this study are to develop the basic science, the investigative methods and the hardware so that the demanding analytical requirements associated with the characterization of organic and inorganic pollutants in effluents from energy generating sources can be met in a viable practical manner. Particular emphasis is devoted to the development of multipollutant analytical concepts and on the determination of ultratrace pollutants. Special attention is being placed on those inorganic and organic pollutants which are or may be emitted from fossil-fueled energy sources and from coal liquefaction and gasification plants. Many of these pollutants are certainly health hazards, and some already identified are proven carcinogens.
APPROACH: Two approaches are utilized. The first involves a critical evaluation of the capability of macroreticular resins in sorbing quantitatively intermediate molecular weight organic compounds as well as polynuclear aromatic hydrocarbons from air at levels from approximately ppb up to 100 ppm. The second approach is focused on the selective energy transfer of energy, from X-ray beams to pollutant molecules of interest followed by optical emission of characteristic radiation. The goal of this study is to devise multipollutant anlytical systems.
RESULTS: (1) Development of reliable techniques for isolating ultratrace amounts of intermediate molecular weight organic compounds, as well as polynuclear aromatic hydrocarbons (PAH) from air samples followed by their quantitation by gas chromatography, mass spectroscopy and other techniques. (2) Development of an analytical system for observation of x-ray excited optical luminescence (XEOL) of PAH's immobilized in Shopol'skii solvents.
PROJECT MILESTONES: (1) 1978 The principal organic vapors emitted from the Ames power plant, which is burning solid waste to provide 20-25 percent of the fuel, will be identified and characterized for a period of a year or more. (2) 1979 The complete analytical system for the observation of the XEOL and time resolved phosphorescence of PAH's immobilized in Shopol'skii solvents should be operational and ready for field applications.
KEYWORDS: POLYNUCLEAR AROMATIC HYDROCARBONS;GASEOUS WASTES;CHEMICAL EFFLUENTS;ENVIRONMENT;AIR POLLUTION;WATER POLLUTION;FOSSIL-FUEL POWER PLANTS;COAL GASIFICATION PLANTS;COAL LIQUEFACTION PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL ANALYSIS;AIR POLLUTION MONITORS;DESIGN;AEROSOLS;PARTICLES;MULTI-ELEMENT ANALYSIS;CARCINOGENS;FLUE GAS;MEASURING METHODS;MEASURING INSTRUMENTS

<087549>
TITLE: Environmental Effects of Solid Waste as a Supplemental Fuel
PROJECT NUMBER: 001534
PRINCIPAL INVESTIGATOR: Shanks, H.R.
ADDRESS: A207 Physics Building, Iowa State University, Ames, IA 50011
AFFILIATION: Ames Lab., Iowa (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-W-7405-ENG-82
77 FUNDING: Energy Research and Development Administration FY77:$156,000; American Public Power Association
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Coal (25%);CONSERVATION/General (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (25%);ELECTRICITY GENERATION (25%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);PRODUCTION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Power plants
APPROACH: The approach in this study is to make use of standard sampling procedures (EPA recommended methods) where feasible and to develop new or modified sampling methods where needed to measure all emissions from the boiler units.
RESULTS: It is expected that if the study shows insignificant changes in power plant emissions when wastes are added to the coal that the technique can be recommended as a desirable method for resource recovery and disposal of solid wastes. A second result expected is a more complete evaluation of coal fired plants with particular emphasis on the emissions of heavy organics.
PROJECT MILESTONES: (1) Jan. 1, 1977 Complete sampling of first traveling grate unit for all gaseous and particulate emissions. (2) Feb. 1, 1977 Results for composition of fuels, ash and all emissions except heavy organics available. Start sampling tangentially fired boiler unit. (3) Jan. 1, 1978 Complete sampling of tangentially fired boiler unit for gaseous and particulate emissions. Results on heavy organics from traveling grate unit available. (4) Feb. 1, 1978 Results of measurements on tangentially fired boiler available except for heavy organics. Preliminary evaluation of relative effectiveness of the

types of boilers for burning solid wastes with coal. Measurements started on large traveling grate unit with emphasis on emission of carcinogens and other heavy organics. (5) Jan. 1, 1979 All currently planned measurements on the three units will be completed and a comparison of data from the two traveling grate units, the tangentially fired unit and the St. Louis facility will be available. A decision will be made with respect to the need for additional data on carcinogens and heavy organics from the power plant and in the surrounding ambient air. (6) Oct. 1, 1979 Project completed and publication of all results unless there is a need for additional carcinogen and heavy organics monitoring.
KEYWORDS: CARCINOGENS;COAL;BOILER FUEL;SOLID WASTES;INCINERATORS;COMBUSTION PRODUCTS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS;ORGANIC COMPOUNDS;POWER PLANTS;ENVIRONMENTAL IMPACTS;FLUE GAS;FLY ASH;CHEMICAL COMPOSITION;GASEOUS WASTES;HEALTH HAZARDS;MONITORING;CARCINOGENS;HYDROCARBONS;DATA ACQUISITION

<087552>
TITLE: Resistance of Plants to Environmental Stress
PROJECT NUMBER: 001964
PRINCIPAL INVESTIGATOR: Hanson, A.D.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA). ERDA Plant Research Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$88,000
TECHNOLOGY: CONSERVATION/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) By continuing literature survey to monitor plant related problems arising from increases in energy production and costs, and changes in energy technology. (2) General research on metabolic responses of plants subjected to environmental insults (e.g., lack of water). The accumulation of the free amino acid proline, and the value of this activity to the plant will be investigated, proline accumulation being a feature found in many plants subjected to various environmental stresses. (3) Applied work to assemble germ plasm of known field tolerance to environmental stresses (especially drought) and to use this material for developing physiological and biochemical criteria for use as screening tests in selecting stress-resistant plants.
APPROACH: (1) Continuing literature survey. (2) and (3) Determination of levels, formation and fate of proline in plants, comparing stress (drought) sensitive and tolerant varieties and species, under normal and stressed conditions.
RESULTS: (1) Identification of problems related to plant growth and production, arising from increases in energy production and costs and from increasing use of new technologies, in critical need of investigation. (2) Identification and understanding the biochemical mechanisms of stress injury and tolerance, as basis for protecting plants and producing plants resistant to environmental stresses. (3) Development of simple, reliable methods for screening crop plants for stress tolerance.
PROJECT MILESTONES: (1) Assessment of value of proline accumulation as a criterion for drought resistance in wheat, for application to a breeding program aimed at development of high-yielding wheats resistant to a range of environmental stresses Mar. 1978. (2) Completion of assembly and seed multiplication of a range of wheat with defined tolerance to water stress (and salinity and cold stresses) Mar. 1978.
KEYWORDS: PRODUCTIVITY;PLANTS;BIOLOGICAL STRESS;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;TECHNOLOGY ASSESSMENT;PROLINE;ECOLOGICAL CONCENTRATION;PHYSIOLOGY;BIOCHEMISTRY;MOISTURE;WATER;CROPS;CLIMATES;METABOLISM;WHEAT;PREFERRED SPECIES;PLANT BREEDING

<087553>
TITLE: Health Studies: Decorporation; Removal of Transuranic Elements from the Body
PROJECT NUMBER: 001966
PRINCIPAL INVESTIGATOR: Jee, W.S.S.
ADDRESS: Utah University, Salt Lake City, UT
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(11-1)-119
77 FUNDING: Energy Research and Development Administration FY77:$57,000
TECHNOLOGY: FOSSIL FUEL/General (10%);NUCLEAR/General (90%)
ENERGY CYCLE: PROCESSING, CONVERSION (90%);WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION/Plutonium;RADIATION/Americium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Development of improved methods to remove transuranic elements from the body both safely and efficiently.
APPROACH: Test repeated administration of Ca-DTPA (now approved on an experimental basis by the FDA) and safer agents such as Zn-DTPA. Radionuclide removal is being measured and possible toxic effects on the fetus, the young, and the adult animal are being observed.
RESULTS: (1) (As soon as possible)--Help US ERDA prepare a much-needed IND (investigational new drug application) for the approved use of Zn-DTPA in humans. (2) 1977 Define the fetal toxicity of Ca-DTPA in large animals, such as beagles. (3) 1978 Continue studies on the possible toxic effects, if any, of Zn-DTPA at doses proposed for human therapy. (4) 1979 Test new agents and combinations of agents for safety and decorporation efficiency.
PROJECT MILESTONES: (1) (As soon as possible)--Help US ERDA prepare a much-needed IND (investigational new drug application) for the approved use of Zn-DTPA in humans. (2) 1977 Define the fetal toxicity of Ca-DTPA

in large animals, such as beagles. (3) 1978 Continue studies on the possible toxic effects, if any, of Zn-DTPA at doses proposed for human therapy. (4) 1979 Test new agents and combinations of agents for safety and decorporation efficiency.
KEYWORDS: FOSSIL FUELS;NUCLEAR ENERGY;HEALTH HAZARDS;PLUTONIUM;AMERICIUM;CARCINOGENS;MAN;PATHOLOGICAL CHANGES;BIOLOGICAL REPAIR;DISEASES;SKELETON;NEOPLASMS;IN VIVO;DTPA;REMOVAL

<087554>
TITLE: Biochemistry of Sulfur Dioxide Injury in Plants
PROJECT NUMBER: 002191
PRINCIPAL INVESTIGATOR: Filner, P.
ADDRESS: MSU/ERDA Plant Research Laboratory, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA). ERDA Plant Research Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hanson, John B.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-1338
77 FUNDING: Energy Research and Development Administration FY77:$42,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine how SO/sub 2/ damages plants, and how some plants resist SO/sub 2/
APPROACH: Exposure to SO/sub 2/ of closely related varieties and species with differing SO/sub 2/ sensitivity, and determination of the differences in /sup 35/S metabolism. The project has been initiated in this fiscal year, and the effort has so far been mainly concerned with designing equipment, developing criteria for quantitation of SO/sub 2/ effects in plants, and survey of sensitive and tolerant plants.
RESULTS: Understanding of the mechanism of SO/sub 2/ action; development of strategies for minimizing damage, e.g. by breeding.
PROJECT MILESTONES: (1) Identification and quantitation of SO/sub 2/ sensitivity differences of species Jan. 1977. (2) Analysis of metabolites derived from /sup 35/SO/sub 2/ Jan. 1978. (3) Detection of metabolic differences between resistant and sensitive species FY 1978.
KEYWORDS: PLANTS;SULFUR DIOXIDE;BIOLOGICAL EFFECTS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;LAND POLLUTION;TERRESTRIAL ECOSYSTEMS;CHEMICAL REACTION KINETICS;BIOLOGICAL REPAIR;ENERGY;CHEMICAL EFFLUENTS;METABOLISM;BIOLOGICAL STRESS;PATHOGENESIS

<087555>
TITLE: Area Program in Population Genetics
PROJECT NUMBER: 002208
PRINCIPAL INVESTIGATOR: Neel, J.V.
ADDRESS: Univ. of Michigan Medical School, Dept. Human Genetics, 1137 East Catherine St., Ann Arbor, MI 48109
AFFILIATION: Michigan Univ., Ann Arbor (USA). Dept. of Human Genetics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(11-1)-2828
77 FUNDING: Energy Research and Development Administration FY77:$775,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);NUCLEAR/Fission (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop a system for monitoring human populations for mutation rates at the protein level; and to develop studies of the same protein indicators of mutation in experimental animal and tissue culture material. The latter should facilitate extrapolation to man of the results of studies on laboratory animals.
APPROACH: For man, placental cord blood samples will be screened for protein variants and appropriate studies performed when a variant is encountered to determine if it is a new mutation. It is expected that this experience will not only contribute to knowledge of spontaneous mutation rates but also provide the basis for decisions regarding the desirability of large scale monitoring programs in the U.S. For experimental animals and cell culture material, mutation rates will be determined in treated and control material.
RESULTS: Data on somatic cell and germinal mutation rates, employing protein indicators, which data should have certain desirable characteristics not possessed by previous data on mutation rates, such as precision of phenotype and end point.
PROJECT MILESTONES: (1) Systems in place Dec., 1976. (2) Substantial data Dec., 1977. (3) 1,000 blood core samples will be collected and analyzed for protein variants and an indication of spontaneous germ cell mutations in human populations September, 1978.
KEYWORDS: HUMAN POPULATIONS;LABORATORY ANIMALS;CELL CULTURES;MUTAGENESIS;MUTATION FREQUENCY;TIME DEPENDENCE;PROTEINS;EXTRAPOLATION;BIOASSAY;GENETIC VARIABILITY;ANIMAL CELLS;MAN;ENZYMES;EPIDEMIOLOGY;IMMUNOLOGY

<087556>
TITLE: The Cytogenetics of Monosomes in Zea mays
PROJECT NUMBER: 006001
PRINCIPAL INVESTIGATOR: Weber, D.F.
ADDRESS: Department of Biological Sciences, Illinois State University, Normal, IL 61761
AFFILIATION: Illinois State Univ., Normal (USA). Dept. of Biological Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-AT(11-1)-2121;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: SOLAR/Biomass (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Monosomics lack a pairing partner in each meiotic cell and genes on an entire chromosome

are present in the hemizygous condition. We have isolated monosomics for chromosomes 1, 2, 3, 4, 6, 7, 8, 9, and 10 in Zea mays utilizing a recently-discovered system. This is the first time that a series of this type has been produced in any diploid form. The monosomics are surprisingly vigorous, good cytological samples can be taken, and crosses made. We are isolating all possible monosomic types and characterizing them by studying (1) the cytology of meiosis, (2) the cytological behavior of monosomic chromosomes, (3) the effect of monosomy on recombination, (4) the frequency and types of spontaneous chromosomal aberrations arising in monosomics, (5) the effect of monosomy on free amino acids in leaves, and (6) the ultrastructure of maize monosomics. By comparing a monosomic with its diploid siblings, one compares one and two copies of all genes on an entire chromosome. If a gene expressing dosage effects resides on the monosomic chromosome, a difference will be found between these plant types. This rationale is the basis for parts 1, 3, 5, and 6.
RESULTS: This study has discovered genetic factors that control meiosis, genetic recombination, lipid biosynthesis, fatty acid biosynthesis, and the free amino acid pool in monosomic leaves. It has also shown that the 5S rRNA template is not necessarily for nucleolar formation; thus, it is not a nucleolar organizing region. It has also shown that ribosomal gene compensation and magnification does not occur at the nucleolar organizing region in maize.
KEYWORDS: MAIZE;GENETICS;MEIOSIS;CYTOLOGY;CHROMOSOMES;CHROMOSOMAL ABERRATIONS;GENE RECOMBINATION

<087557>
TITLE: Effect of Radiation on Normal Hematopoiesis and on Viral Induced Cancers of the Hematopoietic System
PROJECT NUMBER: 006004
PRINCIPAL INVESTIGATOR: OKunewick, J.P.
ADDRESS: Allegheny General Hospital, 320 East North Avenue, Pittsburgh, PA 15212
AFFILIATION: Allegheny General Hospital, Pittsburgh, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Bieschke, James
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-3097
77 FUNDING: Energy Research and Development Administration FY77:$23,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are to examine the interactions between irradiation and leukemia causing viruses, to determine the effects of radiation on viral leukemia, the immune response to leukemia viruses, and if radiation enhances the susceptibility of animals to such viruses.
APPROACH: The approach involves the definition of the in vivo kinetics of viral leukemia in a murine model, with respect to the control of cellular proliferation of viral hematopoietic target cells, the activity of immune competent cells, and how these are affected by low level acute and chronic exposure to radiation and other carcinogens.
RESULTS: The anticipated end product will be to provide an answer to the question: ''Do radiation and/or chemical carcinogens interact with cancer-causing viruses in the animal in such a way as to increase the probability of cancer development.''
KEYWORDS: BLOOD FORMATION;NEOPLASMS;HEMATOPOIETIC SYSTEM;VIRUSES;LEUKEMIA;IMMUNE REACTIONS;MICE;RADIATIONS;BIOLOGICAL RADIATION EFFECTS;ANIMAL CELLS;CARCINOGENS;BIOLOGICAL EFFECTS;X RADIATION

<087558>
TITLE: A Study of the Physiological Function and Histological Changes of Thyroids Irradiated with Radioactive Iodine
PROJECT NUMBER: 006014
PRINCIPAL INVESTIGATOR: Dobyns, B.M.
ADDRESS: Cleveland Metropolitan General Hospital, 3395 Scranton Road, Cleveland, OH 44109
AFFILIATION: Case Western Reserve Univ., Cleveland, Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Carter
TYPE OF FUNDING: Contract No.-E(11-1)-1784
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/I-131 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This is a broad study of the effects of radioiodines on the thyroids of animals and man. One aspect deals with the latent effects of this material in the therapy of hyperthyroidism, i.e., thyroid failure and tumor development. The other aspect deals with the dose level which produces tumors in rats. Most attention here is devoted to a relatively low dose range following which the tumors develop. A model seems to be found so that tumors can be expected in a relatively high percentage of animals. The biological implications of these are being explored.
KEYWORDS: THYROID;PHYSIOLOGY;IODINE ISOTOPES;HYPERTHYROIDISM;NEOPLASMS;MAN;ANIMALS;RATS;BIOLOGICAL EFFECTS;DNA;NUCLEAR MEDICINE;PATHOLOGICAL CHANGES

<087559>
TITLE: Investigations of the Biological Effects of Radiation: A Multi-Discipline Approach
PROJECT NUMBER: 006015
PRINCIPAL INVESTIGATOR: Friedell, H.L.
ADDRESS: Department of Radiology, Case Western Reserve University, Cleveland, OH 44106
AFFILIATION: Case Western Reserve Univ., Cleveland, Ohio (USA). Dept. of Radiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)2486
77 FUNDING: Energy Research and Development Administration FY77:$112,000
TECHNOLOGY: GENERAL SCIENCE (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study and elucidate (1) transport and attachment processes of electrons in biomolecules; (2) mechanism of DNA replication in vitro and in vivo, the effects of ionizing radiation on this process, and eventually the isolation of the replication complex; (3) changes in DNA precursor pool sizes postirradiation and define underlying mechanism(s); and (4) the relationship between protein synthesis and radiation-induced mitotic delay (need for ''mitotic proteins'' or ''recovery proteins'').
APPROACH: The use of (1) 1 MeV pulsed electrons; (2) isolated nuclei and nuclear extracts from a synchronously dividing slime mold; (3) radioactive DNA precursor and the determination of precursor pool sizes and specific activities, with and without irradiation; and (4) correlation of biochemical and cytological events in synchronously dividing sea urchin eggs and in slime mold plasmodia.
RESULTS: (1) ''Design'' of better radiosensitizers and development of high-sensitivity monitoring systems for electrophilic compounds (potential carcinogens); (2) identification and eventual isolation of a DNA replication complex; (3) identification of reasons for decreased efficiency of DNA precursor incorporation in irradiated cells; and (4) definition of effects of ionizing radiation on proteins associated with apparatus and the process of mitosis.
PROJECT MILESTONES: (1) Observation of efficient electron attachment rates to both radiosensitizers and carcinogens; (2) achievement of highly efficient DNA synthesis in vitro (25% of in vivo rate, 15% of genome replicated); (3) partial elucidation of DNA precursor pool effects in irradiated cells; and (4) identification of a new ''marker'' for sensitivity (in terms of mitotic delay) to combined radiation and cycloheximide in late prophase. Our ''Project'' in reality consists of four sub-projects; therefore, the Project Summary (item 93) had to be broken down as four items under each heading. Through an oversight, the ''Milestones'' listed (item 94) are achievements that have occurred (rather than anticipated achievements). In terms of projected milestones, these may be listed as: (1) design of an instrument for determination of extremely low concentrations of organic electrophilic compounds (potential detection of carcinogens in gaseous effluents); (2) identification and/or isolation of a ''replication complex'' from isolated nuclei of a synchronous slime mold; (3) improved means to determine absolute rate of DNA replication from the incorporation of radioactive precursors; and (4) identification of the protein involved in recovery from radiation-induced mitotic delay as either a structural (''mitotic'') protein or an enzyme (''recovery'' protein).
KEYWORDS: RADICAL PRODUCTION;IONIZING RADIATIONS;BIOLOGICAL RADIATION EFFECTS;BIOCHEMICAL REACTION KINETICS;DNA;PROTEINS;BIOSYNTHESIS;MITOTIC DELAY;MITOSIS;BIOCHEMISTRY;CYTOLOGY;ELECTRONS;SEA URCHINS;EGGS;CARCINOGENS;RADIOSENSITIZERS;BIOLOGICAL RECOVERY;ENZYMES

<087561>
TITLE: A Study of the Translocation of Plutonium and Americium from Puncture Wounds
PROJECT NUMBER: 006019
PRINCIPAL INVESTIGATOR: Lebel, J.L.
ADDRESS: Department of Radiology and Radiation Biology, Colorado State University, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Radiology and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-AT(11-1)1787
77 FUNDING: Energy Research and Development Administration FY77:$21,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Plutonium toxicity (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Acquire an understanding of mechanisms and processes of translocation and excretion ratios for americium and plutonium from contaminated wounds. Study effects of removal agents on contaminants.
APPROACH: Implant isotopes of interest subdermally. Make routine biochemical and histological samples from the beagles thus injected. Serial sacrifice of 1/2 of population. Divide second group for study of removal agents.
RESULTS: Elucidation of what happens when plutonium and other contaminants enter the body from wounds. Develop a logical method of minimizing or reducing effect of such contamination.
KEYWORDS: PLUTONIUM;AMERICIUM;INJECTION;BEAGLES;TISSUE DISTRIBUTION;EXCRETION;WOUNDS;TOXICITY;PATHOGENESIS

<087563>
TITLE: Proteins in Growth Regulation During Early Development of the Chick Embryo
PROJECT NUMBER: 006025
PRINCIPAL INVESTIGATOR: Klein, N.W.
ADDRESS: Department of Animal Genetics, University of Connecticut, Storrs, CT 06268
AFFILIATION: Connecticut Univ., Storrs (USA). Dept. of Animal Genetics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Harvey, Elmer B.
TELEPHONE: C(202)353-4177
TYPE OF FUNDING: Contract No.-E(11-1)-3139
77 FUNDING: Energy Research and Development Administration FY77:$36,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Teratogens (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the extent to which changes in the synthesis of individual serum proteins cause alterations in the growth and development of early embryos observed in response to developmental age, nutrition, teratogens, and genetic factors.
APPROACH: In vitro cultures of intact early chick embryos are used as the test system. Yolk-sacs are isolated from these embryos and incubated with radioactive amino acids to measure serum protein synthesis. To determine the response to serum proteins, individual serum proteins are isolated by column chromatographic and immunological procedures. Intact embryos (chick, rat) and isolated organs (brains and heart) are used to test the response to serum proteins.
RESULTS: Serum proteins are important regulators of growth and development in early embryos. Changes in the synthesis of serum proteins cause some of the deleterious responses of embryos to nutrition, teratogens, and genetic factors.

PROJECT MILESTONES: Serum proteins are important regulators of growth and development in early embryos. The deleterious responses of embryos to nutrition, teratogens and genetic factors are mediated by changes in serum protein synthesis. The molecular mechanisms by which serum proteins act on the embryo are defined. The molecular mechanisms by which nutrition, teratogens, and genetic factors alter serum protein synthesis are defined.
KEYWORDS: PROTEINS;BIOSYNTHESIS;EMBRYOS;CHICKENS;ANIMAL GROWTH;AGE DEPENDENCE;RATS;BLOOD SERUM;BIOLOGICAL EFFECTS;IN VITRO;METABOLISM;TERATOGENESIS

<087564>
TITLE: Toxicology and Metabolism of Nickel Compounds
PROJECT NUMBER: 006026
PRINCIPAL INVESTIGATOR: Sunderman, F.W. Jr.
ADDRESS: Department of Laboratory Medicine, University of Connecticut School of Medicine, Farmington, CT 06032
AFFILIATION: Connecticut Univ., Farmington (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Harvey, Elmer B.
TELEPHONE: C(301)376-4678
TYPE OF FUNDING: Contract No.-E(11-1)-3140
77 FUNDING: Energy Research and Development Administration FY77:$101,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Nickel (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The toxicology and metabolism of nickel compounds (including particularly Ni/sub 3/S/sub 2/, Ni/sub 3/Se/sub 2/, NiSe, NiS, NiCl/sub 2/ and Ni(CO)/sub 4/) are being investigated following administration to mice, rats, hamsters and rabbits. The objectives of these investigations include: (1) elucidation of the mechanisms of nickel toxicity and carcinogenesis; (2) evaluation of the teratogenicity and mutagenicity of nickel compounds; (3) understanding of the nutritional and physiological roles of nickel and of the disturbances of nickel metabolism in pathological conditions; (4) delineation of potential hazards to man and animals from environmental or occupational exposures to nickel compounds, particularly in relationship to nickel exposures from coal-gasification technologies; (5) development of new techniques for identification and measurement of nickel compounds in biological materials and environmental samples; (6) development of new biochemical indices of nickel exposure; and (7) introduction of improved methods for the prevention, detection and therapy of poisoning by nickel compounds.
APPROACH: The procedure involves the study of Ni-63 metabolism following administration of Ni-63(CO)/sub 4/, Ni-63/sub 3/S/sub 2/, and Ni-63Cl/sub 2/ to animals in order to identify (a) the nickel-binding constituents of body fluids, (b) the organ distribution and routes of elimination of Ni-63, and (c) the biochemical alterations which are associated with nickel carcinogenesis. The research also involves (d) evaluations of the teratogenicity and mutagenicity of nickel compounds in animals, and (e) the use of atomic absorption spectrometry to determine Ni-59 concentrations in biological fluids and tissues of normal men and of men who are subject to environmental or occupational exposures to nickel. The test objects and agents include rats, hamsters and rabbits, and blood, urine, feces, hair, sweat, saliva and semen from human subjects.
RESULTS: The expected products of this research are the accomplishment of the objectives that were listed under 93a above. There is currently widespread concern by government, industry and the general public regarding the hazards to human populations from environmental and occupational exposures to nickel compounds. Certain nickel compounds are extremely toxic (e.g., Ni(CO)/sub 4/) and highly carcinogenic (e.g., Ni/sub 3/S/sub 2/), whereas other nickel compounds (e.g., NiCl/sub 2/) are relatively less toxic and are apparently non-carcinogenic. The relevance of this research to national priorities has been enhanced by the recent introduction of nickel catalysts in several industrial processes for gasification of coal.
PROJECT MILESTONES: (1) Investigations have demonstrated the carcinogenicity of Ni(CO)/sub 4/ and Ni/sub 3/S/sub 2/ in rats. (2) Alterations of serum nickel concentrations have been found in common human diseases such as myocardial infarction. (3) Atomic absorption methods have been developed for analysis of nickel in biological materials. (4) Data has been obtained regarding the effects of environmental and occupational exposures upon nickel concentrations in body fluids and excreta. (5) A new chelating agent, triethylenetetramine, has been found to be an effective antidote for acute Ni(II) toxicity in rats.
KEYWORDS: NICKEL COMPOUNDS;TOXICITY;METABOLISM;RATS;HAMSTERS;RABBITS;MAN;CARCINOGENESIS;TERATOGENESIS;NEOPLASMS;CARCINOGENS NICKEL;HEALTH HAZARDS;COAL GASIFICATION;MUTAGENESIS;CHEMICAL ANALYSIS

<087565>
TITLE: Pathophysiologic Effects of Stable Iodine Used As A Thyroidal Blocking Agent to Reduce Thyroid Radiation Exposure
PROJECT NUMBER: 006027
PRINCIPAL INVESTIGATOR: Becker, D.V.
ADDRESS: Cornell University Medical College, 1300 York Avenue, New York City, NY 10021
AFFILIATION: Cornell Univ., New York (USA). Medical Coll.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, Walter
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Contract No.-E-(11-1)-3173
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This study will determine whether iodide-induced thyroid follicular cell necrosis, previously documented in dogs (J. Clin. Endocrin: 36:466 March 1973), occurs in man and will attempt to delineate factors relating to the occurrence of the lesions including susceptibility, size and time of iodine dose required to produce the lesion as well as to define the potentially susceptible population.
APPROACH: Clinical opportunities will be exploited to provide this information in man. Many patients of potential susceptibility receive iodides as part of their general management, i.e., hyperthyroid patients

with rapid iodide turnover and small thyroidal iodine pool, patients prepared for surgery for hyperthyroidism without thionamide antithyroid agents and patients receiving large doses of iodides for various diagnostic and therapeutic purposes. In these patients, the lesion will be searched for by serial measurement of serum thyroglobulin, thyroxine and triodithyroxine (by radioimmunoassay) and late measurements of thyroid autoantibodies. When appropriate, direct examination by light and electron microscopic (including scanning microscopy) procedures will also be carried out.
KEYWORDS: IODINE;BIOLOGICAL EFFECTS;MAN;THYROID;HYPERTHYROIDISM;PATIENTS;DIAGNOSTIC TECHNIQUES;THERAPY;ANIMAL CELLS;NECROSIS;PATHOLOGICAL CHANGES;TOXICITY;DOSE-RESPONSE RELATIONSHIPS

<087566>
TITLE: Characterization of Biological Membranes by Physical Chemical Methods
PROJECT NUMBER: 006036
PRINCIPAL INVESTIGATOR: Solomon, A.K.
ADDRESS: 25 Shattuck Street, Boston, MA 02115
AFFILIATION: Harvard Medical School, Boston, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Harvey, Elmer B.
TELEPHONE: C(301)376-4678
TYPE OF FUNDING: Contract No.-E(11-1)-3010
77 FUNDING: Energy Research and Development Administration FY77:$48,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The project is concerned with the structure-function relationship of biological membranes. We plan to determine the three parameters which define the permeation process in human red cells, resealed ghosts and preparations of the human red cell membrane in the normal configuration, called right side out vesicles, and in the inverted configuration, called inside out vesicles. The three parameters are the hydraulic conductivity, the reflection coefficient and the permeability coefficient.
APPROACH: We plan to address these two questions: how do proteins affect the passive flux of water and polar nonelectrolytes, and how does the molecular arrangement of the membrane lipids affect small lipophilic solute permeability. To study the first, we will use specific sulfhydryl and amino group reagents; for the second we will modify membrane cholesterol and use specific phospholipases.
RESULTS: We have made an exact measurement of the dead time of our stop-flow apparatus for measuring red cell swelling. We will use this value in applying our new computer solution which enables us to determine all three permeation parameters in a single series of experiments. We plan to determine the reflection coefficient for urea permeability across the human red cell membrane. We have found that the specific amino group reagent that inhibits anion self-exchange, DIDS, also inhibits water and urea flux across the human red cell membrane, and we will explore the implications of this finding.
PROJECT MILESTONES: We hope that the output of our stop-flow device can be coupled on line to our new PDP 11/34 computer so that the parameters we want to determine can be computed automatically. If we succeed, this will be a milestone.
KEYWORDS: CELL MEMBRANES;PERMEABILITY;ERYTHROCYTES;PROTEINS;LIPIDS;IN VITRO;ANIMAL CELLS;BLOOD;MAN

<087568>
TITLE: Blood Platelets and Coagulation
PROJECT NUMBER: 006044
PRINCIPAL INVESTIGATOR: Levin, J.
ADDRESS: Hematology Division, 1002 Blalock, The Johns Hopkins Hospital, Baltimore, MD 21205
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wise, David
TELEPHONE: C(301)353-4177
TYPE OF FUNDING: Contract No.-E(11-1)-3014
77 FUNDING: Energy Research and Development Administration FY77:$31,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION/Gamma irradiation (2%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Development of knowledge of mechanisms by which production of platelets by the bone marrow is regulated, and purification of the humoral regulator (thrombopoietin) of platelet production. Many toxins (e.g., irradiation, bacterial endotoxins, some hydrocarbons) produce damage to the bone marrow, with resultant thrombocytopenia and death. Therefore, information about mechanisms of thrombopoiesis and preparation of purified thrombopoietin will potentially allow treatment of a variety of disorders in which there is bone marrow failure.
APPROACH: Currently, animal models in mice and rabbits are being used to study alterations in thrombopoiesis and assay systems have been developed to measure thrombopoiesis and the thrombopoietic effects of agents which either stimulate or depress bone marrow function. Some measurements are based on altered incorporation of the radionuclide, selenomethionine-Se-75, into megakaryocytes and platelets.
RESULTS: We expect to eventually purify thrombopoietin, gain greater understanding of the mechanisms by which megakaryocytes respond to stimuli, and finally to be able to more effectively treat persons whose marrows have been damaged by exposure to a variety of environmental toxins, pollutants, and other hazardous agents.
PROJECT MILESTONES: (1) Partial purification of thrombopoietin. (2) Improved animal models for the study of thrombopoiesis, and evaluation of environmental pollutants and other biohazards that alter thrombopoiesis. (3) Administration of thrombopoietin to appropriate humans with bone marrow depression.
KEYWORDS: BLOOD PLATELETS;BLOOD COAGULATION;BONE MARROW;BLOOD FORMATION;HORMONES;HEMIC DISEASES;SELENIUM 75;TRACER TECHNIQUES;BONE MARROW CELLS;THERAPY;BIOCHEMISTRY;MEDICINE;CHEMICAL EFFLUENTS

<087570>
TITLE: Molecular Events Basil to Cellular Radiation Response
PROJECT NUMBER: 006051
PRINCIPAL INVESTIGATOR: Kolodny, G.M.
ADDRESS: Radiology Research Laboratory, Massachusetts General Hospital, Boston, MA 02114
AFFILIATION: Massachusetts General Hospital, Boston (USA). Radiology Research Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Harvey, Elmer D.
TELEPHONE: C(301)376-4678
TYPE OF FUNDING: Contract No.-E(11-1)-3335
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The biological effects of radiation are most noticeable in the short and long term effects of cell division. This laboratory has been concerned with genetic regulatory mechanisms which would control the initiation and inhibition of cell division and the effects of radiation on these mechanisms. We have proposed a new hypothesis for the regulation of gene expression which postulates that RNA sequences from degraded functional RNA act as primers for the synthesis of new RNA. Data from experiments on the turnover of ribosomal RNA are consistent with this hypothesis. During the coming year, we will attempt to demonstrate incorporation of labeled oligonucleotide segments as primer RNA in the synthesis of high molecular weight RNA. Small molecular weight degraded RNA fragments will be added to both nuclear and whole cell preparations to test for their ability to stimulate transcription. Recent studies on cell membranes have shown the importance of these structures in cell behavior and transformation. We shall be studying the effect of cell growth, confluence, transformation and x-irradiation on the number and location of insulin receptors. Because of recent evidence that RNA sequence and integrity may be important in genetic stability and transcription, we shall be investigating the effect of x-irradiation on RNA strand breakage and on vasopressin induced radioprotection.
KEYWORDS: CELL DIVISION;BIOLOGICAL RADIATION EFFECTS;RNA;BIOSYNTHESIS;CELL MEMBRANES;STRAND BREAKS;RADIOINDUCTION;VASOPRESSIN;RADIOSENSITIVITY EFFECTS;BIOCHEMISTRY;NEOPLASMS;ANIMAL CELLS;IN VITRO;MOLECULAR STRUCTURE;X RADIATION

<087574>
TITLE: Regulation of Enzymes in Animals: Effects of Developmental Process, Cancer and Radiation
PROJECT NUMBER: 006058
PRINCIPAL INVESTIGATOR: Knox, W.E.
ADDRESS: Cancer Research Institute, New England Deaconess Hospital, 185 Pilgrim Road, Boston, MA 02215
AFFILIATION: New England Deaconess Hospital, Boston, Mass. (USA). Cancer Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duda, George D.
TELEPHONE: C(301)353-5037
TYPE OF FUNDING: Contract No.-E(11-1)-3085
77 FUNDING: Energy Research and Development Administration FY77:$78,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To measure and interpret biochemical constituents of animal tissues as the regulated outcome of genetic, age, embryological, physiological and pathological influences. The purpose is to describe the biochemical equivalents of anatomical, pysiological and pathological processes, and ultimately to use these sensitive indices for identification, diagnosis, etc.
APPROACH: Enzymes are measured because they are the most sensitive and varied components, as well as being the functional elements and the products of the cell's genome. Cumulative data matrices of our own determinations and useable ones from the literature are constructed. Numerical analyses by computer programs identify relationships (chemical distances) between the patterns of tissues, from which inferences can be drawn.
RESULTS: The many chemical things known about the body will be integrated into a coherent picture analogous to those in other areas of basic medical science. The theme is genomic, organismic, and environmental regulation of the metabolic machinery of cell-types and therefore of their functions. The highly resolving terms of biochemistry are expected to extend greatly our insight into the dynamic nature of animal tissues as they grow, function and respond to disease.
PROJECT MILESTONES: (1) Inducible enzymes in animals were discovered in 1952. (2) Differentiation of tissues by stepwise inductions of enzymes were discovered in 1968. (3) The first substantial chemical atlas of tissue differences was published in 1972. (4) The chemical similarity of different kinds of cancers and their resemblance to fetal tissues was demonstrated in 1972 (''fetalism'' of neoplasms). (5) Immediate goals are characterization of the chemical nature of cancers for possible diagnostic use; discrimination of cancers from representative normal tissues; and description of the changing genetic programs during normal development.
KEYWORDS: PATHOLOGICAL CHANGES;BIOCHEMISTRY;PHYSIOLOGY;ENZYMES;NEOPLASMS;GENETICS;DIAGNOSIS;METABOLISM;TISSUES

<087575>
TITLE: Radiation Carcinogenesis
PROJECT NUMBER: 006060
PRINCIPAL INVESTIGATOR: Warren, S.
ADDRESS: Cancer Research Institute, New England Deaconess Hospital, 194 Pilgrim Rd., Boston, MA 02215
AFFILIATION: New England Deaconess Hospital, Boston, Mass. (USA). Cancer Research Inst.
ITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-3017

77 FUNDING: Energy Research and Development Administration FY77:$96,000
TECHNOLOGY: NUCLEAR/General (50%);CONSERVATION/General (50%)
POLLUTANTS: PARTICULATES/Asbestos (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Establishing the relationship between radiation injury and the malignant transformation of cells and tissues. The ultimate objectives are knowledge of the mechanisms of radiation carcinogenesis and better knowledge of dose-effect relationships. These will permit the establishment of better-documented safety standards for exposure and the determination of synergistic or antagonistic relaticnships between radiation and selected other types of injurious agents encountered in the production and conservation of energy.
APPROACH: The test objects are rats, mice and other rodents. The sources of radiation are chiefly 250 kv x-rays. Leukemia, solid tumors, and other morphologic evidences of tissue damage are used as end indicators of effect. In certain experiments the use of whole body radiation permits establishment of the relative sensitivity to carcinogenesis of the various tissues. Attention is given to the role of hormonal imbalance as a cocarcinogenic factor with radiation. The possible synergistic effect of radiation and a different carcinogen (asbestos) administered intratracheally, intrapleurally and intraperitoneally is being investigated.
RESULTS: Knowledge of the relative sensitivity of different cell and tissue types to known amounts of radiation. More accurate dose-effect data.
PROJECT MILESTONES: (1) September 1, 1976 Completion of study of factors in adrenal cortical tumorigenesis. (2) October 1, 1976 Completion of data analysis on relative tissue sensitivity to carcinogenesis. (3) January 1, 1977 Completion of hormonal level analyses in radiation-induced mammary tumorigenesis. (4) August 1, 1977 First cancers expected in asbestos-radiation carcinogenesis study.
KEYWORDS: IONIZING RADIATIONS;CARCINOGENESIS;NEOPLASMS;RADIOINDUCTION;DOSE-RESPONSE RELATIONSHIPS;HORMONES;SYNERGISM;CARCINOGENS;TISSUES;RADIOSENSITIVITY;ANIMAL CELLS;LUNGS;INHALATION;PATHOGENESIS

<087576>
TITLE: The Tumorigenic Action of Beta, Proton, Alpha and Electron Radiation on the Rat Skin
PROJECT NUMBER: 006064
PRINCIPAL INVESTIGATOR: Burns, F.J.
ADDRESS: N.Y.U. Institute of Environmental Medicine, 550 First Ave., New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-AT(11-1)3380
77 FUNDING: Energy Research and Development Administration FY77:$64,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (60%);SPECIFIED OTHER POLLUTANTS/Ultraviolet (40%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this research is to establish as quantitatively as possible how various radiolcgic and biologic factors, such as, dose, dose rate, age, other carcinogens, etc. affect the induction of tumors in rat skin after irradiation with various types of radiation. The possible existence of a linear term in the dose response curve, which has great implications in radiation protection, will be studied by means of a multiple dose fractionation schedule.
APPROACH: Recovery for epidermal stem cell survival will be determined as a function of the cell cycle and compared to recovery for tumor induction. The effect of dose rate on tumor induction will be studied within the context of a proposed theoretical model. Chemical sensitization with DNA specific agents, such as, bromodeoxyuridine, will be utilized to determine to what extent the target for oncogenesis resides in the nucleus. The kinetics of DNA repair will be compared to the kinetics of recovery as a possible basis for a mechanistic relationship.
RESULTS: The proposed experiments are expected to produce the following results: a better delineation of the tumor induction dose-response curve and significance of recovery for high and low LET radiation, a clearer idea of the role of cell cycle and nuclear dose in the oncogenic action of radiation, and how extremely low dose rates and age affect the tumor response.
PROJECT MILESTONES: (1) Completion of high LET experiments on Bevalac at Lawrence Radiation Laboratory. (2) Completion cf lcw dose rate irradiations with electrons.
KEYWORDS: ALPHA PARTICLES;BETA PARTICLES;ELECTRONS;PROTONS;FRACTIONATED IRRADIATION;SKIN;RATS;BIOLOGICAL RADIATION EFFECTS;NEOPLASMS;RADIOINDUCTION;DOSE-RESPONSE RELATIONSHIPS;DOSE RATES;AGE DEPENDENCE;STEM CELLS;BIOLOGICAL RECOVERY;CELL CYCLE;COMPARATIVE EVALUATIONS;LET;ANIMALS;PATHOGENESIS;ULTRAVIOLET RADIATION;X RADIATION

<087577>
TITLE: Radioactivity Studies
PROJECT NUMBER: 006065
PRINCIPAL INVESTIGATOR: Eisenbud, M.
ADDRESS: New York University Medical Center, Department of Environmental Medicine, 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-3382;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$107,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: EXTRACTION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION/U-238;RADIATION/Pb-210;RADIATION/Po-210;RADIATION/Am;RADIATION/Co;RADIATION/Pu (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: As in the past, major research efforts propoed by our laboratory are directed toward defining the potential radiological health problems associated with nuclides encountered at the two ends

of the nuclear fuel site, i.e., the mining of uranium ores and possible exposures to actinides during nuclear waste handling, fuel reprocessing or fuel fabrication. Proposed research is directed toward efining those metabolic parameters, i.e., uptake, retention and disposition of the natural long-lived aughters of the U-238 chain, Pb-210 and Po-210 and of the transuranic nuclides, Am, Cm and Pu. oncomitant studies will be carried out in exposed humans with measurable body burdens and in adult and juvenile baboons.
RESULTS: The efficacy of Na/sub 3/DTPA was assessed in decorporation therapy for removing systemic burdens of Am-241 from the primate. Americium-241 is cleared rapidly from the circulation after i.v. injection with less than 10% remaining in the blood after one hour and less than 1% of I.D. after 24 hours. A new method of estimating skeletal burdens of ''bone-seeking'' radionuclides has been developed and tested employing in vivo methods.
KEYWORDS: WASTE HANDLING;LEAD 210;POLONIUM 210;AMERICIUM ISOTOPES;CURIUM ISOTOPES;PLUTONIUM ISOTOPES;UPTAKE;RETENTION;TISSUE DISTRIBUTION;AMERICIUM 241;EXCRETION;DTPA;FUEL CYCLE;MINING;HAZARDS

<087578>
TITLE: Biochemical Studies of the Ocular Lens in Relation to Cataractogenesis
PROJECT NUMBER: 006074
PRINCIPAL INVESTIGATOR: Kinsey, V.E.
ADDRESS: Institute of Biological Sciences, Oakland University, Rochester, MI 48063
AFFILIATION: Oakland Univ., Rochester, Mich. (USA). Inst. of Biological Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles
TYPE OF FUNDING: Contract No.-AT(11-1)-2012
77 FUNDING: Energy Research and Development Administration FY77:$12,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of the research which is supported by ERDA in the Institute of Biological Sciences is to add to the knowledge of the normal chemistry and physiology of the lens in order to gain a better understanding of the metabolic aberrations that lead to cataract formation.
APPROACH: (1) Investigate the relation between ion transport and aberrations in hydration of the lens leading to swelling and production of cataract. (2) Investigate the changes in electrolytes and hydration levels of the lens and relate them to opacities following short-wave radiation. (3) Measure the key intermediate of the cycle (oxoproline) in the presence and absence of various amino acids by blocking the utilization of the intermediate by specific agents.
RESULTS: (1) Investigate the quantitative significance of the gamma-glutamyl cycle in the lens and its relation to amino acid transport. (2) Study the function of membrane sulfhydryls and glutathione in the transport of rubidium and other cations. (3) Further examine the changes in various biochemical parameters during the formation and reversal of galactose cataract in order to provide an understanding of the mechanism of cataract reversal. (4) Study further the saturation of the Na-K ATPase system responsible for extruding sodium from the lens in relation to lens hydration. (5) Determine those constituents which are needed and those which are toxic for maintenance of lens clarity in culture medium.
PROJECT MILESTONES: (1) Formulation of a mathematical model that describes quantitatively the movement of the alkali metal cations, potassium, rubidium and cesium into and out of the lens. (2) Demonstration that potassium, rubidium, and cesium are actively transported into the lens by a carrier-mediated system similar to or identical with Na-K ATPase, with a single kind of active site. (3) Observation that permeability of the lens for the above mentioned cations is dependent on absorptive rather than frictional forces, i.e., on the anionic field strength of the membrane that limits diffusion. (4) Evidence that glutathione synthesis in galactose cataract is unaffected and is in contrast to the observations in z-ray-induced cataracts where the enzymes of GSH synthesis have been shown to be inhibited.
KEYWORDS: BIOCHEMISTRY;CRYSTALLINE LENS;EYES;PATHOLOGICAL CHANGES;CATARACTS;ETIOLOGY;PHYSIOLOGY;METABOLISM;ALKALI METALS;CATIONS;POTASSIUM;RUBIDIUM;CESIUM;BIOLOGICAL RADIATION EFFECTS;IONIZING RADIATIONS

<087582>
TITLE: Biological Effects of Ionizing Radiation at the Molecular, Cellular and Human Level
PROJECT NUMBER: 006086
PRINCIPAL INVESTIGATOR: Hempelmann, L.H.
ADDRESS: Department of Radiology, University of Rochester School of Medicine and Dentistry, Rochester, NY
AFFILIATION: Rochester Univ., N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
TYPE OF FUNDING: Contract No.-AT(11-1)-3501;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$53,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: In this project we measure the size and organization of mammalian chromosomal DNA, its breakage and repair following exposure to ionizing radiation, and the effects of such damage and its repair on cells, tissues and organisms (especially man). Molecular studies rely on sedimentation and viscometry using DNA from synchronously and randomly growing mammalian cell cultures. The tissue and animal studies are based on a well defined analog system in the planarian. The molecular basis of differentiation control in tissue maintenance is studied by the use of biochemical methods. In the human radiation studies we have developed a retrospective-prospective epidemiological study of mortality and morbidity of about 6,000 plutonium workers throughout the country.
KEYWORDS: IONIZING RADIATIONS;BIOLOGICAL RADIATION EFFECTS;CHEMICAL RADIATION EFFECTS;ANIMAL CELLS;DNA;CHROMOSOMES;MOLECULAR BIOLOGY;STRAND BREAKS;MAN;TISSUES;BIOLOGICAL REPAIR;PLUTONIUM;OCCUPATIONS;EPIDEMIOLOGY

<087583>
TITLE: Uranium Miner Lung Cancer Study
PROJECT NUMBER: 006089
PRINCIPAL INVESTIGATOR: Saccomanno, G.
ADDRESS: St. Mary's Hospital and Medical Center, P.O. Box 1628, Grand Junction, CO 81501
AFFILIATION: Saint Mary's Hospital, Grand Junction, Colo. (USA). Dept. of Pathology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research, Medical Research Branch
MONITOR: Weyzen, Walter H.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(11-1)-1826
77 FUNDING: Energy Research and Development Administration FY77:$121,000; National Cancer Inst.
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Radon;RADIATION/Uranium (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our objectives have been to learn more about the morphogenesis of human lung cancer. This is being accomplished in many ways. Our foremost study entails analysis of sputum samples from uranium miners and, by annual study of these samples, identify abnormal sputum metaplastic cells that, when fcllowed for many years, eventually become malignant in a significant number of cases. Second, we are following miners who have carcinoma in situ, determining the length of time it takes these cases to progress into invasive carcinoma. The incidence of specific cell tumor types in the uranium miners is being accumulated for comparisons with carcinoma of the lung in non-miners. Too, and probably most important, we hope to learn more of the process of morphogenesis of cancer of the lung in man.
APPROACH: (1) Continuation of sputum collection and collection of lungs from deceased miners. (2) ''Predictive'' analytical study of sputum samples taken from individual miners over several years. (3) Uranium Miners Lung Study.
RESULTS: (1) Early diagnosis of lung cancer by sputum smears. (2) Many publications of our findings. (3) Manual on Pulmonary Cytology.
PROJECT MILESTONES: (1) Satisfactory technique for preparation of sputum smears. (2) We have proven that carcinoma in situ will remain in that stage for three plus years before becoming invasive.
KEYWORDS: URANIUM MINES;MINERS;LUNGS;NEOPLASMS;LATENCY PERIOD;CARCINOGENESIS;ANIMAL CELLS;INHALATION

<087585>
TITLE: Problems in Radiation Embryology
PROJECT NUMBER: 006099
PRINCIPAL INVESTIGATOR: Brent, R.L.
ADDRESS: 1025 Walnut Street, Philadelphia, PA 19107
AFFILIATION: Thomas Jefferson Univ., Philadelphia, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1) 3268
77 FUNDING: Energy Research and Development Administration FY77:$38,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (90%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To study the effects of potentially toxic agents on the mammalian embryo. A major portion of these investigative efforts involves studying the effects of intrauterine X-irradiation exposure on adult life expectancy and the frequency of adult malignancy. Other radiation embryologic projects include threshold determination for radiation-induced congenital malformations, the mechanisms involved in radiation-induced embryonic death and embryonic malformations, the importance of yolk sac radiation and four other radiation embryology projects using in vivo and in vitro systems.
APPROACH: Pregnant rat and mouse embryos are exposed to X-irradiation at various stages of embryonic development. Biochemical, pathological, immunological, histological and morphologic techniques are used to describe in great detail the quantitative and qualitative aspects of embryonic radiation exposure. Besides laboratory animal experiments, an in vitro embryo culture technique will be used to study the effect of embryotoxic agents during the period of organogenesis. This will permit us to better evaluate the significance of changes in the cultured embryo, since we have an extensive experience with the prognostic implications of pathological findings in the embryo grown in vivo. The data from the human epidemiological study involving diagnostic radiation exposure is obtained from referrals to our research center from all over the ccuntry.
RESULTS: Learn more about the quantitative and qualitative effects of embryonic irradiation at different stages of mammalian gestation with regard to malformations, embryolethality, adult pathology, adult malignancy induction and repair mechanisms. Determination of the importance of dose and dose-rate of X-irradiation upon lethality and malformation thresholds. Learn more about the appropriateness of embryo culture techniques for screening for potentially toxic agents (including radiation). Because of the concern about the exposure of pregnant women to diagnostic irradiation, it is important to confirm the animal experiments in the human which indicate that gross congenital malformations should not be expected in the 5-rad and below range.
PROJECT MILESTONES: Reported findings and contributions of these investigations: (1) Embryonic and fetal growth retardation are intimately associated with malformations produced by radiation. (2) The embryo, while very sensitive to radiation, also has sophisticated repair mechanisms which can prevent the effects of radiation if the dose rate and dose are very low. (3) The preimplantation period of mammalian development is a stage that is resistant to the teratogenic and growth retarding effects of radiation. (4) X-ray exposures below 10 rads have no ability to produce gross malformations in this mammalian embryo. (5) Fractionation cf radiation dose markedly reduces the malforming effects of X-irradiation. (6) Data from these investigations and the associated publications were important in revising the approach to handling the potentially pregnant women who may be exposed to radiation.
KEYWORDS: EMBRYOS;MAMMALS;X RADIATION;BIOLOGICAL RADIATION EFFECTS;PRENATAL IRRADIATION;RATS;MICE;MALFORMATIONS;DOSE-RESPONSE RELATIONSHIPS;RADIOINDUCTION;NEOPLASMS;EPIDEMIOLOGY;IN VITRO;REPRODUCTION;TERATOGENESIS

<087586>
TITLE: Effects of X-Irradiation on Steroid Biotransformations by Testicular Tissue
JECT NUMBER: 006104
ICIPAL INVESTIGATOR: Ellis, L.C.
ADDRESS: Department of Biology UMC-53, Logan, UT 84322
AFFILIATION: Utah State Univ., Logan (USA). Dept. of Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hobbs, Chas
TELEPHONE: C(301)353-3681
TYPE OF FUNDING: Contract No.-E(11-1)-1602
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/X-irradiation (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: The long-term goals of the proposed research are to ascertain (1) specifically how radiation affects the testis in terms of specific biochemical reactions; (2) if alterations in steroid biotransformations are related to changes in gametogenesis; (3) if radiation-induced changes in androgen synthesis are related to general endogenous radioprotective mechanisms or the enhancement of lethality; (4) the role of the cyclic nucleotides -cAMP and cGMP to steroid biotransformations, radioprotective mechanisms and spermatogenesis; and (5) how radioprotective and antioxidant compounds such as serotonin, melatonin, nordihidroquaretic acid, AET, cAMP, cGMP and caffeine exert their radioprotective effects on the gonads.
APPROACH: In vivo and in vitro assays are being used to assess the effects of x-irradiation and the various chemical on specific enzymatic processes. Histological evaluation of the in vivo experiments are correlated with the alterations in biochemical phenomena.
RESULTS: The project is being terminated July 31, 1976. No further data will be obtained after this date.
PROJECT MILESTONES: The project is being terminated July 31, 1976. No further data will be obtained after this date.
KEYWORDS: X RADIATION;BIOLOGICAL RADIATION EFFECTS;TESTES;STEROIDS;BIOCHEMISTRY;GAMETOGENESIS;ANDROGENS;BIOSYNTHESIS;NUCLEOTIDES;RADIOPROTECTIVE SUBSTANCES;ANTIOXIDANTS;SEROTONIN;AET;CAFFEINE;RADIOSENSITIVITY EFFECTS;ENZYMES;REPRODUCTION;AGE DEPENDENCE

<087587>
TITLE: Mechanisms of Calcium Transport in Small Intestine
PROJECT NUMBER: 006116
PRINCIPAL INVESTIGATOR: DeLuca, H.F.
ADDRESS: Department of Biochemistry, University of Wisconsin, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-1668
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS: METALS/Strontium;METALS/Lead;METALS/Cadmium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this investigation are to delineate the molecular mechanism whereby calcium, magnesium, strontium and barium are transported across intestinal membrane. This includes a study of factors which control these processes such as parathyroid hormone and the active form of vitamin D, 1,25-dihydroxyvitamin D/sub 3/. A second objective is to study factors which control the processes whereby pollutants such as lead, cadmium and possibly plutonium are absorbed from small intestine. The ultimate aim is, by understanding the molecular mechanisms which facilitate the absorption of these cations, that methods of preventing absorption can be devised.
APPROACH: Using rats and chicks, factors which are known to stimulate or retard intestinal calcium absorption have been studied for their effect on the biosynthesis of the active form of vitamin D as a possible mechanism whereby they affect intestinal absorption of the cations. To study the molecular events, radioactive 1,25-dihydroxyvitamin D/sub 3/ has been prepared and its subcellular location, and its receptor proteins have been studied and isolated. The subcellular fractions which bind calcium following 1,25-dihydroxyvitamin D/sub 3/ administration have also been studied, revealing the existence of a 220,000 molecular protein in the brush borders of small intestine which facilitate the transport of calcium and presumably other divalent cations. Finally, a study of the factors which affect lead absorption using an in vivo rat model have been initiated. It is now clear that calcium interferes with lead absorption whereas vitamin D enhances the absorption of lead.
RESULTS: We expect by studying the molecular mechanisms whereby the divalent cations are transported and the factors which affect the transport across intestine that procedures and methods for preventing the absorption of unwanted environmental pollutants such as strontium 90, barium, cadmium and lead can be devised.
PROJECT MILESTONES: The project milestones have been a demonstration that vitamin D must be metabolically converted to an active hormone, 1,25-dihydroxyvitamin D/sub 3/, before it stimulates the intestine. The 1,25-dihydroxyvitamin D/sub 3/ was found to bind to a receptor protein and is transferred into the nuclear fraction where it initiates the events responsible for calcium absorption. It has been shown that strontium interferes with calcium absorption by blocking production of 1,25-dihydroxyvitamin D/sub 3/. Other factors such as diphosphonates and lead function in a similar manner. Using in vivo models it has been possible to show that lead absorption is controlled by vitamin D and is inhibited by the presence of calcium. Other important discoveries have been the idea that the parathyroid hormone stimulates intestinal absorption of calcium by stimulating production of 1,25-dihydroxyvitamin D/sub 3/.
KEYWORDS: CALCIUM;MAGNESIUM;STRONTIUM;BARIUM;LEAD;CADMIUM;PLUTONIUM;INTESTINAL ABSORPTION;SMALL INTESTINE;RATS;CHICKENS;VITAMIN D;PARATHORMONE;BIOCHEMISTRY;HORMONES;INGESTION;IN VITRO;IN VIVO;METABOLISM;MOLECULAR BIOLOGY;TISSUES;TOXICITY

<087590>
TITLE: Effect of Light on Respiration and Development of Photosynthetic Cells
PROJECT NUMBER: 006127
PRINCIPAL INVESTIGATOR: Gibbs, M.
ADDRESS: Institute for Photobiology of Cells and Organelles, Brandeis University, Waltham, MA 02154
AFFILIATION: Brandeis Univ., Waltham, Mass. (USA). Inst. for Photobiology of Cells and Organelles
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles
TYPE OF FUNDING: Contract No.-E(11-1)-3231
77 FUNDING: Energy Research and Development Administration FY77:$31,000; National Science Foundation FY77:$48,000
TECHNOLOGY: SOLAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Elucidate hydrogen metabolism (bio-solar) in photosynthetic cells. The pathways of hydrogen uptake and evolution in the light and dark will be investigated.
APPROACH: Adapted and readapted intact cells and reconstituted systems will be employed. Algae in the North Atlantic (the Mass. coast) will be surveyed to seek out new metabolic pathways for hydrogen metabolism.
PROJECT MILESTONES: (1) That NADH (reduced pyridine nucleotide) can enter the photosynthetic electron chain. (2) H/sub 2/ rates at 40 to 50 mu mole per hour per M, chlorophyll have been obtained.
KEYWORDS: VISIBLE RADIATION;BIOLOGICAL EFFECTS;PHOTOSYNTHESIS;ALGAE;HYDROGEN;METABOLISM;NADH2;BIOLOGICAL ADAPTATION;BIOCHEMICAL REACTION KINETICS;BIOMASS;PLANTS

<087592>
TITLE: Use of Lymphoblastoid Cells for the Estimation of Environmental Insults to DNA
PROJECT NUMBER: 006156
PRINCIPAL INVESTIGATOR: Strauss, B.S.
ADDRESS: 920 East 58th Street, Chicago, IL 60637
AFFILIATION: Franklin McLean Memorial Research Inst., Chicago, Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-2040
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Carcinogens (10%);ORGANICS/Carcinogens (75%);RADIATION/Carcinogens (15%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Chemical mutagenicity and carcinogenicity are determined by the competition between DNA excision repair and post replication recovery. Since these processes occur to different extents in different species and in different tissues of the same organism, the carcinogenicity of a compound will be determined by the interactions between the processes. We wish to: (1) develop precise and convenient methodologies for the quantitative estimation of these processes in human cells; (2) determine the mechanisms of post replication recovery in human cells, and; (3) determine why a portion of the post replication recovery mechanism is ''error prone'' leading to mutation and possibly to tumor induction.
APPROACH: Development of the benzoylated naphthoylated DEAE cellulose methodology (BND-cellulose) for the estimation of excision repair makes possible the rapid determination of changes in the DNA of a variety of cell types under different experimental conditions. We plan to study the repair capabilities of lymphoblastoid cells and lines to determine the quantitative repair capabilities of human cells for damage induced by specific agents. We plan to adapt the ''nude'' mouse to the growth of lymphoblastoid cell lines in order to permit assay of the repair activity of human cells under approximately in vivo conditions. Since the critical event for mutation/carcinogenesis occurs during post replication recovery, we plan to continue our efforts to isolate intermediates in this process. We have developed a model which supposes that branch migration plays a key role in recovery. We plan to utilize the BND-cellulose methodology to isolate intermediates in post replication repair and to test the predictions of our model.
RESULTS: (1) A quick, inexpensive, precise method for the measurement of DNA excision repair. This methodology should be a useful addition to the armamentarium of screening techniques since it should be applicable to readily obtainable human cellular material. (2) Information about the characteristics of the post replication repair process. This information should make possible the assessment of the precise conditions at which exposure to carcinogens becomes harmful and should permit prediction as to which compounds are likely to be carcinogenic.
PROJECT MILESTONES: Development of a rapid excision repair technique and a methodology for the measurement of individual human excision repair activities for a particular chemical agent.
KEYWORDS: DNA;AIR POLLUTION;LAND POLLUTION;HEALTH HAZARDS;PATHOLOGICAL CHANGES;GASEOUS WASTES;CHEMICAL EFFLUENTS;IONIZING RADIATIONS;ORGANIC COMPOUNDS;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL RECOVERY;MUTAGENESIS;CARCINOGENS;ALKYLATING AGENTS

<087593>
TITLE: Biogenesis
PROJECT NUMBER: 006159
PRINCIPAL INVESTIGATOR: Albersheim, P.
AFFILIATION: Colorado Univ., Boulder (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (100%)

<087594>
TITLE: A Study of Nucleic Acid Methylations in Differentiating Systems
PROJECT NUMBER: 006160
PRINCIPAL INVESTIGATOR: Borek, E.
ADDRESS: University of Colorado Medical Center, 4200 East Ninth Ave., Denver, CO 80220
AFFILIATION: Colorado Univ., Denver (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-2066
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective is to elucidate the mechanism of DNA fragmentation after UV irradiation. The damage to DNA by UV irradiation is far in excess of the energy absorbed which indicates that the damage may occur subsequent to irradiation. It has been shown both in E coli and in eukaryotes that methylation of the DNA continues after UV irradiation even though there is no synthesis. We have postulated that there may be endonucleases which cleave the aberrantly methylated DNA. This postulate has been confirmed recently by Dr. Sanford Lacks who has demonstrated the existence of a methyl dependent endonuclease. We are developing inhibitors of DNA methylation with the hope that such inhibitors may protect against radiation damage by preventing aberrant methylation of DNA.
APPROACH: Cells in tissue culture are incubated with putative inhibitors of DNA methylase. Methylation and synthesis of DNA are determined by the use of appropriately labelled metabolites. Mammalian cells are grown in tissue culture, are washed in fresh medium, are re-suspended and the methylase inhibitor is added if it is not UV absorbing. If it is, it is added after irradiation. Aliquots of cells are exposed to increasing dose of UV the usual way. The cells are then incubated for varying periods, viability as well as methyl content are measured the usual way.
RESULTS: We hope to obtain efficient inhibitors of DNA methylases which could be used to protect against radiation damage. We, of course, do not visualize irradiation screening agents. We hope to have inhibitors of DNA methylation which could be administered intravenously after some accidental radiation exposure.
PROJECT MILESTONES: The achievement of a non-toxic inhibitor of DNA methylases.
KEYWORDS: DNA;CHEMICAL RADIATION EFFECTS;ESCHERICHIA COLI;ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;ENZYMES;BIOCHEMICAL REACTION KINETICS;STRAND BREAKS;RADIOINDUCTION;CELL CULTURES;ANIMAL CELLS;DOSE-RESPONSE RELATIONSHIPS;MOLECULAR BIOLOGY;RADIATION INJURIES;RADIATION PROTECTION;TRANSFERASES;AGE DEPENDENCE;HORMONES

<087595>
TITLE: Use of Molecular Hybridization to Explore Genetic Relationships
PROJECT NUMBER: 006162
PRINCIPAL INVESTIGATOR: Atwood, K.C.
ADDRESS: College of Physicians and Surgeons, 630 W. 168th St., New York, NY 10032
AFFILIATION: Columbia Univ., New York (USA). Coll. of Physicians and Surgeons
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office, Energy Research and Development Administration
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-3133
77 FUNDING: Energy Research and Development Administration FY77:$44,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Objectives are to map genes for various cellular RNA components in the chromosome complements of humans, primates, and laboratory animals; to discover the mechanisms whereby iterated genes are maintained at their optimal multiplicity; and to characterize the mammalian phenotypes caused by partial deficiencies of RNA genes.
APPROACH: Various techniques of RNA-DNA and DNA-DNA hybridization are used, including hybridization to chromosomes in situ. Genetic experiments are performed to manipulate the iteration numbers of RNA genes and allow observation of phenotypic effects, and of compensatory changes in multiplicity.
RESULTS: We expect to identify the phenotypic effects of departures from optimal multiplicity of rRNA and 5S RNA genes in humans, and to estimate the frequency of occurrence of such abnormalities. In addition we hope to understand the evolution of the multichromosomal distribution of rRNA genes in higher primates.
PROJECT MILESTONES: First description of a mammalian phenotype caused by partial deficiency of rRNA or 5S RNA genes.
KEYWORDS: MAN;PRIMATES;LABORATORY ANIMALS;HUMAN POPULATIONS;MUTAGENESIS;GENETIC VARIABILITY;MUTATION FREQUENCY;GENETICS;GENES;DNA;RNA;GENOTYPE;TIME DEPENDENCE;CHROMOSOMES;MESSENGER-RNA;TRANSCRIPTION

<087596>
TITLE: Studies of Photosynthetic Energy Conversion
PROJECT NUMBER: 006167
PRINCIPAL INVESTIGATOR: Clayton, R.K.
ADDRESS: Plant Science Building, Cornell University, Ithaca, NY 14853
AFFILIATION: Cornell Univ., Ithaca, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duda, George D.
TELEPHONE: C(301)353-5037
TYPE OF FUNDING: Contract No.-E(11-1)-3162
77 FUNDING: Energy Research and Development Administration FY77:$52,000; National Science Foundation FY77:$30,000
TECHNOLOGY: SOLAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: Elucidation of the primary photochemical process and the structure of the photosynthetic membrane in photosynthetic bacteria.
APPROACH: Optical measurements on isolated components of the photosynthetic membrane and on the intact membrane, coupled with biochemical modifications.
RESULTS: (1) Complete elucidation of the primary photochemical process. (2) Visualization of the molecular architecture of the photosynthetic membrane. (3) Possible application to the construction of a solar cell from photosynthetic materials.
PROJECT MILESTONES: (1) Isolation and study of the photochemical reaction centers of photosynthetic bacteria. (2) Discovery of transient physical states following light absorption. (3) Demonstration that ubiquinone functions as primary photochemical electron acceptor.
KEYWORDS: BACTERIA;BIOCHEMICAL REACTION KINETICS;PHOTOSYNTHESIS;PHOTOCHEMISTRY;ELECTROMAGNETIC RADIATION;MOLECULAR BIOLOGY

<087598>
TITLE: The Investigation of the Genetic Structure of Populations
PROJECT NUMBER: 006170
PRINCIPAL INVESTIGATOR: Wallace, B.
ADDRESS: Section of Gen., Dev., and Physiol., Cornell University, Ithaca, NY 14850
AFFILIATION: Cornell Univ., Ithaca, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Roderick, Thomas H.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E-(11-1)-3149
77 FUNDING: Energy Research and Development Administration FY77:$14,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the genetic structure of populations keeping in mind the two, often conflicting, demands made of any species: high individual fitness (largely a problem of developmental genetics) and high population fitness (a matter involving the continuation of the population through a series of fluctuating environments).
APPROACH: The approach has remained constant only in the use of a single experimental organism: Drosophila. Otherwise, through past years, the approach has varied from the study of irradiated populations, of the viability effects of newly induced mutations on both their homozygous and heterozygous carriers, of the ecology of intra- and inter-specific competition, and, very recently, of the fine structure of the scute locus in D. melanogaster. The last study has been prompted by a new model for the control of gene action which has emerged from past studies.
RESULTS: At the moment it seems that the genotypes which lead to the optimal development of individuals consist of dissimilar alleles at many gene loci, an advantage, in a sense never made clear before, of heterozygosity per se. Such genotypes must, of necessity, generate a variety of individuals in any cross-fertilizing population. Rather than constituting a genetic load, however, this variation provides the population with a means for carrying out a systematic and orderly culling of individuals under environmental stress. Such culling is necessary if the population is to avoid periodic pathological overcrowding and subsequent extinction in a capricious environment.
KEYWORDS: DROSOPHILA;GENETICS;POPULATION DYNAMICS;ENVIRONMENT;CHROMOSOMES;GENETIC VARIABILITY;REPRODUCTION;BIOLOGICAL STRESS;GENETIC EFFECTS;ANIMALS;X RADIATION;MUTATIONS

<087600>
TITLE: Enzymatic Studies of Radiation Damage
PROJECT NUMBER: 006200
PRINCIPAL INVESTIGATOR: Laskowski, M. Sr.
ADDRESS: Lab. of Enzymology, Roswell Park Memorial Institute, 666 Elm Street, Buffalo, NY 14263
AFFILIATION: Roswell Park Memorial Inst., Buffalo, N.Y. (USA)
MONITORING AGENCY: Health Research, Inc., Albany, N.Y. (USA); New York State Dept. of Health, Albany (USA)
DIVISION: State of New York Department of Health
MONITOR: Goehle, Robert W.
TELEPHONE: C(716)845-3033
TYPE OF FUNDING: Contract No.-E(11-1)3225
77 FUNDING: Health Research FY77:$48,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: For the next triennium characterization of mung bean nuclease with respect to its chemical properties and particularly with respect to function is the major task. The investigation of a newly observed action (resembling that of rec BC DNase) of venom phosphodiesterase is our next goal.
APPROACH: Mung bean nuclease has been purified to the stage of homogeneity by several criteria and was characterized as a glycoprotein. If the amount of material allows, we will attempt the sequence. The immediate emphasis, however, will be on the mode of action. In particular, detailed sequence of cleavages on supercoiled DNA is intriguing. Is a nick on one strand sufficient to attack the opposite strand, or is the gap required before a scission occurs. If so, how big a gap.
RESULTS: Mung bean nuclease already found application for removal of single-stranded parts of double-stranded molecules (e.g., sticky ends of lambda phage DNA) and in relaxing supercoil viral DNA. In some respects, it is an intermediate between restriction enzymes and common nuclease. It may hopefully be useful in excising damaged regions of the whole genome.
KEYWORDS: PHASEOLUS;NUCLEASES;BIOLOGICAL REPAIR;DNA;STRAND BREAKS;PHYSIOLOGY;BIOCHEMISTRY;ENZYMES;IN VITRO;MOLECULAR BIOLOGY;VIRUSES

<087602>
TITLE: Action of Radiations on Some Biological Model Systems
PROJECT NUMBER: 006202
PRINCIPAL INVESTIGATOR: Stein, G.
ADDRESS: Department of Physical Chemistry, The Hebrew University of Jerusalem, Jerusalem, IS
AFFILIATION: Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-3009;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$11,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Ionizing (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Application of physico-chemical techniques to the study of the action of radiation on biochemical and biological systems. Particularly, the application of fast time resolution pulse radiolysis techniques to the study of enzyme systems (hydrolytic and redox); study of radiation damage on biological and biochemical systems at the nucleo-protein level, emphasizing the interaction between the protein and nucleic acid components at low radiation doses of the order of 250 rad. The use of chromatin as the test substance. The development of fast ultra-violet laser flash photolysis techniques to supplement pulse radiolysis in the dynamic investigation of irradiated systems in the microsecond and sub-microsecond region.
RESULTS: Elucidation of consecutive intramolecular radical chain reactions in the radiation interactivation of hydrolytic enzymes, particularly ribonuclease. Development of the technique of pulse radiolysis for the study of biochemical redox processes. The role of divalent sulfur and aromatic amino acids in radiation effects.
KEYWORDS: NUCLEIC ACIDS;PROTEINS;BIOLOGICAL RADIATION EFFECTS;ENZYMES;RADIOLYSIS;PULSED IRRADIATION;BIOCHEMISTRY;RADIOISOTOPES;SULFUR;AMINO ACIDS

<087603>
TITLE: Research on Human Genetics in Iceland
PROJECT NUMBER: 006206
PRINCIPAL INVESTIGATOR: Fridricksson, S.
ADDRESS: The Genetical Committee of the University of Iceland, Ingolfsstraeti 5, Reykjavik, IC
AFFILIATION: Iceland Univ., Reykjavik
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(11-1)-3214;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$8a,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Iceland
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This is a continuation of a long term project involving genetic and linking studies of the Icelandic population.
APPROACH: A Genealogical Register has been built up covering the population in the period 1910 to present. And, in progress is transcription of demographic data from parish registers to punch cards in the period 1840-1910. These data yield some 350,000 birth records. The demographic register is gradually being linked up and is being used as a background for various genetical and sociological studies such as: (1) The possible inheritance of breast cancer and association of various types of cancer with blood groups. (2) Thorough investigation of first-cousin marriages in Iceland covering 630 individuals. The inheritance of blood groups are being studied in collaboration with leading European laboratories and clinical data will be investigated.
RESULTS: Mental disorders, intelligence, and population structure have been analyzed and school records have been used for a study of assortative mating. Chromosomal linking in man. Various genetic markers are being investigated such as GBG-types and HL-A.
PROJECT MILESTONES: Almost all mongoloid individuals living in Iceland have been karyotyped and cytotechnical work will continue.
KEYWORDS: ICELAND;HUMAN POPULATIONS;GENETICS

<087604>
TITLE: Comparative Mutagenesis
PROJECT NUMBER: 006207
PRINCIPAL INVESTIGATOR: Brockman, H.E.
ADDRESS: Department of Biological Sciences, Illinois State University, Normal, IL 61761
AFFILIATION: Illinois State Univ., Normal (USA). Dept. of Biological Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-1314;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$18,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Drugs, pesticides, herbicides, smoking (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our previous studies at the ad-3 region of Neurospora crassa have shown that the lethal and mutagenic activities of the acridine mustard ICR-170 and of some related ICR-compounds are greater in the absence than in the presence of O/sub 2/. We propose from our studies on the mechanism of the anoxia effect that the intracellular degradation of ICR-170 is dependent on oxidative phosphorylation and hence is less under anoxic than under hypoxic conditions. We have isolated ad-3 mutants induced by ICR-170 in the presence of O/sub 2/ or of N/sub 2/, and we will characterize these mutants in order to determine whether the spectrum of genetic alterations induced by ICR-170 is different in these two groups of mutants. We will also study the mutagenicity of the antibiotic streptonigrin under anoxic and hypoxic conditions. We will continue to study various ICR-compounds in order to determine the effect of different

structural changes on mutagenic activity in the presence and absence of O/sub 2/. We will initiate studies on water samples from a lake that receives runoff from farm land that is exposed to herbicides and insecticides in order to determine whether these samples have mutagenic activity. We also will initiate studies on the possible mutagenic activity of urine from heavy cigarette smokers as compared to nonsmokers.
KEYWORDS: NEUROSPORA;MUTATIONS;ACRIDINES;MUTAGENS;ANOXIA;ANTIBIOTICS;PESTICIDES;URINE

<087605>
TITLE: Development and Function of Membrane Systems in Plant Tissue
PROJECT NUMBER: 006208
PRINCIPAL INVESTIGATOR: Hanson, J.B.
ADDRESS: Botany Department, University of Illinois at Urbana-Champaign, Urbana, IL 61801
AFFILIATION: Illinois Univ., Urbana (USA). Dept. of Botany
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Contracts Management Office, Argonne, IL 60439
MONITOR: Duda, George D.
TELEPHONE: F233-5037
TYPE OF FUNDING: Contract No.-E(11-1)-0790
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: NUCLEAR/General (25%);SOLAR/Biomass (50%);GENERAL SCIENCE (25%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Membrane transport in plants (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the energy-linked mechanisms by which plants accumulate inorganic and organic solutes. These mechanisms are implicated in the absorption of such pollutants by plants, and serve as the primary control on the entry of pollutants into biological food chains. Cell and organelle membranes are the boundaries where the active transport processes are located, and the objective becomes one of determining how the membranes actively transport the pollutant solutes, and thus what one might do to control the process.
APPROACH: Two systems are being studied. Corn mitochondria are used to explore energy-linked ion transport in a relatively simple membrane-bound organelle. Both influx and efflux transport mechanisms energized by respiration or ATPase are being examined, and considerable progress has been made with inorganic and organic ion transport. The corn root system proves to be one in which we can induce an alteration in the rates and efficiency of ion transport, and much work is being done in measuring cell resistances, cell potentials, H/sup +/- fluxes and ion transport rates as affected by alteration of the root. Models have been devised to account for the energy-linkage, and these are being tested. We are attempting to determine how changes in transport are induced.
RESULTS: We expect to understand how respiratory energy is linked to solute transport in terms of selective carrier proteins. Eventually we should know the basis for selection and carrier operation, and have an understanding of why there is variation in pollutant absorption. This will lead to rational studies on the control of pollutant uptake.
PROJECT MILESTONES: Publication of results of experiments on organic acid transport through mitochondrial membranes; publication of results on investigations of disulfide reducing agents on cell potentials, cell resistance, H/sup +/ and K/sup +/ fluxes in corn roots; publication of results of investigating effects of injury on ATP and other nucleotide levels in corn plants.
KEYWORDS: PLANTS;TISSUES;MEMBRANES;POLLUTION;UPTAKE;FOOD CHAINS;CELL MEMBRANES;DIFFUSION;MAIZE;MITOCHONDRIA;ATP-ASE;RESPIRATION;IONS;ROOTS;BIOLOGICAL MODELS;CONTROL;PHYSIOLOGY;BIOLOGICAL EFFECTS;PLANT CELLS;SOILS;RADIOISOTOPES

<087609>
TITLE: Improved Mutagen-Testing Systems in Mice
PROJECT NUMBER: 006216
PRINCIPAL INVESTIGATOR: Roderick, T.H.
ADDRESS: The Jackson Laboratory, Bar Harbor, ME 04609
AFFILIATION: Jackson Lab., Bar Harbor, Maine (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Parker, Dean R.
TELEPHONE: C(301)353-3681
TYPE OF FUNDING: Contract No.-E(11-1)-3267
77 FUNDING: Energy Research and Development Administration FY77:$82,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Air pollutants (100%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);DEVELOPMENT/Laboratory scale (20%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To plan and construct genetic and chromosomal techniques in mice which will permit the analysis of the mutagenic effects over a major portion of the mouse genome. These systems will be applicable to assessment of mutagenesis of all pollutants or potentially hazardous environmental agent.
APPROACH: To develop chromosomal inversion systems which ''inhibit'' meiotic recombination over a significant portion of the genome so that induced mutations can be tracked in those regions over several generations after exposure or treatment to the potential mutagen. Robertsonian metacentrics will be used in conjunction with induced inversions to tie together a greater portion of the genome in a single test system.
RESULTS: From results obtained so far, we expect to be able to produce a single test system which will analyze at least 15 percent of the mammalian genome for recessive lethals and detrimentals. This test should assess the recessive detrimental and lethal effects for all loci in the region analyzed. Furthermore, lethals induced can be examined with this system for their heterozygous effects, an important but relatively unknown health consequence for mammals including humans.
PROJECT MILESTONES: Within this year two inversions will be combined in a single test system. The application of this system should be underway within two years. Inversions within Robertsonian metacentrics are expected within a year. A system employing two inversions coupled by a Robertsonian metacentric should be in use within three years. Quantitative analysis of mitotic crossing over has not been possible in mammalian tissues heretofore. Initial analysis of mitotic crossing over in mammals using inversions in somatic tissue will be completed within a year.
KEYWORDS: POLLUTION;MUTAGENESIS;MUTAGENS;TESTING;MICE;GENETICS;CHROMOSOMES;SOMATIC MUTATIONS

<087610>
TITLE: Inborn Anemias in Mice
JECT NUMBER: 006217
NCIPAL INVESTIGATOR: Russell, E.S.
ADDRESS: The Jackson Laboratory, Bar Harbor, ME 04609
AFFILIATION: Jackson Lab., Bar Harbor, Maine (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-3264;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$56,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Hereditary anemias of mice are the chief objects of our investigations. They include: three macrocytic anemias, four hemolytic anemias, non-hemolytic microcytic anemia, transitory siderocytic anemia, sex-linked iron-transport anemia, and an auto-immune hemolytic anemia (NZB). New anemias will be analyzed as new mutations appear. In all cases, congenic stocks will be produced to facilitate study of gene action. Analyses of these anemias will continue through: (a) characterization of peripheral blood, (b) determinations of RBC lifespan, (c) studies of iron metabolism, (d) histological and biochemical study of blood-forming tissue, (e) tests of the stem cell component, (f) study of responses to erythyroid stimuli and environmental agents, and (g) transplantation of tissue between individuals of differently affected genotypes.
RESULTS: All 10 hematopoietic mutants under study have now been placed on homogeneous genetic backgrounds. Four anemias involve peripheral cell defects, with reduced RBC lifespan, hypochromia, or abnormal cell size. Of three macrocytic anemias, one (W/W/sup v/) is caused by gene-action within blood-forming cells, and one (S1/S1/sup d/) by gene-action in non-erythyroid surrounding cells with effects imposed upon blood-forming cells.
KEYWORDS: MICE;ANEMIAS;MUTATIONS;BLOOD;STEM CELLS;BLOOD FORMATION

<087611>
TITLE: Mechanisms of Bioluminescence, Chemiluminescence and Their Regulation
PROJECT NUMBER: 006220
PRINCIPAL INVESTIGATOR: Seliger, H.H.
ADDRESS: Biology Department, The Johns Hopkins University, Charles and 34th St., Baltimore, MD 21218
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). Dept. of Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-AT(11-1)3277;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$62,000
TECHNOLOGY: FOSSIL FUEL/General (50%);SOLAR/General (25%);GENERAL SCIENCE (25%)
POLLUTANTS: ORGANICS/Polycyclic aromatic hydrocarbons (50%);RADIATION/Ultraviolet (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To investigate the mechanism for the production and control of chemiluminescence, bioluminescence and Adventitious Chemiluminescence in biological systems. To determine the relationship between the shear-sensitive membrane transducing system for triggering bioluminescence in the dinoflagellates and the regulation of this stimulable system by external ambient light. To characterize the spectral emission in the spontaneous chemiluminescence of cigarette smoke. We have proposed in a theory of the origin of bioluminescence, that adventitious chemiluminescence, the production of excited states incidental to oxygenase reactions not involving the luciferases of bioluminescent organisms, is ubiquitous in aerobic organisms. We have proposed that the metabolic production of the ultimate carcinogenic form of polycyclic aromatic hydrocarbons results in an eta pi* excited state and that all carcinogenic PAH's have common active site geometries and chemical reactions.
RESULTS: We have developed a 6-channel polyspectrometer and a 6-channel relative spectral comparator for measuring low level light emission as well as rapid flashes of chemiluminescence. We have measured the action spectrum for photoinhibition of mechanically stimulable bioluminescence in the dinoflagellate Dissodinium lunula. We are in the process of characterizing and separating the precursors to the spontaneous chemiluminescence of cigarette smoke extracts. We have been able to measure significant spontaneous adventitious chemiluminescence in small samples of saliva and urine.
KEYWORDS: FOSSIL FUELS;HEALTH HAZARDS;CHEMICAL REACTION KINETICS;CHEMILUMINESCENCE;POLYCYCLIC AROMATIC HYDROCARBONS;METABOLISM;CARCINOGENESIS;BIOLOGICAL EFFECTS;BIOLOGICAL MATERIALS;LUMINESCENCE

<087612>
TITLE: Basic Problems in Carcinogenesis
PROJECT NUMBER: 006221
PRINCIPAL INVESTIGATOR: Ts'o, P.O.P.
ADDRESS: Division of Biophysics, Department of Biochemical and Biophysical Sciences, Johns Hopkins University, Baltimore, MD 21205
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-3280;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$119,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS/PCH (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Future objective: (1) improvement of the current neoplastic transportation system, and (2) advancement in the studies on the chemistry and metabolism of the polycyclic hydrocarbons.
RESULTS: Results: (1) We have established a mammalian cell system (Syrian hamster embryonic fibroblast) which can be used both for neoplastic transformation studies and somatic mutation studies. The system is particularly useful for studying the mechanism of transformation since every cell is potentially a target cell for transformation and a defined exposure of the carcinogen can be established for the system. (2) The chemistry and metabolism of 6-hydroxy-B(a)P and 6-oxo-B(a)P radicals have now been much more thoroughly understood. The biochemical data indicate that 15-20% of the B(a)P metabolism is probably going through the 6-hydroxy-B(a)P pathway in rat liver homogenates. The biological data indicate that the 6-hydroxy-B(a)P can be the candidate of one of the proximate/ultimate carcinogens of B(a)P metabolism. (3) Preliminary experiments involving incorporation of 5-bromodeoxyuridine into the hamster fibroblasts

followed by photoradiation with light at 320 nm indicated that DNA is probably one of the target macromolecules in the cell for transformation. (4) Comparisons of the somatic mutation frequency and the neoplastic transformation frequency induced by the same carcinogen (B(a)P) or mutagen (MNNG) indicated that the genetic target size of the neoplastic transformation may be 100 to 1000 times larger than that for somatic mutation.
KEYWORDS: HAMSTERS;FIBROBLASTS;CELL CULTURES;CARCINOGENESIS;CARCINOGENS;MUTAGENS;DNA

<087613>
TITLE: Study of Radiation Effects on Nucleic Acids and Related Compounds
PROJECT NUMBER: 006223
PRINCIPAL INVESTIGATOR: Wang, S.Y.
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AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duda, George
TELEPHONE: C(301)353-3681
TYPE OF FUNDING: Contract No.-E(11-1)-3286
77 FUNDING: Energy Research and Development Administration FY77:$24,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/UV;RADIATION/X-rays (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Currently, it has become a national policy to pay more attention to improving and preserving the physical environment and thereby promoting the health and welfare of man. Studies on the effects of ionizing radiation exposure on man and his environments have been established as an area of interest and importance. Since it was first discovered by Mueller in 1928, it has been generally acknowledged that x-rays cause mutagenic and lethal effects in biological systems. Despite these possible genetic risks, the clinical use of x-rays has been widespread because of beneficial medical results. Our understanding of the biological effects of ionizing radiation has largely been in terms of physical and biological concepts because assay of radiation damage to cells is generally based on measurements of reproductive inactivation, chromosomal aberration production, unscheduled DNA synthesis, and increased mutation rates. Although these gross changes are easily discerned, the information thus gathered provides little knowledge concerning the threshold intensity or of setting up a radiation standard. Thus, the study of radiation chemistry relevant to biological effects becomes of crucial importance for these purposes as well as for the understanding of the biological effects of ionizing radiation on a molecular level.
APPROACH: Currently, we are using the following five approaches for this study: (1) chemical isolation and characterization of radiation products; (2) mutagenic study with reactive radiation products; (3) chromosomal aberration study with reactive radiation products; (4) radiation sensitization study with reactive radiation products; and (5) near-UV radiation study for the comparison with ionizing radiation.
RESULTS: The understanding of the biological effects of ionizing radiation on a molecular level is our goal. Such information will enable us to set up an ionizing radiation standard for health safety and will make further studies possible in order to devise effective methods for protection against and repair of damage caused by ionizing radiation.
PROJECT MILESTONES: (1) The unambiguous identification of the major radiation product of nucleic acids. (2) A molecular mechanism for the ionizing of radiation induced mutation in vivo has been delineated.
KEYWORDS: NUCLEIC ACIDS;X RADIATION;BIOLOGICAL RADIATION EFFECTS;MAN;HEALTH HAZARDS;DNA;BIOSYNTHESIS;CHROMOSOMAL ABERRATIONS;MUTATIONS;ULTRAVIOLET RADIATION;MOLECULAR BIOLOGY;RADIOINDUCTION;CARCINOGENS;GAMMA RADIATION;MUTAGENESIS;RNA

<087614>
TITLE: Photochemistry and Enzymology of Photosynthesis
PROJECT NUMBER: 006229
PRINCIPAL INVESTIGATOR: Kok, B.
ADDRESS: Martin Marietta Laboratories, 1450 S. Rolling Rd., Baltimore, MD 21227
AFFILIATION: Martin Marietta Corp., Baltimore, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles
TYPE OF FUNDING: Contract No.-E(11-1)-3326
77 FUNDING: Energy Research and Development Administration FY77:$39,000
TECHNOLOGY: SOLAR/General (50%);SOLAR/Biomass (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%)
POLLUTANTS: RADIATION/UV (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of our program is to obtain an understanding of energy conversion in plant photosynthesis, the mechanisms of the photochemical reactions, and the inherent and extraneous factors that determine the yield and efficiency of the process. Generally, the program is a continuation of previous programs.
APPROACH: The behavior of the four O/sub 2/ precursor (''S'') states is being studied as a function of redox potential, O/sub 2/ tension, and ionophores. Rapid and sensitive polarographic techniques are used to detect oxygen exchange. A rapid (less than or equal to msec) pH technique is being used to analyze the kinetics of (1) the release of protons during the O/sub 2/ evolution process, (2) proton translocation across the membrane, an energy storage device coupled to electron transport between the photoacts, and (3) proton translocation in photosynthetic bacteria.
KEYWORDS: PHOTOCHEMISTRY;PHOTOSYNTHESIS;ENERGY CONVERSION;OXYGEN;REDOX POTENTIAL;PH VALUE;PROTONS;DIFFUSION;BACTERIA;PLANTS;ENZYMES;BIOCHEMISTRY;BIOMASS

<087617>
TITLE: Synthesis of DNA Containing Uracil (or 5-Hydroxymethyluracil) During Bacteriophage Infection of Bacillus subtilis
PROJECT NUMBER: 006237
PRINCIPAL INVESTIGATOR: Price, A.R.
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AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-2101
77 FUNDING: Energy Research and Development Administration FY77:$29,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The infection of Bacillus subtilis by bacteriophage PBS2 whose DNA contains uracil instead of thymine will be studied to determine how uracil-DNA is synthesized and functions. [In addition, the mechanism of inhibition of animal cell growth by 5-hydroxymethyldeoxyuridine (a component of bacteriophage phi e DNA) will be determined.]
APPROACH: PBS2 phage-induced enzymes will be isolated and characterized. Specific inhibitions and mutants will be used to study the mechanisms of host versus viral DNA synthesis. In vivo and in vitro systems will be employed to make host and viral DNA containing either uracil or thymine. [Also, C-14-hydroxymethyldeoxyuridine will be administered to cultured animal cells to determine how it affects DNA synthesis.]
RESULTS: New PBS2-induced enzymes will be discovered and characterized to determine how the virus modifies the host's deoxyribonucleotide metabolism to allow the accumulation of dUTP and to prevent the synthesis of dTTP. [Also, we will determine whether hydroxymethyldeoxyuridine blocks DNA synthesis in animal cells by incorporation into the DNA.]
PROJECT MILESTONES: We hope to determine why PBS2 phage DNA uniquely contains uracil, while almost all other DNAs in nature contain thymine. Thus, we may learn why thymine evolved for most DNAs. [Also, we will learn how hydroxymethyldeoxyuridine exerts its cytostatic (and possibly cancerostatic) effects on animal cells.]
KEYWORDS: BACILLUS SUBTILIS;BACTERIOPHAGES;DNA;BIOSYNTHESIS;URACILS;ANIMAL CELLS;CELL CULTURES;ENZYMES;BACTERIA;BIOCHEMISTRY;GENETICS;VIRUSES

<087620>
TITLE: Bovine Lymphocytic Leukemia
PROJECT NUMBER: 006241
PRINCIPAL INVESTIGATOR: Sorensen, D.K.
ADDRESS: Department of Veterinary Clinical Sciences, University of Minnesota, St. Paul, MN 55108
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
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TYPE OF FUNDING: Contract No.-E(11-1)910
77 FUNDING: Energy Research and Development Administration FY77:$59,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The primary objective of the research is to elucidate the etiology and pathogenesis of bovine leukemia.
APPROACH: We have consistently demonstrated C-type particles in mitogen stimulated lymphocyte cultures from leukemic cows and cows with a persistent lymphocytosis. These particles have been concentrated and partially purified by continuous flow, density gradient, ultracentrifugation. Newborn calves and late stage bovine fetuses have been inoculated with these concentrated cell-free preparations. Our current study involves extensive monitoring of these inoculated animals to detect early precancerous changes.
RESULTS: Two of the inoculated fetuses died one month after birth. Both showed identical pathological changes. The cause of death in both cases was severe aplastic anemia. Most of the other inoculated animals show early pre-leukemic changes in their lymphocytes, including the production of C-type particles. We hope to demonstrate induction of the tumor phase of the disease.
PROJECT MILESTONES: A significant project milestone would be the development of the tumor phase of the disease in inoculated animals.
KEYWORDS: COWS;LEUKEMIA;ETIOLOGY;PATHOGENESIS;LYMPHOCYTES;ANIMALS;BLOOD;NEOPLASMS;PATHOGENESIS;VIRUSES

<087621>
TITLE: Studies of Lymphocyte Growth and Differentiation
PROJECT NUMBER: 6245
PRINCIPAL INVESTIGATOR: Rubin, A.D.
ADDRESS: College of Medicine and Dentistry of New Jersey, Newark, NJ 07103
AFFILIATION: College of Medicine and Dentistry of New Jersey - New Jersey Medical School, Newark (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-AT(11-1)-3363-6;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$38,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project will investigate the control of lymphocyte growth at the molecular level in response to mitogens, and will include further attempts in elucidating the regulatory mechanisms involved in the coupling of ribosomal protein and rRNA transcription and processing leading to the delivery of cytoplasmic ribosomes. Studies into factors controlling gene readout in these cells will be coupled with the correlative analysis of growth kinetics and lymphocyte surface factors.
APPROACH: To date we have demonstrated that (a) ribonucleoprotein particle synthesis and processing in

lymphocyte nucleoi depend upon continuous delivery of new ribosomal protein; (b) PHA can directly stimulate RNA synthesis of both lymphocyte nuclei and naked chromatin; and (c) we have further characterized the nature of the circulating lymphocytes in patients with chronic lymphocytic leukemia and nodular lymphoma.
KEYWORDS: LYMPHOCYTES;GROWTH;RNA;BIOSYNTHESIS;PHYTOHEMAGGLUTININ

<087622>
TITLE: Potential Radiosensitizing Antiviral and Anticancer Nucleosides
PROJECT NUMBER: 006256
PRINCIPAL INVESTIGATOR: Prusoff, W.H.
ADDRESS: Yale Univ. School of Medicine, 333 Cedar Street, New Haven, CT 06510
AFFILIATION: Yale Univ., New Haven, Conn. (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duda, George D.
TELEPHONE: C(301)353-5037
TYPE OF FUNDING: Contract No.-E(11-1)-2468
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is proposed to synthesize certain halogenated nucleoside derivatives that will sensitize neoplastic tissues or appropriate viral infections to the lethal effects of radiation by a specific sensitization of key enzymes of the DNA biosynthetic pathway.
APPROACH: A procedure for the synthesis of the proposed compounds will be developed to attain not only the compound but in adequate amounts. These will be evaluated for their radiation sensitizing effect in purified enzyme systems, in cell cultures and in animal systems.
RESULTS: To date a number of compounds have been prepared which do indeed sensitize specific enzymes to UV-radiation. A newly developed method of synthesis now affords large scale production of 5'-amino analogs of a variety of nucleosides which possess radiation sensitization and antiviral activities.
PROJECT MILESTONES: Development of agents that will sensitize certain disease states to the lethal effects of radiation such as appropriate neoplasms or virus infections.
KEYWORDS: ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;ENZYMES;NUCLEOSIDES;RADIOSENSITIVITY EFFECTS;RADIOSENSITIZERS;BIOSYNTHESIS;NEOPLASMS;VIRUSES;BIOCHEMISTRY

<087623>
TITLE: Study of Mathematical Models of Mutation and Selection in Multi-Locus Systems
PROJECT NUMBER: 006257
PRINCIPAL INVESTIGATOR: Lewontin, R.C.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Parker, Dean R.
TELEPHONE: C(301)353-3681
TYPE OF FUNDING: Contract No.-E(11-1)-2472
77 FUNDING: Energy Research and Development Administration FY77:$24,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To understand the fate of mutations in populations subject to natural selection, when many genes are taken into account simultaneously rather than considering each gene in isolation.
APPROACH: Mathematical evaluations, but especially large-scale computer simulation of populations with the full set of forces including mutation, selection, finite population size, associative mating, simulated on digital computers.
PROJECT MILESTONES: Discovery that the entire chromosome must be treated as the unit of selection because of cumulative effect of weak interactions.
KEYWORDS: POPULATIONS;MUTATIONS;MATHEMATICAL MODELS;SIMULATION;BIOLOGICAL EVOLUTION;COMPUTER CODES;DNA;MAN

<087625>
TITLE: Studies on Virus-Induced Cell Fusion
PROJECT NUMBER: 006266
PRINCIPAL INVESTIGATOR: Person, S.
ADDRESS: 618 Life Sciences Building, The Pennsylvania State University, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Shepherd, George R.
TELEPHONE: C(301)353-5037
TYPE OF FUNDING: Contract No.-E(11-1)-3419
77 FUNDING: Energy Research and Development Administration FY77:$31,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Viruses (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The major objective of the proposed research is to investigate the nature of virus-induced cell fusion. Cell fusion is being studied with mutants of the KOS strain of Herpes Simplex Virus Type 1 (HSV-1) which cause cells to fuse in an otherwise normal virus infection. The wild type strain does not cause extensive cell fusion. The use of mutants allows both a genetic and a biochemical study of the fusion process. In the next year we plan to compare the glycosyl transferase and glycosidase enzyme activities in uninfected, wild type infected and syncytia-producing (syn) mutant infected cells; to determine the effect of ammonium chloride, adamantanone and other membrane pertubers on viral functions involving membranes; to determine the effects of membrane perturbing molecules on the physical state of the membrane; to characterize the kinetics of cell fusion in single and mixed infections with wild type and syn mutant viruses for a variety of experimental conditions; and to continue examination of the fusion process by electron microscopy.

RESULTS: Our specific objectives for the coming year are as follows. (1) Comparison of glycosyl transferase and glycosidase enzyme activities in uninfected, wild type infected and syn mutant infected cells. (2) Determination of the effect of NH/sub 4/Cl, adamantanone and other membrane perturbers on viral functions involving membranes. (3) Determination of the effects of membrane-perturbing molecules on the physical state of the membrane. (4) Characterization of the kinetics of cell fusion in single and mixed infections with wild type and syn mutant viruses for a variety of experimental conditions. (5) Examination of cell fusion using electron microscopy.
PROJECT MILESTONES: Publications in open literature.
KEYWORDS: VIRUSES;MUTANTS;CELL MEMBRANES;ANIMAL CELLS;BIOLOGICAL EFFECTS;BIOCHEMICAL REACTION KINETICS;MOLECULAR BIOLOGY;IN VITRO

<087626>
TITLE: Nucleic Acids and Protein Synthesizing Mechanisms in Mitochondria
PROJECT NUMBER: 006271
PRINCIPAL INVESTIGATOR: Suyama, Y.
ADDRESS: Office of Research Administration, University of Pennsylvania, 3451 Walnut Street/16, Philadelphia, PA 19174
AFFILIATION: Pennsylvania Univ., Philadelphia (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-3083;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$23,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We will investigate the properties, biosynthesis and origins of all the necessary elements directly concerned with mitochondrial protein synthesis. Specifically, we plan to study: (1) the structure and alignments of mitochondrial DNA by analyzing DNA segments produced by restriction endonucleases coupled with rRNA and tRNA hybridization; (2) biosynthesis of mitochondrial tRNA through careful identification of precursor tRNA in mitochondria; (3) properties of the cytoplasmic and mitochondrial synthetases for those tRNA species in mitochondria which are known to be nuclear DNA transcripts; and (4) physico-chemical properties of ribosomal proteins and RNA isolated from mitochondrial ribosomes of Tetrahymena pyriformis.
RESULTS: Mitochondrial DNA of Tetrahymena was shown to be fragmented with Hin and E. coli endonucleases. While Hin produced numerous size fragments, EcoR1 resulted in several large DNA pieces. Tetrahymena mitochondria contain tRNAs of not only mitochondrial DNA transcript but nuclear DNA. The nuclear DNA-transcript tRNA in mitochondria designated ''imported'' tRNA is synthesized in vivo under acriflavin treatments. The imported tRNA may be identified as acriflavin resistant tRNA in acrylamide gels.
KEYWORDS: TETRAHYMENA;PROTEINS;BIOSYNTHESIS;METABOLISM;MITOCHONDRIA;DNA;BIOCHEMICAL REACTION KINETICS;MESSENGER-RNA;MOLECULAR BIOLOGY

<087630>
TITLE: Energy Tranfer Mechanisms in Photobiological Reactions
PROJECT NUMBER: 006302
PRINCIPAL INVESTIGATOR: Spikes, J.D.
ADDRESS: Department of Biology, University of Utah, Salt Lake City, UT 84112
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-875
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: SOLAR/Biomass (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The first objective of this basic research program is to elucidate the molecular level mechanisms of the sensitized photooxidation of biological substrates (photodynamic action). This involves studies of the formation, properties, energy and hydrogen/electron transfer capabilities and interactions with amino acids, proteins, purines, and pyrimidines of light-excited photodynamic sensitizers. The second objective is to use photosensitized reactions as a tool in studying structure-function relationships in certain proteins and the role of membrane properties in the photocontrol of the swimming of selected microorganisms.
APPROACH: The molecular level mechanisms are studied by making kinetic studies of the oxygen consumption in photodynamic systems using an oxygen electrode. Reactions of the various light-excited states of photodynamic sensitizers are examined using fluorescence, phosphorescence, and, in particular, flash photolysis techniques. Responses of single cells to light are measured using microbeams of light in conjunction with a recording TV microscope; light responses of populations of microorganisms are measured using a phototaxigraph.
RESULTS: A better understanding of the fundamental mechanisms of energy and electron reactions involved in photosensitized reactions in biomolecules and in photosensitized behavioral responses in cells should result from these studies. These basic results may be useful in developing more sensitive techniques for the photobiological detection and assay of photosensitizing pollutants (such as the array of polycyclic hydrocarbons resulting from coal combustion).
PROJECT MILESTONES: We have partially completed the determination of the relative participation of the major reaction pathways involved in the photooxidation of a variety of biologically important molecules (amino acids, pyrimidines). We are in the process of establishing the importance of different chemical groupings on biological important molecules in determining the susceptibility of the molecule to sensitized photooxidation.
KEYWORDS: BIOCHEMICAL REACTION KINETICS;AMINO ACIDS;PYRIMIDINES;PHOTOCHEMISTRY;PHOTOLYSIS;BIOLOGICAL MATERIALS;ENERGY TRANSFER;PROTEINS;BIOCHEMISTRY;ENZYMES;VISIBLE RADIATION;PHOTOSENSITIVITY

<087631>
TITLE: Neutron-Induced Mutation Experiments
PROJECT NUMBER: 006312
PRINCIPAL INVESTIGATOR: Abrahamson, S.
ADDRESS: 221 Zoology Research Bldg., 1117 W. Johnson St., Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-1748
77 FUNDING: Energy Research and Development Administration FY77:$39,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The two main purposes of these experiments are (1) to determine the RBE for neutrons of different energies in gonial cells of D. melanogaster; and (2) to obtain information on specific locus mutations induced by neutrons in gonia for purposes of interspecies comparisons.
APPROACH: Based on an extensive body of data which exists for 250 kVp x-rays in Drosophila, females are exposed to neutrons of energies in the range 0.22-15 MeV at several dose points. Brooding procedures are used to sample cells irradiated as gonia. X-linked lethal and specific locus mutation tests are conducted. Results are compared with those found after exposure with x-rays wherever comparable.
RESULTS: Results (preliminary) from both tests indicate that of the neutron energies studied (0.68, 2, 6, 15), 0.68 MeV neutrons have the highest RBE followed by 2 or 6, with 15 MeV having the lowest RBE. The X-linked lethal test indicates that 0.68 MeV neutrons have an RBE of 3-4 relative to 250 kVp x-rays. 0.43 and 0.34 MeV neutrons are expected to be similar to 0.68 MeV results.
PROJECT MILESTONES: Quarterly review of existing data is conducted by the principal investigator and scientific personnel to determine experimental direction, i.e., which energy of neutrons and which dose points will be most fruitful to attain the experimental objectives.
KEYWORDS: NEUTRONS;IRRADIATION;DROSOPHILA;GENETIC RADIATION EFFECTS;MUTATIONS;RADIOINDUCTION;RBE;X RADIATION;COMPARATIVE EVALUATIONS;ANIMALS;DNA

<087632>
TITLE: Genetic Effects of Low X-Ray Doses in Drosophila
PROJECT NUMBER: 006313
PRINCIPAL INVESTIGATOR: Abrahamson, S.
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AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-2001
77 FUNDING: Energy Research and Development Administration FY77:$41,000; National Institutes of Health
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The aim of our investigation is to develop a mathematical model of the dose-kinetics for sex-linked lethal mutations induced by X-rays in Drosophila oogonia, which is valid for a wide range of doses (20-6000 R).
APPROACH: In weekly experiments young Drosophila females are exposed simultaneously to several X-ray doses. By suitable breeding procedures offspring from irradiated oogonia are obtained. Only one single daughter per treated parent-female is tested further to detect a possible newly arisen sex-linked mutation in the treated (maternal) X-chromosome. Confirmation crosses and extensive progeny counts are made on all suspected lethal cultures.
RESULTS: Our own extensive data do not show linear proportionality but can be fitted to a linear-quadratic equation. If this is a valid model we would predict that equivalent doses will give different yields of mutations when given acutely, as opposed to fractionated or protracted exposures.
PROJECT MILESTONES: Conclusions drawn from our large-scale investigation will contribute to the pool of information on which risk estimates of genetic damage from radiations are based. They will also be of importance for our understanding of radiation damage in respect to chromosome structure and the nature of radiation-induced mutational damage.
KEYWORDS: OOGONIA;X RADIATION;LOW DOSE IRRADIATION;DROSOPHILA;GENETIC RADIATION EFFECTS;LETHAL MUTATIONS;RADIOINDUCTION;DOSE-RESPONSE RELATIONSHIPS;FEMALES;MUTAGENESIS;ANIMALS

<087633>
TITLE: Structure and Synthesis of Small Viruses and Their Component Parts
PROJECT NUMBER: 006314
PRINCIPAL INVESTIGATOR: Kaesberg, P.J.
ADDRESS: Biophysics Laboratory, 1525 Linden Drive, University of Wisconsin, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-AT(11-1)-1633
77 FUNDING: Energy Research and Development Administration FY77:$21,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this research is to study the structure and synthesis of small viruses since such knowledge is important both for control of virus infection and knowledge of protein and nucleic

acid synthesis. In the past it has been useful to study viruses that are easy to handle, but which have properties in common with viruses that are medically or economically important. Probably the viruses now in most need of study are the multi-component viruses, viruses whose genetic information is divided among several nucleic acids. The small plant virus, brome mosaic virus (BMV), is one of the best model multicomponent viruses. The cistronic content of the RNA messages will be determined. The factors controlling synthesis will be sought.
APPROACH: We have a cell-free system from a eukaryotic organism, wheat embryo, that can translate a homologous messenger, BMV RNA, with great fidelity and efficiency. We plan to simplify and to further characterize this system using the BMV RNAs as homologous messengers. We will use the system to determine what messenger information exists in BMV.
RESULTS: It is expected that the results obtained by studying model small plant viruses will be relevant to viruses in general and to the cells in which they are replicated.
KEYWORDS: VIRUSES;MORPHOLOGICAL CHANGES;DISEASES;PROTEINS;NUCLEIC ACIDS;RNA;BIOCHEMISTRY;SYNTHESIS;IN VIVO;IN VITRO;ENZYMES

<087634>
TITLE: Organization of the R Chromosome Region in Maize
PROJECT NUMBER: 006315
PRINCIPAL INVESTIGATOR: Kermicle, J.L.
ADDRESS: Laboratory of Genetics, University of Wisconsin, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA). Lab. of Genetics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)1300;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: SOLAR/Biomass (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The R chromosome region in maize is under study with a view to determining the number, kind, and arrangement of the genic and structural components involved in the control of anthocyanin pigmentation. Organization of the region is investigated by analysis of the variation found in cultivated races or that arising in experimental cultures. Variation among races appears to reflect local chromosome structural differentiation, such as small duplications or inversions, as well as genic divergence. Changes arise in culture spontaneously by mutation or intralocus recombination, and are induced in appropriate heterozygotes by paramutation. The classification of intralocus recombinants for outside markers permits recognition and serial ordering of the various R components. Characterization for simultaneous changes in less conventional properties, such as paramutation, permits the corresponding determiners to be spatially ordered relative to the pigmenting elements. Particular attention also is to be given to the following phenomena: interaction between determinants based on local position; suppression by particular R alleles of chlorophyll striping; and the analysis of R mutations not associated with exchange of linked markers.
KEYWORDS: MAIZE;CHROMOSOMES;PIGMENTS;GENETIC CONTROL

<087636>
TITLE: Effects of Radiation on DNA and Repair of the Damage
PROJECT NUMBER: 006321
PRINCIPAL INVESTIGATOR: Hutchinson, F.
ADDRESS: Dept. of Molecular Biophysics and Biochemistry, Yale University, Box 1937 Yale Sta., New Haven, CT 06520
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jensen, Roy A.
TELEPHONE: F233-3681
TYPE OF FUNDING: Contract No.-AT(11-1)-3571
77 FUNDING: Energy Research and Development Administration FY77:$68,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (30%);ORGANICS (20%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Characterize the effects of chemical and physical agents on the DNA of living cells, measure the repair of the damage, and assay the consequences, particularly the ability of the cell to survive and the appearance of genetic mutation.
APPROACH: The repair of DNA double-strand breaks is being studied in E. coli, and will be extended to Saccharomyces cerevisiae. The incidence of mutations from agents producing known DNA lesions in lambda bacteriophage and E. coli is being studied in E. coli cells with various defects in repair capabilities.
RESULTS: The aim of this research is an understanding of DNA repair and mutagenesis in simple prokaryotic systems, which can then be used as the basis for understanding these processes in much more complicated human cells.
KEYWORDS: ESCHERICHIA COLI;DNA;STRAND BREAKS;BIOLOGICAL REPAIR;SACCHAROMYCES CEREVISIAE;BACTERIOPHAGES;MUTAGENESIS;MOLECULAR BIOLOGY;MUTATIONS;ANIMAL CELLS

<087637>
TITLE: Effects of Environmental Stress on the Community Structure and Productivity of Salt Marsh Epiphytic Communities
PROJECT NUMBER: 006338
PRINCIPAL INVESTIGATOR: Lee, J.J.
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DIVISION: Chicago Operations Office
MONITOR: McCammon, Helen M.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E-(11-1)-3254
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)

ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Chromium;METALS/Zinc;METALS/Lead;METALS/Copper (30%);ORGANICS/As related to community;ORGANICS/Dynamics and structure (15%);RADIATION (15%);NOISE, VIBRATION (10%);HEAT, THERMAL (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: We propose to analyze and define the subtle variables which regulate the microbial and micrometazoan assemblages in salt marshes and shallow embayments in the greater New York City metropolitan region. This year we plan to make a comparative assessment of the role of diverse species of marine nematodes and ciliates in the detritus food chain including: mineral cycling and concentration, energy flow, biological half-life, food web complexion, biotic potential and trophic efficiency estimations. Microcosm experiments will be used to evaluate effects of environmental stress including: intense radiation; thermal; heavy metal; organic and petrochemical; as well as in the design and testing of a water quality assay system for near-shore water testing. It is hoped that the identification of the structure-function relationships may help to establish realistic guidelines for more effective use and management of this important habitat which surrounds much of this great city.
APPROACH: With the aforementioned objectives in mind, we have chosen 4 principal areas of the general problem for study this year by the personnel supported by this contract. We expect to make considerable progress in each of the areas, but primary emphasis will be placed on objectives 1-4. Data from one aspect of the work or related projects will be fed into others as soon as it becomes available. (1) Field experiments on transplanted and local natural communities aimed at testing the changes in community structure at a particular location due to: local water quality, heavy metals, organochlorides, and water insoluble fractions of crude petrochemicals. These experiments will be coupled with laboratory and field studies aimed at evaluating the effects such changes will have on energy flow and mineral cycling. (2) Laboratory studies of structured microcosms aimed at evaluating the effects of food quality and patchiness on energy flow, efficiency of secondary production and competition between microherbivores and meioherbivores. (3) Comparative quantitative and qualitative assessment of the role of diverse species of marine nematodes, copepods and ciliates in the detritus food chain of marine marshes including: (a) mineral cycling and concentration, energy flow, biological half-life and trophic efficiency estimation. (b) food web complexion studies and ''special growth factors.'' (c) estimation of biotic potential
RESULTS: Briefly summarized, our long range goals are as follows: (1) Characterize the shallow water marine aufwuchs microbial and meiofaunal community structure in key bays in the greatest New York City metropolitan region, study their changes in time and space, and to make additional comparative characterizations of nearby (less than 300 miles) of less stressed communities. (2) Study the theoretical and realized niches of many of the organisms in the community with the aim of understanding the bases for the huge diversity of species on the same trophic levels and, through these studies, discover and analyze the subtle variables which regulate population structure, succession, energy flow, mineral cycling and information content of the community. (3) Construct, using the above field and laboratory data, small defined microcosms which can be used in predicting and interpreting the changes which take place, or which could take place in the detritus food web and in coastal productivity as the result of inorganic, organic, thermal, herbicide, pesticide or industrial pollution. (4) Develop model microcosms which can be used as bioassay tools for judging water quality in inshore environments in the greater N.Y.C. Region.
KEYWORDS: WATER POLLUTION;FOOD CHAINS;AQUATIC ECOSYSTEMS;SEAWATER;SYNERGISM;RADIATION EFFECTS;TEMPERATURE EFFECTS;METALS;PETROCHEMICALS;ORGANIC COMPOUNDS;HYDROCARBONS;PESTICIDES;MATHEMATICAL MODELS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;ANIMALS;PLANTS;INVERTEBRATES

<087638>
TITLE: Radioecology of Some Natural Systems
PROJECT NUMBER: 006341
PRINCIPAL INVESTIGATOR: Whicker, F.W.
ADDRESS: Dept. Radiology and Radiation Biology, Colo. State University, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Radiology and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: F233-4905
TYPE OF FUNDING: Contract No.-E(11-1)-1156
77 FUNDING: Energy Research and Development Administration FY77:$126,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: METALS/Lead (5%);RADIATION/Plutonium;RADIATION/Cesium;RADIATION/Strontium;RADIATION/Iodine (95%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To understand and predict behavior of plutonium in a grassland ecosystem, cesium in a mountain lake, and lead in an alpine watershed.
APPROACH: Both laboratory and field studies are employed to elucidate distribution and mechanisms and kinetics of nuclide transport.
RESULTS: Publications describing findings, relevance, and predictive capabilities are to be forthcoming.
PROJECT MILESTONES: (1) Completion of the first phase of investigations on plutonium distribution at Rocky Flats September 1976. (2) Publication of results of all sub-projects and development of new plans Sept. 1976-June 1977.
KEYWORDS: PLUTONIUM ISOTOPES;CESIUM ISOTOPES;LEAD;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;DISTRIBUTION;RADIONUCLIDE MIGRATION;ENVIRONMENTAL TRANSPORT;ECOLOGICAL CONCENTRATION;RADIOECOLOGICAL CONCENTRATION

<087640>
TITLE: Transport and Transfer Rates in Waters off the Continental Shelf
PROJECT NUMBER: 006345
PRINCIPAL INVESTIGATOR: Biscaye, P.E.;Broecker, W.S.;Li, Y.
ADDRESS: Lamont-Doherty Geological Observatory of Columbia Universtiy, Palisades, NY 10964
AFFILIATION: Columbia Univ., Palisades, N.Y. (USA). Lamont-Doherty Geological Observatory
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: C(301)353-3035;F233-3035
TYPE OF FUNDING: Contract No.-E-(11-1)2185

77 FUNDING: Energy Research and Development Administration FY77:$423,000
TECHNOLOGY: FOSSIL FUEL/General (80%);NUCLEAR/General (20%)
LLUTANTS: NOXIOUS GAS/Carbon dioxide (5%);METALS/Trace metals (wide range) (30%);PARTICULATES/Suspended (30%);RADIATION/Cesium-134;RADIATION/Plutonium-239;RADIATION/Plutonium-240;RADIATION/Cobalt-60 (35%)
RACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to combine a number of physical oceanographic, geochemical and marine biological techniques to understand the pattern and the rates and scales of the active vertical and horizontal mixing processes and the variations in these parameters as a function of seasonal hydrographic regime, and cther forcing functions such as storm induced wind and wave pulses, radium-228 in advection-diffusion models of mixing of shelf water and shelf open ocean water. Suspended particulates, the natural carrier of most energy-related pollutants, are being studied by several microscopic, gravimetric, and other analytical and radioactive techniques.
PROJECT MILESTONES: Spring 1977 Fourth seasonal course in New York Bight
KEYWORDS: WATER POLLUTION;MIXING;RADIUM 228;PLUMES;DIFFUSION;PARTICLES;RADIOCHEMICAL ANALYSIS;SEAWATER;OCEANOGRAPHY;SEASONAL VARIATIONS;MATHEMATICAL MODELS;RADIOACTIVITY;CESIUM 134;PLUTONIUM 239;PLUTONIUM 240;COBALT 60;RADIONUCLIDE MIGRATION;CONTINENTAL SHELF;COASTAL WATERS;RADIOACTIVE EFFLUENTS

<087641>
TITLE: Foodchains of Transuranium Elements in the Subarctic Environment
PROJECT NUMBER: 006361
PRINCIPAL INVESTIGATOR: Miettinen, J.K.
ADDRESS: UNIONINKATU 35, Helsinki 17, Finland SF-00170
AFFILIATION: Helsinki Univ. (Finland). Dept. of Radiochemistry
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-CH E (11-1)-3011
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Scandinavia;COASTS/Other coasts Baltic;HYDROGRAPHIC AREAS/Other hydrographic areas Baltic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Purpose of the proposed project is to study the movement and dynamics of transuranic elements in the subarctic environment. Plutonium and americium are generally considered to cause a risk to higher animals and man only via inhalation in general environmental conditions. This is not true in communities based on reindeer economy. The reindeer obtains the bulk of these transuranium elements via fodder (lichen) and reindeer herders an important part of their intake via reindeer liver and meat. This offers a unique opportunity to study a transuranium foodchain in fully natural conditions. Baltic studies will be carried out to have background values of transuranic elements in the hydrospheric foodchains of the Baltic Sea.
APPROACH: Studies of transuranic isotopes Pu-238, Pu-239,240, and Am-241 in lichen, in organs of reindeer and in lung, liver, bone, placenta and teeth of man will be carried out to elucidate absorption, transfer and elimination of these radionuclides in the organisms of the foodchain lichen-reindeer-man. Elk will be analyzed as comparison for reindeer. Sr-90 and Pb-210 will be analyzed in bones as markers of man-made and natural fallout. The same transuranic radionuclides will be analyzed also in marine sediment cores from the Baltic Sea. Age determination of the sediment layers will be made by the Pb-210 method.
RESULTS: The project is expected to give new information on the environmental behavior of these transuranium elements in the subarctic biota, particularly in the foodchain lichen-reindeer-man and in the Baltic Sea in order to make possible evaluation of their biological significance in the future, when their concentrations in the biosphere will increase.
PROJECT MILESTONES: 3-yr. Technical Progress Report prepared May 10, 1976. Proposal for continuation under new title: ''Foodchains of Transuranium Elements in the Subarctic Environment'' proposed for 1976-79.
KEYWORDS: PLUTONIUM 238;PLUTONIUM 239;PLUTONIUM 240;AMERICIUM 241;RADIOECOLOGICAL CONCENTRATION;FOOD CHAINS;RADIONUCLIDE MIGRATION;LICHENS;ARCTIC REGIONS;DEER;MAN;SEDIMENTS;BALTIC SEA;RADIOACTIVITY

<087643>
TITLE: Biogeochemistry of Trace Metals in Chesapeake Bay
PROJECT NUMBER: 006364
PRINCIPAL INVESTIGATOR: Gross, M.G.
ADDRESS: Chesapeake Bay Institute, The Johns Hopkins University, Baltimore, MD 21218
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). Chesapeake Bay Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Forster, William O.
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-E(11-1)3292
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (30%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (40%)
POLLUTANTS:
METALS/Manganese;METALS/Iron;METALS/Cobalt;METALS/Copper;METALS/Chromium;METALS/Zinc;METALS/Nickel;METALS/ead (60%);PARTICULATES/Silicate iron-manganese oxy-hydroxides (40%)
RACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
IONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Proposed research deals with biogeochemical processes that control the distribution and abundances of certain trace metals in Chesapeake Bay water and sediment. During the proposed contract

year, work will continue to develop and perfect analytical techniques for minor elements in interstitial waters with emphasis on Hg, Cd, and Cu. Particular attention will be given to processes that transport these metals across the water-sediment interface and into the overlying waters. Fine grained, slow-settling particles in Bay Waters will be studied to determine what fraction is derived from interstitial waters, and from other sources such as power plant cooling waters or from mine drainage.
APPROACH: Chemical composition of particulate and associated aquatic phases will be determined to study the effects of different sources of metals and minerals (such as coal mine wastes or steam-electric generating plants) on waters and sediments of river, estuarine and marine systems.
RESULTS: Mass emission rates of metals and possibly other waste products released during various parts of fuel (coal) production, combustion, and energy transformation processes.
PROJECT MILESTONES: (1) Oct. 1976 Major element composition of sediments in Upper Chesapeake Bay. (2) Jan. 1977 Completion of first phase reconnaissance of fine grained particulate matter in surface waters of Upper Chesapeake Bay. (3) Jan. 1978 Comparison of selected metals in interstitial waters of sediments with the solid phases and their surface coatings.
KEYWORDS: MERCURY;CADMIUM;COPPER;BIOGEOCHEMISTRY;CHESAPEAKE BAY;COAL MINING;THERMAL POWER PLANTS;CHEMICAL EFFLUENTS;WATER;SEDIMENTS;MANGANESE;IRON;CHROMIUM;LEAD;NICKEL;ZINC;SEWAGE;SOILS;WASTE WATER;OCEANOGRAPHY;COOLING

<087644>
TITLE: Phytoplankton Growth, Dissipation and Succession in Estuarine Environments
PROJECT NUMBER: 6365
PRINCIPAL INVESTIGATOR: Seliger, H.H.
ADDRESS: McCollum-Pratt Institute, The Johns Hopkins University, Baltimore, MD 21218
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). McCollum-Pratt Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, G.W.
TELEPHONE: C(301)353-5548
TYPE OF FUNDING: Contract No.-AT(11-1)-3278;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$135,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Other coasts Mid-Atlantic;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This is a study of the dynamics of phytoplankton growth and succession in a natural estuarine system. Our marine station is at the Rhode River on the Chesapeake Bay just south of Annapolis. The study includes: (1) light spectral and nutrient dependent physiology of growth and migration. (2) Relative contributions to the nutrition of herbivores and filter feeders of phytoplankton and detritus. (3) Development of instrumentation, biochemical diagnostic parameters and statistical sampling procedures for modeling the stability of localized plankton ecosystems nutrient, biocide, or thermal loading. New growth over a division cycle is measured in plankton cages containing captured natural samples, replaced in situ, and in pumped water with metered additions. Underwater measurements of absolute spectral scalar irradiance are made seasonally for the Chesapeake Bay and used to obtain ecological photosynthetic efficiencies. (4) Mechanisms of dinoflagellate accumulations into blooms.
RESULTS: The results are summarized in the following publications: (1) Ches. Sci. 13, 282-299 (1972); (2) AIBS Symposium on Plant Physiology (1973) in F.J. Vernberg (ed.) Physiological Adaptation to the Environment; Intext Educ. Pub. N.Y. 1975; (3) Ches. Sci. 15, 185-204 (1974); (4) Ches. Sci. 16, 79-92 (1975); and (5) Proc. 1st International Conference on Toxic Dinoflagellate Blooms, V.R. LoCicero (ed.); Mass. Sci. Tech. Found., Wakefield, Mass. 1975, pp 181-205.
KEYWORDS: AQUATIC ECOSYSTEMS;CHESAPEAKE BAY;PLANKTON;POPULATION DYNAMICS;AQUATIC ORGANISMS;NUTRIENTS;FOOD CHAINS;SEASONAL VARIATIONS;PHOTOSYNTHESIS;ALGAE;BIOMASS;ECOLOGY;GROWTH;PHYTOPLANKTON

<087645>
TITLE: Effects of Energy Related Activities on the Plankton of the Chesapeake Bay
PROJECT NUMBER: 006366
PRINCIPAL INVESTIGATOR: Taft, J.L.
ADDRESS: Chesapeake Bay Institute, Johns Hopkins University, Baltimore, MD 21218
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). Chesapeake Bay Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George
TELEPHONE: C(301)353-5548
TYPE OF FUNDING: Contract No.-E(11-1)-3279
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: FOSSIL FUEL/Coal (38%);FOSSIL FUEL/Oil and Gas (37%);NUCLEAR/Fission (25%)
ENERGY CYCLE: TRANSPORTATION (67%);ELECTRICITY GENERATION (33%)
POLLUTANTS: PARTICULATES/Algae (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Identify the major factors regulating phytoplankton primary productivity during each season in Chesapeake Bay and on the adjacent continental shelf. (2) Determine the effects of potential pollutants from energy technologies now sited on Chesapeake Bay (and its tributaries) on productivity regulation. (3) Determine the effects of heated power plant effluents and cooling tower effluents on bacterial processes in Chesapeake Bay.
APPROACH: Field studies with natural phytoplankton and bacterial populations employing both experimental introduction of selected pollutants (heat, acid, biocides, hydrocarbons, heavy metals) and physiological measurements on natural populations subjected to power plant effluents.
RESULTS: More complete understanding of the impact of energy related technologies on coastal marine and estuarine ecosystems.
KEYWORDS: WATER POLLUTION;CHEMICAL EFFLUENTS;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;PLANKTON;BACTERIA;PRODUCTIVITY;CHESAPEAKE BAY;ESTUARIES;PHOTOSYNTHESIS;RESPIRATION

<087646>
TITLE: Thermal Regulation of Functional Groups in Running Water Ecosystems
PROJECT NUMBER: 006374
PRINCIPAL INVESTIGATOR: Cummins, K.W.
ADDRESS: Kellogg Biological Station, Hickory Corners, MI 49060
AFFILIATION: Michigan State Univ., Hickory Corners (USA). W.K. Kellogg Biological Station
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George W.
TELEPHONE: C(301)353-5548
TYPE OF FUNDING: Contract No.-E(11-1)2002
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: HEAT, THERMAL/Effect of unusual temperature regimes on macroinvertebrates (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Other hydrographic areas
Streams
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) The establishment of lower and/or upper thermal limits within the normal stream temperature range of 0-26 degree C, and degree-day (cumulated temperature) relationships for representatives of broad functional ecological groups of stream organisms. (2) Determination of the lability of the thermal control with respect to nutritional differences.
APPROACH: A combination of laboratory and field procedures, particularly involving the use of two large (40 ft. long, 5 ft. wide, 1/2 ft. deep) experimental stream channels with flow, temperature, light and nutrient control. A mini computer facility is almost totally dedicated to data acquisition, management and processing.
RESULTS: Identification of ecological groups of stream organisms that can be used to assess environmental conditions influenced by temperature.
KEYWORDS: FUNCTIONAL GROUPS;AQUATIC ECOSYSTEMS;INVERTEBRATES;ECOLOGY;TEMPERATURE DEPENDENCE;THERMAL EFFLUENTS;BIOMASS;RESPIRATION;BIOLOGICAL ADAPTATION;NUTRITION;TEMPERATURE EFFECTS;COMPUTER CALCULATIONS;DATA ACQUISITION;DATA PROCESSING

<087647>
TITLE: Dissolved Organic Matter and Lake Metabolism
PROJECT NUMBER: 006375
PRINCIPAL INVESTIGATOR: Wetzel, R.G.
ADDRESS: W. K. Kellogg Biological Station, Michigan State University, Hickory Corners, MI 49060
AFFILIATION: Michigan State Univ., Hickory Corners (USA). W.K. Kellogg Biological Station
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George W.
TELEPHONE: F233-5548
TYPE OF FUNDING: Contract No.-E-11-1599
77 FUNDING: Energy Research and Development Administration FY77:$97,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (20%);ORGANICS (70%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: These continuing studies focus on integrated investigations of the qualitative and quantitative cycling of particulate and dissolved organic matter in lakes and the mechanisms controlling this dynamic cycling in eutrophication. Emphasis is placed on the biotic and abiotic sources and fates of dissolved organic matter (DOM), the interactions of DOM in inorganic nutrient cycling, and the relationship of these mechanisms to nutrient physiology and metabolism of phytoplanktonic, sessile algal, macrophytic, and bacterial populations. Experimental evaluation of the regulatory mechanisms of growth and nutrient cycling is yielding quantitative insight into control interactions among (1) the microflora of the pelagial zone, (2) the littoral photosynthetic producer-decomposer complex, and (3) allochthonous inorganic-organic influxes. All parameters are fundamental to determination of the functional regulation of rates of eutrophication.
APPROACH: The studies integrate experimental and in situ analyses of inorganic and organic nutritional-biotic interactions that permit a causal interpretation of control of carbon flux rates in lakes of differing productivities. The investigations further permit a quantitative evaluation or responses of system metabolism to stress parameters such as nutrient loading, and thermal and organic enrichment leading to eutrophication.
RESULTS: See above. (All results are published in the open scientific literature.)
KEYWORDS: WATER POLLUTION;EUTROPHICATION;NUTRIENTS;PHYSIOLOGY;AQUATIC ECOSYSTEMS;NITROGEN COMPOUNDS;PHOTOSYNTHESIS;PLANTS;THERMAL POLLUTION;METABOLISM;LAKES;ORGANIC COMPOUNDS;MATHEMATICAL MODELS;NUTRITION;WATER QUALITY;GEOTHERMAL ENERGY;ENVIRONMENTAL EFFECTS;HYDROTHERMAL SYSTEMS

<087649>
TITLE: Nutrient Enrichment and Eutrophication of Lake Michigan
PROJECT NUMBER: 006378
PRINCIPAL INVESTIGATOR: Schelske, C.L.
ADDRESS: Great Lakes Research Division, University of Michigan, Ann Arbor, MI 48109
AFFILIATION: Michigan Univ., Ann Arbor (USA). Great Lakes Research Div.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, G.N.
TELEPHONE: C(301)353-5548;F233-5548
TYPE OF FUNDING: Contract No.-E(11-1)-2003
FUNDING: Energy Research and Development Administration FY77:$98,000
CHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (10%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS

PROJECT DESCRIPTION: The objectives are to determine the environmental factors, primarily chemical, limiting phytoplankton growth in Lake Michigan, to determine the influences of nutrient inputs on phytoplankton and to assess the effects of resulting changes on the Lake Michigan ecosystem.
APPROACH: The approach has been two fold. First, the effects of nutrients, phosphorus, silica and nitrogen, on phytoplankton growth have been assessed experimentally by adding nutrients to lake water with its natural phytoplankton assemblages. Second, data on phytoplankton abundance, species composition and nutrient chemistry have been collected at different locations in the lake so the experimental results can be related to the lake system.
RESULTS: These results are essential for decisions on management of nutrient inputs to the lake. The results are also useful in assessing the relative magnitude of different pollutants and stresses on the ecosystem and in separating man induced and natural changes in the ecosystem.
PROJECT MILESTONES: It has been shown that phosphorus is the major nutrient that is controlling the rate of eutrophication in Lake Michigan. An imbalance of phosphorus in the nutrient inputs to the lake has stimulated the growth of diatoms, resulting in a general decline in concentration of silica. Concentrations of silica in the summer limit diatom growth in some parts of the lake, favoring the growth of blue-green and green algae and contributing to a general decline in water quality. These results have led tc the development of a conceptual model that can be used to assess the rate of eutrophication.
KEYWORDS: LAKE MICHIGAN;EUTROPHICATION;PLANKTON;PRODUCTIVITY;NUTRIENTS;BIOLOGICAL EFFECTS;AQUATIC ECOSYSTEMS;WATER POLLUTION;PHOSPHORUS;PHOTOSYNTHESIS;SILICON OXIDES

<087652>
TITLE: Vertebrate Behavior and Ecology
PROJECT NUMBER: 006381
PRINCIPAL INVESTIGATOR: Tester, J.R.
ADDRESS: Dept. Ecology and Behavioral Biology, 310 Biological Sciences Center, St. Paul, MN 55108
AFFILIATION: Minnesota Univ., St. Paul (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: C(301)353-4905
TYPE OF FUNDING: Contract No.-E(11-1)-1332
77 FUNDING: Energy Research and Development Administration FY77:$93,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (20%);ORGANICS (20%);RADIATION (20%);HEAT, THERMAL (40%)
CHARACTER OF STUDY: RESEARCH/Applied (60%);DEVELOPMENT/Laboratory scale (40%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas river
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The ultimate objective of our investigations is to evaluate the possible influences of envircnmental changes on the behavior and ecology of wild animals. Our approach has been to develop techniques for monitoring individual animals, mostly by means of radio telemetry. Data on movements and behavicr of these marked animals are then used to develop accurate population monitoring techniques and methods for evaluating environment changes.
APPROACH: Telemetry equipment is being developed to determine position and activity of terrestrial animals and position activity, temperature, and depth of aquatic vertebrates. Investigations are being carried out in three species of tree squirrels, pronghorn antelope, sea otters, and chinook salmon. Emphasis is on aspects of coexistence of the tree squirrels and on population dynamics and movement patterns of the other species.
RESULTS: Current studies on movements, activity and temperature patterns of chinook salmon are being carried out in the Snake River in Washington. an automatic radio tracking system and a computer software system have been developed for obtaining and analyzing ecological and behavioral data on wild animals living under natural conditions. Data have been collected and are being analyzed on coexistence of three species of tree squirrels. Radio telemetry data have been accumulated on sea otter movement in Alaskan waters, and the effects of oil and immobilizing drugs on these animals studied. A telemetry study of pronghorn antelcpe was initiated to document seasonal movements of antelope in Idaho at the Idaho National Engineering Laboratory site.
KEYWORDS: WILD ANIMALS;ECOLOGY;POPULATION DYNAMICS;TELEMETRY;SQUIRRELS;SALMON;DEER;MAMMALS;BEHAVIOR;PLUMES

<087653>
TITLE: Accumulation and Transport of Minerals by Marine Protozoa
PROJECT NUMBER: 006385
PRINCIPAL INVESTIGATOR: Gold, K.
ADDRESS: Osborn Laboratories of Marine Sciences, New York Aquarium, New York, NY 11224
AFFILIATION: New York Aquarium, Brooklyn (USA). Osborn Labs. of Marine Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D. Heyward
TELEPHONE: C(301)353-4155
TYPE OF FUNDING: Contract No.-E(11-1)-3390
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Estuaries
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The amounts, sizes, chemical composition and the sources of the particulate materials utilized by various species of Tintinnida in building a lorica are being determined. Among the ciliated protozoa, the agglutinated Tintinnida have the unique ability to take up mineral particles in the size range of silts and incorporate them into their shells. The ecological significance of such mineral accumulation is twofold: (1) it is a source of biological concentration that could lead to rapid cycling of radionuclides, heavy metals, or other toxic substances from the sediments or water column to the biota; (2) the types and amounts of accumulated particles are expected to be helpful where the loricae are used as biological indicators, e.g., water movements or special environmental perturbations.
APPROACH: Specimens are to be studied from stressed environments for comparisons with others from relatively clean, less perturbed habitats. Included will be specimens from thermally stressed areas, polluted

environments, and an estuary, to determine whether lorica development in these habitats is affected in a way that modifies their mineral burden. Scanning electron microscopy and electron probe analysis are being used extensively in this study. A variety of methods of building loricae have been observed, and the principal types of materials accumulated are being characterized for species in different habitats. Quartz particles are the kinds most commonly found on the loricae of arenaceous tintinnids along the northeastern coast of the U.S.; CaCO/sub 3/ particles were detected agglutinated to specimens collected at Eniwetok. The agglomerated species appear to take up particles randomly; they include both biogenic fragments, such as diatom frustules, protozoan shells, and coccoliths, and non-biogenic grains and flakes, probably quartz.
RESULTS: (1) The amount and the chemical composition of the minerals accumulated by Tintinnida will be determined for species (a) growing in the vicinity of a nuclear reactor effluent, and (b) from a habitat containing high concentrations of metals either sorbed to silt-sized particulate matter, or as particulates themselves. (2) It will be determined if the materials accumulated by agglutinated benthic foraminifera and the planktonic tintinnids are the same in the habitats given in (1) above. (3) It will be determined whether or not temperature is a major factor governing the accumulation of particulate materials by Tintinnida, i.e., if temperature influences the sizes, amounts, or the chemical composition of the particles being accumulated.
PROJECT MILESTONES: (1) The chemical nature of the particulate materials accumulated by protozoa in the vicinity of a nuclear reactor effluent will be identified. (2) The physical, chemical, and biological factors that affect the uptake of particulate substances by protozoa, deemed to be potential hazards to public health, will be determined.
KEYWORDS: FAUNA;PROTOZOA;MINERALS;METABOLISM;PARTICLES;ECOLOGICAL CONCENTRATION;THERMAL POLLUTION;ELECTRON MICROSCOPY;QUARTZ;SHELLS;CHEMICAL COMPOSITION;NUCLEAR POWER PLANTS;CHEMICAL EFFLUENTS;PLANKTON;BENTHOS;FORAMINIFERA;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;BIOLOGICAL ACCUMULATION;ANIMALS;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS

<087656>
TITLE: Movement of Metal Cations Through the Soil to the Plant Root Membrane
PROJECT NUMBER: 006397
PRINCIPAL INVESTIGATOR: Barber, S.A.
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AFFILIATION: Purdue Univ., Lafayette, Ind. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Franklin, Ralph E.
TELEPHONE: C(301)353-4155
TYPE OF FUNDING: Contract No.-E(11-1)-1495
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (80%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the principles and mechanisms involved in the movement of metal cations through the soil to the plant root, their absorption by the root and their translocation to the shoot.
APPROACH: The reactions between metals and soil particles that influence their rates of diffusion are investigated. The absorption characteristics of plant roots are evaluated. A mathematical model of the process is developed and a computer program written to define all of the steps involved.
RESULTS: A mathematical model which will include the soil and plant parameter that control the flux of the metal through the soil and into the plant. This model can then be used to predict the effect of growing various plant species on particular soil sites in terms of metal movement from the soil to the plant.
PROJECT MILESTONES: Completion of an adequately tested mathematical model which includes all the principles and mechanisms of metal transport from the soil into the plant.
KEYWORDS: METALS;DIFFUSION;ROOT ABSORPTION;PLANTS;SOILS;MATHEMATICAL MODELS;TERRESTRIAL ECOSYSTEMS;SILICON;CESIUM;CALCIUM;POTASSIUM;ENVIRONMENTAL TRANSPORT;BIOADSORBENTS

<087657>
TITLE: Fission- and Alpha-Track Study of Biogeochemistry of Plutonium and Uranium in Carbonates of Bikini and Eniwetok Atolls
PROJECT NUMBER: 006398
PRINCIPAL INVESTIGATOR: Miller, D.S.;Friedman, G.M.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Darneal, Robert
TELEPHONE: C(301)353-5778
TYPE OF FUNDING: Contract No.-E(11-1)-3462
77 FUNDING: Energy Research and Development Administration FY77:$42,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Site specific South west Pacific;COASTS/Other coasts Pacific Island;HYDROGRAPHIC AREAS/Other hydrographic areas Marine lagoon
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To define the concentration and distribution of alpha emitters (plutonium, americium and uranium) in carbonate materials from Bikini and Eniwetok Atolls. Samples will include various corals, corralline algae, and marine cements; the resultant data will be interpreted with the hope of defining more precisely the mobility and biogeochemistry of plutonium, americium and uranium in the natural environment.
ROACH: Techniques have been developed in our laboratory to measure the concentration of alpha emitters in the picocurie per gram range and to define the location of the alpha emitters in samples within a few microns based on an alpha-track detection method using cellulose nitrate. The cellulose nitrate detector is placed directly on the sample surface to be analyzed so that the alpha particles can be detected in a manner which allows the source of the alpha particles to be recognized.
RESULTS: An understanding of the precise location of alpha emitters in samples from Bikini and Eniwetok which should lead to a better capability of defining the biogeochemistry of the alpha emitters, especially

plutonium.
PROJECT MILESTONES: As reported in the latest project report (COO-3462-12) concentration levels of alpha emitters ten to 100 times higher than previously measured have been found in a coral Favites virens.
KEYWORDS: AMERICIUM;PLUTONIUM;URANIUM;BIOGEOCHEMISTRY;CARBONATES;BIKINI;ENIWETOK;RADIONUCLIDE MIGRATION;SEDIMENTS;CORALS

<087658>
TITLE: Biological Research on the Volcanic Island Surtsey and Its Environs
PROJECT NUMBER: 6401
PRINCIPAL INVESTIGATOR: Fridriksson, S.
ADDRESS: The Surtsey Research Society, P.O. Box 1238, Reykjavik, IC
AFFILIATION: Surtsey Research Society, Reykjavik (Iceland)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-3531;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Surtsey Island
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This is a long-term program dealing with the ecology of terrestrial biota on Surtsey Island which was formed during an eruption in 1963, and also the effects of the volcanic activities on Heimaey that took place in January 1973. This study's objectives are to investigate the dispersal of various life forms on Surtsey and the ability of species to colonize its inert volcanic substrate. It is proposed tc continue the study of colonization and spread of the various life forms on Surtsey as well as on the new lava on Heimaey and compare it with the ecosystems on the older islands in the Vestmannaeyjar archipelago. A number of lower and higher plants and animals have established themselves on Surtsey. In 1973 there were 1273 vascular plants on the island. Of these 537 over-wintered and many new plants were found in 1974. Three species of birds have nested on the island, of which the newest addition is the black-tacked gull.
KEYWORDS: ICELAND;TERRESTRIAL ECOSYSTEMS;VOLCANOES;PLANTS;ANIMALS;POPULATION DYNAMICS;BIRDS;ECOLOGY;SOILS;CHEMICAL COMPOSITION;ISLANDS;GEOLOGIC STRATA;LAVA;ENVIRONMENTAL EFFECTS;TIME DEPENDENCE

<087659>
TITLE: Population Dynamics, Movement and Home Range of Black-Tailed Jackrabbits in Curlew Valley, Northern Utah
PROJECT NUMBER: 006406
PRINCIPAL INVESTIGATOR: Stoddart, L.C.
ADDRESS: Utah State University, Department of Wildlife Sciences, Logan, UT 84322
AFFILIATION: Utah State Univ., Logan (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
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TELEPHONE: C(301)353-4905
TYPE OF FUNDING: Contract No.-E(11-1)-1329
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific INEL
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Population ecology of the black-tailed jackrabbit population on a 250-square-mile area in Curlew Valley, Utah has been studied from 1962-1974. In spring 1975 the studies were expanded to include a 450-square-mile portion of the Idaho National Engineering Laboratory. The main objective is to describe observed changes in jackrabbit density in terms of mortality and natality rates, to relate changes in these two parameters to variation in environmental factors, and to integrate the results into a mathematical model describing population change.
APPROACH: Jackrabbit densities are estimated in spring and fall with 160 randomly located 1-mile transects. Natality rates are calculated from litter sizes and littering frequency per female as determined from results of monthly collections and autopsy of adult females. Mortality rates are calculated for the total population from fall-spring, for the adult population from spring-fall, and for the juvenile population from birth-fall census. Prenatal mortality is also estimated from autopsy of pregnant females. Mortality and natality rates are related through mathematical models to coyote/rabbit ratios, rabbit population density, and rodent biomass. Coyote and rodent densities are estimated using trap transects, trapping grids, scat lines and scent-post lines.
RESULTS: Data collections were initiated on (1) controlled experiments to investigate genetic and/or behavioral changes in the jackrabbit population associated with observed high rates of juvenile mortality; (2) field studies to observe the effects of food supply on jackrabbit population dynamics; and (3) habitat preferences of rodents on the Idaho National Engineering Laboratory site.
KEYWORDS: RABBITS;ECOLOGY;POPULATION DYNAMICS;MATHEMATICAL MODELS;UTAH;BIOMASS;TERRESTRIAL ECOSYSTEMS;BEHAVIOR

<087660>
TITLE: Exchange of Lyotropic Series Cations by Micaceous Vermiculite and Its Weathering Products Determined by Electron Microscopy and Radiochemical Analysis
PROJECT NUMBER: 006422
PRINCIPAL INVESTIGATOR: Jackson, M.L.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(11-1)-1515
77 FUNDING: Energy Research and Development Administration FY77:$36,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)

ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (40%);PARTICULATES (40%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Investigate mica weathering to vermiculite in relation to retention of radioactive cations of fission origin. Relate adsorption and fixation of 137-Cs/sup +/ to layer charge and steric configuration in crystallographic wedges and of 90-Sr/sup 2+/ adsorption on associated hydrous metal oxides. Trace sources of aerosolic dusts that fix 137-Cs/sup +/, other fission products, and uranium.
APPROACH: Naturally weathered micaceous vermiculites of soils are being tested by saturation with various fixing cations (K/sup +/, Rb/sup +/, Cs/sup +/) and non-fixing control cations (Li/sup +/, Na/sup +/) and measurements of retention are being carried out by beta and gamma ray counting. Hydrous oxides of iron and aluminum, fresh and variously aged to model soils, are being tested for retention of a wide variety of divalent cations common in fission products, applied in trace amounts (10/sup -3/ to 10/sup -7/M). Marker minerals such as quartz, from dusts containing micaceous vermiculite, are being subjected to mass spectrometry of oxygen isotopes and neutron activation analysis for signature trace elements in order to learn the source of the formations and their movement in relation to past climates and possible prediction of the distant future nature of waste product disposal and nuclear plant sites.
RESULTS: Through electron microscopy (and radiochemistry, above), visual and chemical models of soil mineral fixation sites for fission products and transuranium elements are being characterized. Natural and thermal neutron-produced fission particle tracks in micas are being employed as a sensitive analytical measure of uranium concentration in soil minerals and to age-date minerals formed in soils. Evaluation of U ore accumulation processes in micas of soils and sediments is envisioned. Time spans of a few tens of years up to one billion years allow determination of relative stability of geological formations and may assist in evaluating possible reactor sites and disposal sites for waste products, both from nuclear and carbonaceous fuels.
PROJECT MILESTONES: (1) Uranium fixation and accumulation in flaws of micaceous vermiculite in soils during weathering, as model for uranium-ore accumulation and waste retention. (2) Establish sites on minerals where radioactive elements are fixed, for example Cs-137/sup +/ in mica occlusions in kaolinite crystals and Sr-90/sup 2+/ adsorbed on specific sites of iron oxide surfaces where retained and not desorbed by concentrated monovalent salt solutions. (3) Establish meteorological patterns of dust origin and flow in relation to radioactive elements adsorption from the atmosphere from fallout from power plants and bomb testing. Evaluate soil role in fate of stored transuranium and other radioactive fission waste products in relation to the long-range weather and glacial cycles in landscapes on a global basis based on interdisciplinary information accumulating in palynology, ecology, oceanography, agricultural (anthropological) history, and ice/water oxygen isotopic ratios.
KEYWORDS: NUCLEAR ENERGY;FISSION PRODUCTS;MICA;RADIATION EFFECTS;ENVIRONMENTAL EFFECTS;CESIUM 137;URANIUM;LAND POLLUTION;RADIOACTIVE WASTE DISPOSAL;MATHEMATICAL MODELS;ION EXCHANGE;CATIONS;SOILS;PHYSICAL PROPERTIES;RADIOCHEMICAL ANALYSIS;AEROSOLS;RADIOACTIVE EFFLUENTS

<087661>
TITLE: Radioelement Studies in the Oceans
PROJECT NUMBER: 6423
PRINCIPAL INVESTIGATOR: Bowen, T.
ADDRESS: Department of Chemistry, Woods Hole Oceanographic Institution, Water Street, Woods Hole, MA 02543
AFFILIATION: Woods Hole Oceanographic Institution, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-3563;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$575,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Deep ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: A long-standing study trying to lay the basis for prediction of the movements, rates and fates of long lived artificial radionuclides introduced into marine environments; this obviously requires clarification of the basic geochemical and biological processes in which they participate. Measurements are made both of soluble tracers like strontium-90 and cesium-137, and of largely particuate tracers like iron-55 and the transuranic nuclides. Samples of water (all depths), aerosols, biota and sediments are analyzed routinely for Sr-90, Cs-137, Fe-55, Pu-238, -239, and -240, and Am-241; in special cases also for Pu-241, Am-242m, Cm-242, Cm-244, and many others, stable element analyses also are made by a wide variety of techniques. Although most of the study refers to fallout nuclides, waste disposal situations and experimental introductions are also studied.
RESULTS: Summarized in 30 reprints within last 17 months, most published or in press; apply to Principal Investigator for bibliography.
KEYWORDS: ATLANTIC OCEAN;OCEANOGRAPHY;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;RADIOECOLOGICAL CONCENTRATION;STRONTIUM 90;CESIUM 137;IRON 55;PLUTONIUM 238;PLUTONIUM 239;PLUTONIUM 240;AMERICIUM 241;CURIUM 242;CURIUM 244;SAMPLING;DIFFUSION;SEAWATER;DEPTH;SEDIMENTS;AQUATIC ORGANISMS;FALLOUT DEPOSITS;RADIOACTIVE EFFLUENTS;RADIATION MONITORING;AQUATIC ECOSYSTEMS;CHEMICAL COMPOSITION;RADIOACTIVE AEROSOLS

<087663>
TITLE: Plutonium and Americium Concentrations Along Fresh-water Food Chains of the Great Lakes, USA
PROJECT NUMBER: 6425
PRINCIPAL INVESTIGATOR: Bowen, V.T.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-AT(11-1)-3568
77 FUNDING: Energy Research and Development Administration FY77:$93,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: We will continue to measure plutonium and americium radionuclides from fallout in the water, sediments and biota of Lake Ontario; also, we will begin to investigate non-fallout sources of transuranic nuclides in this lake, and in the materials supplied from Lake Erie to the Niagara River fan. In the process of evaluating the significance of the transuranic elements to questions of public health, water quality, and environmental effects, it is important to estimate their trajectories and rates of movement from such point-sources as shore-based nuclear reactors or nuclear fuel services. It is also important to estimate more accurately the rates of back diffusion of transuranics from lake sediments, and to establish the chemistry responsible for this process. A certain number of measurements of strontium 90, cesium 137 or iron 55 have proved very useful in interpreting the distributions of the transuranic elements.
RESULTS: Much detail with regard to the fate, transport and distribution of fallout plutonium and americium in Lake Ontario are contained in two reports. In addition to the measurements of transuranics from fallout sources, the detection of Cm-244 in some sediment cores has pointed to a small but significant input of transuranic elements from non-fallout sources.
KEYWORDS: LAKE ONTARIO;LAKE ERIE;PLUTONIUM 238;PLUTONIUM 239;PLUTONIUM 240;AMERICIUM 241;CESIUM 137;IRON 55;CURIUM 244;FALLOUT DEPOSITS;DIFFUSION;RADIOACTIVE EFFLUENTS;NUCLEAR POWER PLANTS;SURFACE WATERS;SEDIMENTS;CHEMICAL COMPOSITION;FRESH WATER;AQUATIC ECOSYSTEMS;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;RADIOECOLOGICAL CONCENTRATION;AQUATIC ORGANISMS;FOOD CHAINS;SAMPLING;OCEANOGRAPHY

<087664>
TITLE: Distribution of Some Chemical Elements Between Particulate and Dissolved Phases in Sea Water
PROJECT NUMBER: 6427
PRINCIPAL INVESTIGATOR: Spencer, D.W.
ADDRESS: Woods Hole Oceanographic Institution, Woods Hole, MA 02543
AFFILIATION: Woods Hole Oceanographic Institution, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Divisicn of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TYPE OF FUNDING: Contract No.-E(11-1)
77 FUNDING: Energy Research and Development Administration FY77:$19,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/Fission (80%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of our program is to describe and understand the mechanisms controlling the distribution of trace elements in the ocean. A major factor in the distribution of non-conservative species is their interaction with and transfer by particulate phases both biogenic and inorganic. During the coming year, we plan to complete analyses of Pb-210, Po-210 and several stable trace elements on particulate matter and water of samples collected from the Gulf of Maine in January 1975. We will attempt to describe the rate at which trace elements are cycled within a silled basin in the Gulf of Maine. As a further extension of our continental shelf studies we plan to participate in the FLEX 76 program, a major international cooperative effort to study the onset and development of a plankton bloom in the North Sea.
RESULTS: Our studies of Pb-210 and Po-210 in the open ocean on a transect of the Atlantic Ocean at 15 degrees N indicate that excess Pb-210 is consistently present in the surface due to the atmospheric delivery while Po-210 is consistently depleted due to uptake by phytoplankton. Po-210 is being removed from the mixed layer with residence times from 0.17 to .47 yrs and the comparable residence times for Pb-210 are 2-5 years.
KEYWORDS: GULF OF MAINE;ATLANTIC OCEAN;CONTINENTAL SHELF;FALLOUT DEPOSITS;LEAD 210;POLONIUM 210;TRACE AMOUNTS;DIFFUSION;SEAWATER;PLANKTON;RADIOECOLOGICAL CONCENTRATION;AQUATIC ECOSYSTEMS;FOOD CHAINS;DEPTH;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;CHEMICAL COMPOSITION;SAMPLING;COASTAL WATERS;METALS;WATER QUALITY;WATER POLLUTION

<087665>
TITLE: Microbiology of Coastal Waters
PROJECT NUMBER: 6428
PRINCIPAL INVESTIGATOR: Watson, S.W.
ADDRESS: Woods Hole Oceanographic Institution, Biology Department, Woods Hole, MA 02543
AFFILIATION: Woods Hole Oceanographic Institution, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-3565
77 FUNDING: Energy Research and Development Administration FY77:$12,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;COASTS/Other coasts All
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The role bacteria play in coastal waters will be investigated. The percent of the total biomass composed of bacteria will be defined and the rates of mineralization of organic matter will be determined. The effect of heavy metals and other pollutants on bacteria in coastal waters will be studied. The morphology and physiology of bacteria ranging in diameter from 0.1-0.5 microns will be investigated and new techniques for the in vivo identification of specific bacteria will be developed. In these studies the Limulus amoebocyte lysate, ATP, chlorophyll a, radioisotope and fluorescence techniques will be employed. Studies will be carred on in Cape Cod Bay and the New York Bight.
RESULTS: Techniques have been developed to measure the concentration and distribution of bacteria in oceanic environments. With these techniques it is possible to determine what percent of the total biomass is composed of bacteria. Studies in Buzzards Bay suggest that bacteria comprise over 50% of the biomass and that they utilize 50-90 percent of the energy captured by photosynthetic processes in this marine envircnment.
KEYWORDS: COASTAL WATERS;ATLANTIC OCEAN;AQUATIC ECOSYSTEMS;BACTERIA;METALS;METABOLISM;MASSACHUSETTS;NEW YORK;BIOMASS;PHOTOSYNTHESIS;BIOLOGICAL MATERIALS;ENERGY TRANSFER;IN VIVO

<087666>
TITLE: Trace Elements in Natural Waters
PROJECT NUMBER: 006430
PRINCIPAL INVESTIGATOR: Turekian, K.K.
ADDRESS: Department of Geology and Geophysics, Yale University, New Haven, CT 06520
AFFILIATION: Yale Univ., New Haven, Conn. (USA). Dept. of Geology and Geophysics
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-3573 Yale
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: METALS/Uranium;METALS/Lead;METALS/Zinc;METALS/Copper;METALS/Cadmium;METALS/Lead 210;METALS/Radium 226;METALS/Polonium 210;METALS/Thorium 228;METALS/Thorium 234;METALS/Etc. (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To understand metal fluxes in the estuarine system. Members of uranium decay series, Mn, Fe and selected trace metals are followed in soil profiles, ground water, streams, estuarine waters and deposits to elucidate sources, sinks and kinetics of transfer.
APPROACH: Systematic studies of major drainage basins (e.g., Susquehanna) and major estuarine systems (e.g., Long Island Sound) involving time series analyses of water samples, particulate materials and sediment cores for uranium and its decay products, Mn, Fe, Cu, Pb, Zn and Cd as well as major elements.
RESULTS: Results, reported as Progress Reports, PhD Theses and scientific papers in journals. A detailed pathway for trace metals in Earth surface agueous systems will be worked out by the detailed analyses described above.
PROJECT MILESTONES: (1) The observation that the mean residence time of metals in streams and estuaries relative tc particulate removal is about 1 day. (2) The observation that bioturbation disturbs the record of man's impact on coastal sediments.
KEYWORDS: ESTUARIES;METALS;URANIUM;DECAY;MANGANESE;IRON;SOILS;GROUND WATER;SURFACE WATERS;DISTRIBUTION;WATER POLLUTION;SEDIMENTS;ENVIRONMENTAL EFFECTS;COASTAL REGIONS;POLLUTION;TRACE AMOUNTS;RADIOACTIVE AEROSOLS;EARTH ATMOSPHERE;SEWAGE;WASTE WATER

<087667>
TITLE: Effects of Atmospheric Variability on Energy Utilization and Conservation
PROJECT NUMBER: 006436
PRINCIPAL INVESTIGATOR: Reiter, E.R.
ADDRESS: Department of Atmospheric Science, Solar House 3, Colorado State University, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Atmospheric Science
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Elliott, William P.
TELEPHONE: F233-3763
TYPE OF FUNDING: Contract No.-E(11-1)-1340
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (20%);ANALYTICAL (80%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Specify recurrent weather regimes causing anomalous energy consumption rates; (2) determine weather effects upon different demands for energy.
APPROACH: (1) Define interannual variability of global circulations and relate these to characteristic U.S. weather patterns by severity; (2) develop physical bases for assessing impacts of weather upon energy demand by end use, and incorporate adaptive consideration of socio-economic factors which influence conservation measures.
RESULTS: (1) A medium- to long-range capability for anticipating those weather changes which produce severe or minimal demands for energy; (2) models for calculating the weather-sensitive requirement for energy, nationally or by distinct geographical region, which can be updated or projected without recourse to historical data as changes in the contributive physical or socio-economic factors occur or are anticipated.
PROJECT MILESTONES: (1) FY 1976 Defined a 24-day winter-season vacillation in atmospheric energy parameters and tied it to behavior of planetary long waves which influence midlatitude weather regimes; defined a midwinter dip in zonal potential energy which is reflected in development of blocking highs that affect North American weather patterns. (2) FY 1976 Develop model for predicting space heating demand for gas in a western high plains rural city. (3) FY 1977 Discover additional interannual variations in global circulation; correlate hemispheric flow patterns with midwinter dip and 24-day vacillation and in turn with characteristic U.S. weather regimes and their severity. (4) FY 1977 Develop model for predicting space-conditioning demand for electricity and gas in rural, suburban and metropolitan areas representative of a major distinct U.S. geographical region.
KEYWORDS: SPACE CONDITIONING;WEATHER SENSITIVITY;ENERGY CONSERVATION;WEATHER;ENERGY DEMAND;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;ENERGY;CONSUMPTION RATES

<087668>
TITLE: Atmospheric Pollution Scavenging
PROJECT NUMBER: 006440
PRINCIPAL INVESTIGATOR: Semonin, R.G.
ADDRESS: Illinois State Water Survey, Box 232, Urbana, IL 61801
AFFILIATION: Illinois State Water Survey, Urbana (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert W.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(11-1)-1199

77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: METALS (50%);PARTICULATES (40%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: RESEARCH/Applied (95%);ANALYTICAL (5%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Quantitative field measurements are acquired of natural, anthropogenic, and intentionally released tracers processed by clouds and precipitaon, and deposted at the surface. These measurements are interpreted through numerical and empirical models of precipitation scavenging to generalize the results for application to a wide range of energy conversion pollution problems.
APPROACH: Through the use of aircraft, surface instrument networks, upper air measurements, and remote sensing of storms by radar, the 3-dimensional distribution of specific aerosol species is observed and the surface wet and dry deposition is determined. The field measurements are obtained over an area of 4000 km-squared with well defined boundaries for assessment of the areal source contribution to the larger regional airshed.
RESULTS: Lead, cadmium and manganese concentrations vs. particle size distributions measured in and around St. Louis show wide variations both in concentration and the shape of the distribution curves which indicate useful information about the source, human pathological studies and delineation of atmospheric chemical transformations and interactions. Tracer aerosols of indium and lithium released into the updrafts of convective storms are removed with variable efficiency by precipitation scavenging. The temporal and spatial distributions of the deposited tracer indicates cell to cell transport aloft. Similar scavenging efficiencies and deposition patterns were observed for trace metals of anthropogenic origin. From deposition measurement source strength estimates can be made. The effect of the urban area on the planetary boundary layer indicates that the city roughness results in a sizeable convergence and upward motion of the air near the top of the subcloud layer, which, coupled with thermodynamic effects, results in a deeper mixed layer over the city than in the country.
PROJECT MILESTONES: (1) Final report of previous 5-year measurement program prepared for printing 31 March 1977. (2) Preparation for second phase field measurements 31 August 1977. (3) Initialization of second phase field measurements 1 September 1977.
KEYWORDS: EARTH ATMOSPHERE;METEOROLOGY;AIR POLLUTION;PRECIPITATION SCAVENGING;MEASURING INSTRUMENTS;MEASURING METHODS;AIRCRAFT;REMOTE SENSING;WEATHER;AEROSOLS;COMPUTER CODES;M CODES;MATHEMATICAL MODELS;TRACER TECHNIQUES;LEAD;CADMIUM;MANGANESE;PARTICLE SIZE

<087669>
TITLE: Global Transport Processes and Interactions with Trace Constituents
PROJECT NUMBER: 006443
PRINCIPAL INVESTIGATOR: Newell, R.E.
ADDRESS: Room 54-1520, Massachusetts Institute of Technology, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Meteorology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Moses, Harry
TELEPHONE: F233-3763;C(301)353-5572
TYPE OF FUNDING: Contract No.-AT(11-1)-2195
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/CO;NOXIOUS GAS/Ozone;NOXIOUS GAS/Carbon dioxide;NOXIOUS GAS/Sulfur dioxide (15%);PARTICULATES/Including volcanic (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Marine;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas Surface layers of ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: We are trying to understand the large-scale energy budget of the atmosphere-ocean-cryosphere system with the hope that we may then arrive at rational explanations for the observed changes in the energy budget. There has been much speculation that anthropogenic carbon dioxide, or tropospheric aerosol may, or will soon, influence climate. There has also been much consideration of possible changes of ozone due to anthropogenic effects and the resulting possible changes on ultraviolet radiation received at the ground and on climate. It is desirable to understand in detail the operation of the system as it is presently constituted before one attempts to gauge the influence of potential changes. Our approach has been to study global observations in an effort to gain this understanding.
APPROACH: Study of global data on wind, air, and sea temperature, pressure, moisture, and other trace constituents. Computations of means, variances and covariances, empirical orthogonal representations, and trends. Correlation between results and measurements of total ozone, volcanic eruptions, stratospheric and tropospheric aerosol, and food production in several countries. Computation of radiative heating rates by trace substances, such as carbon dioxide, water vapor and ozone. The data base for atmosphere and ocean has been developed at MIT. The ozone data was obtained from Atmospheric Environment Service, Canada.
RESULTS: The factors controlling mean air temperature over the globe and its variations. The inter-relationship between meteorological parameters and food production, and possibly energy use. The reasons for year to year variations in total ozone. The global transport data may be applied to any other trace substance such as carbon monoxide.
PROJECT MILESTONES: (1) December 1976 Integration of sea and air temperature changes into global set. (2) April 1977 Extension of analysis into near real-time.
KEYWORDS: EARTH ATMOSPHERE;SEAS;CLIMATES;TEMPERATURE DISTRIBUTION;OCEANOGRAPHY;CARBON DIOXIDE;AEROSOLS;WATER VAPOR;OZONE;DIFFUSION;ANNUAL VARIATIONS;SEASONAL VARIATIONS;VOLCANOES;CHEMICAL EFFLUENTS;TRACE AMOUNTS;AEROSOL MONITORING;FOOD;METEOROLOGY;SULFUR DIOXIDE

<087675>
TITLE: Physical Basis of Ionizing-Radiation Action
PROJECT NUMBER: 006457
PRINCIPAL INVESTIGATOR: Fano, U.
ADDRESS: Department of Physics, University of Chicago, Chicago, IL 60637
AFFILIATION: Chicago Univ., Ill. (USA). Dept. of Physics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Blaunstein, Robert P.
TELEPHONE: F233-3213
TYPE OF FUNDING: Contract No.-ERDA-11-1-2100
77 FUNDING: Energy Research and Development Administration FY77:$1,000

TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
OJECT DESCRIPTION: The objective of this research is the theoretical calculation and interpretation of yields of the initial (''primary'') events in the absorption of various ionizing radiations by matter. These events are equally crucial for the physical, chemical, and biological action of the radiations. The work has started with ''electronic'' radiations (beta, gamma, or X-rays) and a few representative varieties of matter. The first stage for each material is assembly of a complete set of cross sections for all relevant inelastic processes (excitation and ionization) induced in the atoms or molecules by electron impact, at all electron velocities. These are obtained from analysis of optical data (oscillator-strength distributions) and of experimental cross-section determinations, together with theoretical calculation. The electron degradation-spectrum is then calculated. Under current study is the influence of inner shell ionization upon the degradation spectra of electrons. Completion of this task through pilot stage should conclude the contemplated work of this project.
RESULTS: Publications and reports.
PROJECT MILESTONES: Project completed in 1976.
KEYWORDS: IONIZING RADIATIONS;BIOLOGICAL RADIATION EFFECTS;BETA PARTICLES;GAMMA RADIATION;X RADIATION;CROSS SECTIONS;ATOMS;MOLECULES;ELECTRONS;VELOCITY;PILOT PLANTS;TERRESTRIAL ECOSYSTEMS;RADIATION EFFECTS;ENVIRONMENTAL EFFECTS

<087676>
TITLE: Dosimetry of Ionizing Radiation, Radiation Physics, and Radiobiology
PROJECT NUMBER: 006459
PRINCIPAL INVESTIGATOR: Rossi, H.H.
AFFILIATION: Columbia Univ., New York (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$449,000
TECHNOLOGY: NUCLEAR/Fission (100%)
KEYWORDS: MAMMALS;RADIATION DOSE DISTRIBUTIONS;IONIZING RADIATIONS;RADIOBIOLOGY;DOSIMETRY;BIOPHYSICS

<087677>
TITLE: High Purity Germanium PIN Gamma Detector
PROJECT NUMBER: 006462
PRINCIPAL INVESTIGATOR: Hall, R.N.
ADDRESS: P.O. Box 8, Schenectady, NY 12301
AFFILIATION: General Electric Co., Schenectady, N.Y. (USA). Research and Development Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: F233-3213;C(301)353-3213
TYPE OF FUNDING: Contract No.-E(11-1)-3193
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: NUCLEAR/Fission (50%);NUCLEAR/Fusion (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (30%);DEVELOPMENT/Laboratory scale (70%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Establish improved methods for making large volume (approximately 100 cm/sup 3/) high-purity germanium detectors. Achieve better energy resolution. Identify and eliminate factors which presently limit operating performance. Study effects of hydrogen and annealing procedures.
APPROACH: A new process (Radial Gradient) has been developed for making gamma detectors from high purity germanium. Compatible processing steps are being introduced and measurements of detector performance are being conducted and evaluated in order to determine the advantages of radial gradient coaxial detectors.
RESULTS: Anticipated result is a class of large volume coaxial gamma detectors with improved resolution and reliability, and having an extended range of energy response.
PROJECT MILESTONES: (1) Fabricate coaxial detector. (2) Measure performance. (3) Analyze results. (4) Improve annealing procedures to eliminate hydrogen effects.
KEYWORDS: HIGH-PURITY GE DETECTORS;FABRICATION;ENERGY RESOLUTION;PERFORMANCE;RELIABILITY;ENERGY DEPENDENCE;SENSITIVITY;GAMMA DETECTION

<087679>
TITLE: Theory of Relative Biological Effectiveness
PROJECT NUMBER: 006471
PRINCIPAL INVESTIGATOR: Katz, R.
AFFILIATION: Nebraska Univ., Lincoln (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<087680>
TITLE: Interaction of Radiation with Matter
PROJECT NUMBER: 006473
PRINCIPAL INVESTIGATOR: Brandt, W.
AFFILIATION: New York Univ., N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$318,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)

<087682>
TITLE: Development and Applications of Photosensitive Device Systems to Biological Observations
PROJECT NUMBER: 006477
PRINCIPAL INVESTIGATOR: Reynolds, G.T.
ADDRESS: Princeton University, Physics Dept., Princeton, NJ 08540
AFFILIATION: Princeton Univ., N.J. (USA). Dept. of Physics
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, H.N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E-(11-1)-3120
77 FUNDING: Energy Research and Development Administration FY77:$134,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development and application of improved instrumentation for x-ray diffraction structural analysis of biological structures and for detection of bioluminescence.
APPROACH: The study of the location, distribution and magnitude of light emission provides insight into the mechanism whereby flashing is controlled and into the structural organization of the energy conversion system. Environmental effects on these mechanisms are important to ascertain.
RESULTS: Capability for structural analysis of weakly diffracting or dynamic structures at lower x-ray dosages. Capability for detailed studies of bioluminescent organisms and reactions.
KEYWORDS: LUMINESCENCE;ANIMAL CELLS;VISIBLE RADIATION;ENZYMES;BIOCHEMISTRY;PHOTOMULTIPLIERS;SPECIFICATIONS;IN VIVO;TISSUES;X-RAY DIFFRACTION

<087683>
TITLE: Special Problems in Nuclear Instrumentation
PROJECT NUMBER: 006481
PRINCIPAL INVESTIGATOR: Spokas, J.J.
ADDRESS: Illinois Benedictine College, 5700 College Road, Lisle, IL 60532
AFFILIATION: Illinois Benedictine Coll., Lisle (USA). Physical Sciences Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: F233-3213;C(301)353-3213
TYPE OF FUNDING: Contract No.-E(11-1)-323
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: NUCLEAR/Fission (50%);NUCLEAR/Fusion (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (35%);FULL SCALE DEMONSTRATION (15%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To seek more meaningful and accurate means of measuring radiation fields with reference to possible biological effects caused by such fields particularly in humans. The radiations considered singly and in various combinations include x rays, gamma rays, electrons, neutrons, protons, and pions.
APPROACH: Conducting plastic mixtures which simulate various biological tissues, such as muscle and bone, have been synthesized. These materials are employed in ionization chambers and proportional counters for the accurate measurement of radiation dose. Ionization chamber configurations are studied with respect to practicability and precision in dose measurements. Associated instrumentation including low-noise cables and electrometers as well as measurement procedures are included in the overall study.
RESULTS: New materials which simulate a given biological tissue with respect to a wider range of radiation type and energies and which possess more desirable physical properties are expected products of this project. A greater understanding of present simulating materials and of ionization chambers and measuring techniques can also be anticipated.
PROJECT MILESTONES: Tissue-equivalent (muscle) mixture which more accurately simulate muscle with respect to high energy (greater than 15 MeV) neutrons.
KEYWORDS: DOSIMETRY;X RADIATION;GAMMA RADIATION;ELECTRONS;NEUTRONS;PROTONS;PIONS;RADIATION DOSE DISTRIBUTIONS;TISSUE-EQUIVALENT MATERIALS;PLASTICS;IONIZATION CHAMBERS;PROPORTIONAL COUNTERS;RADIATION DOSES;PERFORMANCE TESTING;NEOPLASMS;MEDICINE;SAFETY;PERSONNEL DOSIMETRY;RADIOTHERAPY;RADIATION PROTECTION

<087684>
TITLE: Biological and Clinical Dosimetry
PROJECT NUMBER: 006482
PRINCIPAL INVESTIGATOR: Laughlin, J.S.
ADDRESS: 410 East 68th Street, New York, NY 10021
AFFILIATION: Sloan-Kettering Inst. for Cancer Research, New York (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division Biological and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: C(301)353-3213
TYPE OF FUNDING: Contract No.-E(11-1)-3522
77 FUNDING: Energy Research and Development Administration FY77:$41,000
TECHNOLOGY: NUCLEAR/Fission (50%);NUCLEAR/Fusion (50%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop and apply physical methods of radiation field measurement. Both quantitative and qualitative aspects of complex radiation beams employed for radiobiological experiments and clinical applications are under study. The aim of these investigations is to improve the accuracy and precision of dosimetry and develop advanced dosimetric instrumentation.
APPROACH: Methods of achieving the objectives of this research include the use of a portable tissue equivalent calorimeter developed in our laboratory. In addition, characterization of the neutron beams produced at the Sloan-Kettering cyclotron in terms of neutron energy spectra and microdosimetric parameters is under continuing study in order to determine W values for T.E. gas and g-values for ferrous sulfate.

RESULTS: It is expected that improvements in the accuracy of neutron dosimetry using the portable tissue equivalent calorimeter will result in improving the dosimetric uncertainty of approximately +-6% associated with ionization chamber techniques currently employed to approximately +-2%. The significance of this improvement is relevant to improving the quality of neutron radiotherapy now underway at several centers throughout the United States.
PROJECT MILESTONES: Significant milestones expected in the near future include the completion of construction of an advanced field calorimeter for measurements at high LET radiotherapy centers. Measurements of the thermal defect in tissue equivalent plastic are underway and these data should provide a valuable contribution to calorimetric dosimetry. Determination of W- and G-values using calorimetric and ionometric methods will also prove valuable for the dosimetry of densely ionizing radiation.
KEYWORDS: RADIATION MONITORING;NEUTRON DOSIMETRY;ACCURACY;EQUIPMENT;TISSUES;RADIOTHERAPY;HEALTH HAZARDS;RADIATION MONITORS;LET;NEOPLASMS;MEDICINE;CALORIMETERS;IONIZATION CHAMBERS

<087685>
TITLE: Solid State Neutron Dosimetry
PROJECT NUMBER: 006488
PRINCIPAL INVESTIGATOR: Moran, P.R.;Attix, F.H.
ADDRESS: Dept. of Radiology, University Hospital, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA). Dept. of Radiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: C(301)353-3213
TYPE OF FUNDING: Contract No.-E-(11-1)-1105
77 FUNDING: Energy Research and Development Administration FY77:$74,000
TECHNOLOGY: NUCLEAR/General (5%);GENERAL SCIENCE (15%);MEDICAL APPLICATIONS OF NUCLEAR TECHNOLOGY (80%)
POLLUTANTS: RADIATION/Neutrons;RADIATION/Low energy betas;RADIATION/X-rays (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Our main objective is to explore new techniques of solid state radiation detection. Of particular interest are techniques which may lead to solid state, passive, integrating dosimeters for fast neutrons that can be used in mixed neutron and gamma-ray environments. In addition, techniques for imaging x-rays and neutrons are being studied.
APPROACH: We are investigating thermoluminescent (TL) and thermally stimulated current (TC) phenomena in high purity insulators. Lithium fluoride, alumina gadolinium gallium garnet and high temperature plastic polymers are being studied. Direct neutron interactions, neutron activation reactions and densely ionizing charged particle interactions are determined. X-ray responses are also measured.
RESULTS: We expect to determine some of the processes underlying the operation of solid state radiation dosimeters. From this, we can demonstrate the feasibility of particular dosimeter configurations and delineate the range of practical applications.
PROJECT MILESTONES: (1) Test of thin film alumina TC dosimeters to proton recoil. (2) Composite image of fast neutrons with fluorine activation. (3) Identification of the surface dopant in LiF responsible for the 300 degree C peak. (4) Test of mixed polymer-alumina TC dosimeter.
KEYWORDS: RITAC DOSEMETERS;THERMOLUMINESCENT DOSEMETERS;LITHIUM FLUORIDES;PLASTICS;NEUTRON DOSIMETRY;ALUMINIUM OXIDES;GADOLINIUM COMPOUNDS;GALLIUM COMPOUNDS;RADIOACTIVATION;RESEARCH PROGRAMS;X RADIATION;SOLIDS;PERSONNEL DOSIMETRY;RADIATION PROTECTION;IMAGES

<087686>
TITLE: Energy Exchange within Ecosystems
PROJECT NUMBER: 006494
PRINCIPAL INVESTIGATOR: Gates, D.M.
ADDRESS: 4053 Natural Science Building, University of Michigan Biological Station, Ann Arbor, MI 48109
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Plawchan, David
TELEPHONE: C(313)764-7237
TYPE OF FUNDING: Contract No.-AT(11-1)-2164
77 FUNDING: Energy Research and Development Administration FY77:$29,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;HYDROGRAPHIC AREAS/Other hydrographic areas Shallow lakes and streams
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Development of an analytical model of photosynthesis of submerged aquatic vascular plants and terrestrial plants. Light, temperature, pH, inorganic carbon concentration and form, oxygen concentration and flow rate of water past the plants all affect the photosynthetic rate of submerged vascular hydrophytes. Further investigations will be conducted on the optimum conditions for photosynthesis. Additional data on photosynthetic rate will be gathered using a pH-Stat system. Elodea densa will continue to be used until species native to Michigan can be cultivated in quantity.
APPROACH: The photosynthetic response of shoots of Elodea densa is being measured under a variety of environmental conditions, with special emphasis on temperature, light and inorganic carbon concentration. The data thus obtained will be analyzed using equations based on first principle of physics and chemistry in order to develop a physically and chemically valid analysis.
RESULTS: Using the above procedure, a detailed analysis of the response of photosynthesis of aquatic vascular plants to variation in the environment will be produced. The final analysis will indicate the kinds of changes in photosynthesis of aquatic vascular plants which can be caused by changes in the environment. Ability to predict stomatal diffusion resistance will permit better understanding of plant growth in response to changes in environmental factors. It will also permit inclusion of stomatal responses in the overall energy budget of a plant leaf.
PROJECT MILESTONES: (1) Development of an apparatus which controls light, temperature, pH and flow rate and which measures the change in the oxygen level continuously. (2) Measurement of the photosynthesis of

Elodea densa has begun with indications of an interaction between pH and the ionic composition of the water. Light intensity and inorganic carbon concentration studies are the main emphasis at present. A description of the temperature responses of photosynthesis should be completed within a year.
KEYWORDS: AQUATIC ORGANISMS;PLANTS;PHOTOSYNTHESIS;ENVIRONMENTAL EFFECTS;MEASURING INSTRUMENTS;VISIBLE RADIATION;PH VALUE;TEMPERATURE DEPENDENCE;FLOW RATE

<087687>
TITLE: Energy Generation and the Sulfur Cycle: Organic Sulfur Compounds
PROJECT NUMBER: 006515
PRINCIPAL INVESTIGATOR: Brock, T.D.
ADDRESS: 1550 Linden Drive, Madison, WI 53705
AFFILIATION: Wisconsin Univ., Madison (USA). Dept. of Bacteriology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Contract No.-E(11-1)-2161
77 FUNDING: Energy Research and Development Administration FY77:$37,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) Anaerobic oxidation of methane and aliphatic hydrocarbons in lake sediments will be studied using 14C-labelled methane and hexadecane. A mechanism for anaerobic oxidation via methyl mercaptan is proposed and has been partially tested. (2) The importance of forests and grassland soils as sources of atmospheric sulfur gases will be tested, using 35S-labeled sulfate. It is proposed that sulfate-reduction to H2S occurs in anaerobic microenvironments in normal soils, the reaction being driven by the large amounts of organic matter present in such soils. On a global basis, it is considered that sulfate reduction in soil may greatly exceed sulfate reduction in water as a source of atmospheric sulfur gases.
KEYWORDS: ENERGY;POWER GENERATION;SULFUR DIOXIDE;ORGANIC SULFUR COMPOUNDS;WASTE MANAGEMENT;AIR POLLUTION;METHANE;EARTH ATMOSPHERE;ECOLOGICAL CONCENTRATION;ANAEROBIC CONDITIONS;CHLORINATED ALIPHATIC HYDROCARBONS;BIODEGRADATION;OXIDATION;LAKES;LABELLED COMPOUNDS;TRACER TECHNIQUES;REACTION KINETICS;ENVIRONMENTAL TRANSPORT;TERRESTRIAL ECOSYSTEMS;CHEMICAL EFFLUENTS;FORESTS;SOILS

<087689>
TITLE: Spin-Labeled Membranes
PROJECT NUMBER: 006582
PRINCIPAL INVESTIGATOR: Keith, A.D.
ADDRESS: Biochem. and Biophysics Department, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duda, George
TELEPHONE: F233-5037
TYPE OF FUNDING: Contract No.-E(11-1)-2223
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (25%);GENERAL SCIENCE (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The effects of membrane structural perturbation induced by a number of semispherical molecules will be investigated. These investigations will concentrate on physiological processes which have a coincident detectable effect on the motion of spin labels. The interrelationship between membrane physical state and cytoplasmic viscosity will be investigated through the technique of using nickel as a paramagnetic line-broadening agent to subtract ESR signals outside membrane-bounded zones. The use and synthesis of N-15 spin labels will be further developed and the general treatment of electron spin exchange and magnetic dipole interactions continue to be developed for the purpose of making nickel more useful and better understood as a line-broadening agent.
APPROACH: Outline of proposed research: (1) synthesis of amphiphilic spin labels; (2) toxicity of these labels to cells; (3) localization of spin label in cell or other preparation; (4) rate spin label crosses membrane preparation; and (5) sensitivity to detection of cell events, especially cell surface events.
RESULTS: In most reports dealing with spin labeled cells or membranes, the spin label probes all membranes in the system. The approach used here is to construct suitable spin labels so that only a part of the cell is labeled. Such spin labels should also be well characterized. The present approach represents an extension and refinement of the spin label techniques and deals with the development of a new class of spin labels that probe only the surfaces of membrane-bounded enclosures.
KEYWORDS: SPIN;MOLECULES;LABELLING;MEMBRANES;NICKEL;ELECTRON SPIN RESONANCE;MAGNETIC DIPOLES;NITROGEN 15;SYNTHESIS;TOXICITY

<087690>
TITLE: Investigation of Molecular Mechanisms in Photodynamic Action and Radiobiology with Nanosecond Flash Photolysis
PROJECT NUMBER: 006590
PRINCIPAL INVESTIGATOR: Grossweiner, L.I.
ADDRESS: Department of Physics, Illinois Institute of Technology, IIT Center, Chicago, IL 60616
AFFILIATION: Illinois Inst. of Tech., Chicago (USA). Dept. of Physics
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
TYPE OF FUNDING: Contract No.-E(11-1)-2217
77 FUNDING: Energy Research and Development Administration FY77:$49,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Laser flash photolysis will be carried out on small peptides and enzymes, emphasizing the significance of photoelectron generation. The decay of photoelectrons will be investigated in detail,

based on current work indicative of non-homogeneous "spur" reactions. Our recent extension of diffusion theory to small reactive species generated external to biological targets will be applied to ionizing and photodynamic irradiations of cell suspensions. The latter will emphasize singlet oxygen damage to S. cerevisiae sensitized by dye and psoralen sensitizers. A new spin label technique will be explored in which the attack of singlet oxygen on a nitroxide precursor generates the probe within the membrane. Flash photolysis and fluorescence studies of psoralen sensitizers will be continued, directed towards identifying the initial photochemical stages of biological sensitization.
KEYWORDS: MOLECULES;MEMBRANES;ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;RADIATION INJURIES;IONIZING RADIATIONS;PHOTOCHEMISTRY;ENZYMES;DNA;BIOLOGICAL REPAIR;PHOTOSENSITIVITY;ELECTRON SPIN RESONANCE;PROTEINS;NUCLEIC ACIDS;PHOTOLYSIS;LASER RADIATION;YEASTS;CARCINOGENS

<087693>
TITLE: Energetic-Neutron Spectrometry
PROJECT NUMBER: 006629
PRINCIPAL INVESTIGATOR: Madey, R.
ADDRESS: Kent State University, Kent, OH 44242
AFFILIATION: Kent State Univ., Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
TELEPHONE: C(301)353-3213
TYPE OF FUNDING: Contract No.-E(11-1)-2231
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this research include the development, test, and evaluation of a spectrometer for measuring neutrons in the energy region from a few MeV to several hundred MeV, and the demonstration and utilization of this instrument in applications pertinent to ERDA programs. In the forthcoming year, we propose (1) to develop the capability for utilizing the spectrometer as an on-line neutron beam monitor, and (2) to demonstrate the feasibility of utilizing the spectrometer to measure neutron spectra at particle accelerators with low duty cycles such as the Los Alamos Meson Physics Facility (LAMPF). To demonstrate this feasibility, we propose to measure the neutron spectrum from the main beam stop at LAMPF. As time and resources permit, we plan to pursue additional measurements relating to ERDA programs.
KEYWORDS: NEUTRON SPECTROMETERS;DESIGN;PERFORMANCE;NEUTRON SPECTRA

<087694>
TITLE: Response of a Forest Ecotone to Ionizing Radiation
PROJECT NUMBER: 006639
PRINCIPAL INVESTIGATOR: Murphy, P.G.
ADDRESS: Department of Botany and Plant Pathology, Michigan State University, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-2283
77 FUNDING: Energy Research and Development Administration FY77:$2,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Gamma radiation;RADIATION/Effects on plants (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Site specific Rhinelander, WI
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To determine the effects of ionizing radiation on the tree flora of two forest types and their interviewing ecotone (i.e., zone of transition). (2) To elucidate patterns of succession (recovery) in the tree flora. (3) To determine the relation of foliage production and tree basal area and to relate foliage production to degree of forest disturbance.
APPROACH: A 10,000 Ci source of Cs-137 was used to irradiate the forest near Rhinelander, Wisconsin (during the growing season). Fine belt transects concentric to the radiation source at 10, 20, 30, 40, and 50 meters have been used annually to record changes in the tree flora. Seedlings, saplings, and mature trees are recorded by species. Annual collections of leaf litter are made along each transect immediately following leaf fall in October.
RESULTS: The short term effects of radiation have been decribed. Most trees were killed to 20 meters from the source. We are now studying the pattern of tree seedling reinversion of the irradiated (destroyed) forest area. We are finding that competition from weed species is slowing the rate of re-establishment by trees.
PROJECT MILESTONES: (1) Irradiation occurred during the summer of 1972. (2) Two papers have been published concerning preirradiation conditions with regard to trees, saplings, and seedlings, and also leaf litter production. (3) A third paper on short term radiation effects, and recovery patterns, is presently in press.
KEYWORDS: ECOTONE;GAMMA RADIATION;IRRADIATION;FORESTS;BIOLOGICAL RADIATION EFFECTS;TREES;BIOLOGICAL RECOVERY;REVEGETATION

<087695>
TITLE: Energy Budgets of Animals, Behavioral and Ecological Implications
PROJECT NUMBER: 006640
PRINCIPAL INVESTIGATOR: Porter, W.P.
ADDRESS: Department of Zoology, 1117 West Johnson Street, Madison, WI 53706
AFFILIATION: Wisconsin Univ., Madison (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John
TELEPHONE: F233-4905
TYPE OF FUNDING: Contract No.-E(11-1)-2270

77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: HEAT, THERMAL (70%);SPECIFIED OTHER POLLUTANTS/Habitat destruction (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Develop and test in the field mechanistic predictive models for population dynamics of small reptiles and mammals as a function of the physical environment and their physical, physiological and behavioral properties.
APPROACH: Mass and energy (thermal and chemical) balances on Dipsosaurus dorsalis, Microtus canicaudus and Peromyscus maniculatus to be done in wind tunnels, Biotron rooms, laboratory rooms and in the field to assess capability for successful reproduction and growth under varying physical environments and available food and water.
RESULTS: General predictive models for population response to habitat disturbance via thermal or mining or construction. Also models should be useful in assessing level of effort required to reconstitute a habitat after disturbance to assure desired level of populations desired.
PROJECT MILESTONES: First completion of 2/sup 16-11/ fractional factorial design in Biotron.
KEYWORDS: POPULATION DYNAMICS;MATHEMATICAL MODELS;REPTILES;MAMMALS;BEHAVIOR;FORECASTING;ENERGY BALANCE;WIND TUNNELS;REPRODUCTION;GROWTH;BIOMASS;CLIMATES;METABOLISM;METEOROLOGY

<087696>
TITLE: Biological/Environmental Relationships in Desert Ecosystems of the Nevada Test Site
PROJECT NUMBER: 006656
PRINCIPAL INVESTIGATOR: Beatley, J.C.
ADDRESS: Department of Biological Sciences, University of Cincinnati, Cincinnati, OH 45221
AFFILIATION: Cincinnati Univ., Ohio (USA). Dept. of Biological Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(11-1)-2307
77 FUNDING: Energy Research and Development Administration FY77:$14,000
TECHNOLOGY: NUCLEAR/Fission (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Nevada Test Site;HYDROGRAPHIC AREAS/Other hydrographic areas Death Valley
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Manuscript preparation from data collected 1962-75 on 68 selected sites at the Nevada Test Site. Overall objectives are an elaboration of models defining interrelationships between the biological and environmental variables of desert ecosystems, and an assessment of the effects of nuclear testing (and related activities) on biological components of the system.
APPROACH: Statistical and other analyses of the data, which include around 40 basic biological and physical environmental parameters, times 300 species (plants and rodents). Data were for up to 10 years on each of the 68 study sites.
RESULTS: Manuscripts, as rapidly as possible.
KEYWORDS: NUCLEAR EXPLOSIONS;TESTING;NEVADA TEST SITE;DESERTS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL RADIATION EFFECTS;PLANTS;RODENTS;ENVIRONMENTAL EFFECTS;ECOLOGY;CLIMATES;SOILS

<087697>
TITLE: Avian Radioecology on a Nuclear Power Station Site
PROJECT NUMBER: 006665
PRINCIPAL INVESTIGATOR: Levy, C.K.
ADDRESS: Dept. of Biology, Boston University, Boston, MA 02215
AFFILIATION: Boston Univ., Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: F233-4905
TYPE OF FUNDING: Contract No.-E(11-1)-2308
77 FUNDING: Energy Research and Development Administration FY77:$6,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Estuarine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: An attempt to trace the movements of radionuclides through the ecosystem of southern New England coastal plain by utilizing whole body counting of small recapturable wild birds.
APPROACH: Small wild birds are trapped or netted, banded with USF and WS bands, measured for gamma-emitting radionuclides in a NaI(Tl) gamma spectrometer and released unharmed. Subsequent recapture (up to 80%) provides life-history data on large numbers of individuals. Laboratory studies of doses of radionuclides administered to captive wild birds aid in interpretation of field data.
RESULTS: Discovery of major temporal and geographic variations in Cs-137 levels (fallout induced) in many avian species over short time and distance scales.
PROJECT MILESTONES: 1978 completion of study, final report.
KEYWORDS: BIRDS;RADIOECOLOGY;COASTAL REGIONS;RADIONUCLIDE MIGRATION;CESIUM 137;BIOLOGICAL RADIATION EFFECTS;GAMMA RADIATION;METABOLISM;TERRESTRIAL ECOSYSTEMS

<087698>
TITLE: Membrane-Membrane Interactions in a Lipid-Containing Bacteriophage System
PROJECT NUMBER: 006669
PRINCIPAL INVESTIGATOR: Snipes, W.C.
ADDRESS: 618 Life Science Lab., Penn. State University, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(11-1)-2311
77 FUNDING: Energy Research and Development Administration FY77:$24,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Virus diseases (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (65%);DEVELOPMENT/Laboratory scale (35%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Development of agents to control viral diseases.
APPROACH: Use of hydrophobic, amphipathic molecules to selectively perturb virus membranes.
RESULTS: Product: antiviral drug.
PROJECT MILESTONES: Antiviral activity of BHT.
KEYWORDS: BACTERIOPHAGES;VIRUSES;DISEASES;CONTROL;MEMBRANES;DRUGS;BIOLOGICAL EFFECTS;LIPIDS;BIOCHEMICAL REACTION KINETICS;MEDICINE

<087699>
TITLE: Basic Aspects of Radiation Action on Microorganisms
PROJECT NUMBER: 006672
PRINCIPAL INVESTIGATOR: Pollard, E.C.
ADDRESS: Life Sciences University Park, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles
TYPE OF FUNDING: Contract No.-E(11-1)-2362
77 FUNDING: Energy Research and Development Administration FY77:$19,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The understanding of the action of ionizing radiation and ultraviolet light on living cells.
APPROACH: The study of the radiation response of microorganisms, particularly the development of repair and recovery systems in response to radiation.
RESULTS: (1) Evidence that mutagenesis is NOT linear with dose, but requires first the induction by radiation of an induced repair system which is the major producer of mutations. (2) A link between these findings and radiation carcinogenesis. (3) A complete theoretical understanding of radiation survival and mutagenic effects on microorganisms.
PROJECT MILESTONES: (1) 1973 Induced inhibition of postradiation DNA degradation. (Pollard and Randall, Rad. Res.) (2) 1975 Induced radioresistance (Pollard and Achey, Biophys. Jour.) (3) 1976 Radiation induced mutagenesis. (Pollard, Person, Rader, in press).
KEYWORDS: MICROORGANISMS;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL RECOVERY;BIOLOGICAL REPAIR;ULTRAVIOLET RADIATION;IONIZING RADIATIONS;DOSE-RESPONSE RELATIONSHIPS;MUTAGENESIS;CARCINOGENESIS;BACTERIA;DNA;SAFETY;X RADIATION

<087700>
TITLE: Effects of Mesoscale Weather Disturbances on Contamination Concentrations
PROJECT NUMBER: 006675
PRINCIPAL INVESTIGATOR: Kreitzberg, C.W.
ADDRESS: 32nd and Chestnut Street, Philadelphia, PA 19104
AFFILIATION: Drexel Univ., Philadelphia, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Moses, Harry
TELEPHONE: F233-3763
TYPE OF FUNDING: Contract No.-E(11-1)-2360
77 FUNDING: Energy Research and Development Administration FY77:$64,000
TECHNOLOGY: FOSSIL FUEL/General (80%);GENERAL SCIENCE (20%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (60%);PARTICULATES (20%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective is to determine the effect of mesoscale weather disturbances and typical East Coast mesoscale circulations on contamination concentrations.
APPROACH: The specific tasks include continued development of an efficient three dimensional primitive equation model to include detailed boundary layer calculations over irregular terrain with dynamic assimilation of the latest most detailed data.
RESULTS: The model could be used in real time with real data or for long range planning purposes with typical climatic patterns.
PROJECT MILESTONES: The goals of the project are to upgrade and verify the accuracy of the model so that it can be used for MAP3S field experiment simulation studies and a regional scale accidental release advisory capability.
KEYWORDS: REGIONAL ANALYSIS;CLIMATES;WEATHER;FORECASTING;ATMOSPHERIC PRECIPITATIONS;AIR POLLUTION;MATHEMATICAL MODELS;CLIMATES;COMPUTER CODES;ENVIRONMENTAL TRANSPORT;METEOROLOGY;WEATHER

<087701>
TITLE: ESR Study of Radiation Damage in Pyrimidines
PROJECT NUMBER: 006677
PRINCIPAL INVESTIGATOR: Benson, B.W.
ADDRESS: Physics Building 16, Lehigh University, Bethlehem, PA 18015
AFFILIATION: Lehigh Univ., Bethlehem, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duda, G.D.
TELEPHONE: F233-5037
TYPE OF FUNDING: Contract No.-E(11-1)-2367
77 FUNDING: Energy Research and Development Administration FY77:$12,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We expect to determine the basic mechanisms for ionizing radiation damage to biomolecules using substituted pyrimidines as a model system analogous to naturally occurring nucleic acids in genetic material.
APPROACH: The structures of free radicals produced by ionizing radiation damage are determined by Electron Spin Resonance Spectroscopy. A comparison is made of the types of alteration arising from similar molecular structures in a variety of crystalline environments.
RESULTS: The synthesis of our data with that of others is expected to lead to general mechanisms of biomolecular radiation damage that will apply to a variety of molecular structures.
PROJECT MILESTONES: Results are regularly published in the scientific literature.
KEYWORDS: PYRIMIDINES;CHEMICAL RADIATION EFFECTS;RADIATION INJURIES;MOLECULES;ELECTRON SPIN RESONANCE;MEASURING METHODS;STRUCTURAL CHEMICAL ANALYSIS;DNA;RNA;MOLECULAR STRUCTURE

<087705>
TITLE: Iron Metabolism in the X-Irradiated Animal
PROJECT NUMBER: 006695
PRINCIPAL INVESTIGATOR: Mazur, A.
AFFILIATION: City Univ. of New York, N.Y. (USA). Research Foundation
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<087708>
TITLE: Cellular Proliferation and Regeneration Following Tissue Damage
PROJECT NUMBER: 006706
PRINCIPAL INVESTIGATOR: Harding, C.V.
ADDRESS: Kresge Eye Institute of Wayne State University, 540 E. Canfield, Detroit, MI 48201
AFFILIATION: Wayne State Univ., Detroit, Mich. (USA). Kresge Eye Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(11-1)-2401
77 FUNDING: Energy Research and Development Administration FY77:$38,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Dyes and other toxic chemicals (20%);HEAT, THERMAL (10%);SPECIFIED OTHER POLLUTANTS/Toxic photo-breakdown products of amino acids (70%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Marine;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To gain a better understanding of the mechanisms of wound healing in the tissues of the eye. The response to physical and chemical injuries are under study. The means by which eye tissues are able to restore themselves (regenerate) following damage are being studied in vivo, and in isolated ocular tissues maintained in organ culture. To establish a basis upon which means of amelioration can be developed.
APPROACH: The eye is exposed to physical or chemical forms of injury. Changes in cellular ultrastructure, and cell-to-cell interrelationships, are studied, utilizing transmission and scanning electron microscopy. Macromolecular synthesis and cellular proliferation are analyzed utilizing autoradiographic and cytochemical techniques.
RESULTS: A better understanding of some of the basic mechanisms of wound healing in tissues of the eye, and the way in which various physical and chemical factors of the environment can cause tissue injury, and the possible means of preventing injury or promoting recovery.
KEYWORDS: EYES;WOUNDS;INJURIES;TISSUES;BIOLOGICAL REGENERATION;IN VIVO;IN VITRO;CELL PROLIFERATION;BIOCHEMICAL REACTION KINETICS;MOLECULAR BIOLOGY;BLOOD;RNA;DNA;ANIMAL CELLS

<087709>
TITLE: Protein Synthesis and Its Regulation: A Background Study Related to the Biological Effects of Radiation
PROJECT NUMBER: 006708
PRINCIPAL INVESTIGATOR: Zamecnik, P.C.
ADDRESS: Huntington Laboratories, Massachusetts General Hospital, 32 Fruit Street, Boston, MA 02114
AFFILIATION: Massachusetts General Hospital, Boston (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)2403
77 FUNDING: Energy Research and Development Administration FY77:$91,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The proposed program is an effort to uncover regulators of protein synthesis in living

systems. It is hoped that a deeper understanding of the mechanisms by which such regulation is accomplished in normal cells will lead to a better perception of the aberrations which lead to the deficient protein synthesis associated with radiation damage, and the excessive protein synthesis of neoplasia.
PROACH: Our current studies consist of several somewhat related approaches: (1) A search for the effect of Ap_4A and unidentified new nucleotides on growth regulation; (2) A search for new regulators of translation in a cell-free system; (3) A search for regulation of protein synthesis in E. coli, with mutant aminoacyl tRNA synthetases; and (4) Development of a chemical sequencing technique that will facilitate sequencing of mRNAs, particularly oncogenic viral messenger RNAs.
RESULTS: This study is an interwoven effort of members of these laboratories to study details of the mechanism of protein synthesis in normal living systems. Such investigations are hopefully basic to an understanding of the aberrations of protein synthesis which accompany radiation damage and carcinogenesis.
PROJECT MILESTONES: This study is an interwoven effort of members of these laboratories to study details of the mechanism of protein synthesis in normal living systems. Such investigations are hopefully basic to an understanding of the aberrations of protein synthesis which accompany radiation damage and carcinogenesis.
KEYWORDS: PROTEINS;BIOSYNTHESIS;BIOCHEMICAL REACTION KINETICS;ESCHERICHIA COLI;NEOPLASMS;RNA;VIRUSES;IN VITRO;ENZYMES

<087710>
TITLE: Studies of Membrane Structure by Freeze-Etching
PROJECT NUMBER: 006769
PRINCIPAL INVESTIGATOR: Branton, D.
ADDRESS: Rm. 204 A, 16 Divinity Ave., Cambridge, MA 02138
AFFILIATION: Harvard Univ., Cambridge, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dudo, G.
TELEPHONE: F233-4177
TYPE OF FUNDING: Contract No.-AT 11-1 2423;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$47,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (20%)
POLLUTANTS: RADIATION (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To provide knowledge relating the architecture of cellular membranes to their role in modulating cell behavior and in regulating the transport of molecules into and out of cells.
APPROACH: The structure and organization of biological membranes will be studied using a variety of physical and biochemical techniques together with electron microscopy and freeze-etching. The human red blood cell will serve as a model system in which to develop new covalent labelling techniques that will identify specific transmembrane proteins in freeze-fractured replicas with precision sufficient to specify how these proteins are distributed and associated with each other in the plane of the membrane and how such associations are altered in response to environmental and physiological perturbants.
RESULTS: Evidence has been obtained that freeze-etching fractures biological membranes in a hydrophobic region which splits the membrane into halves. Morphological, biochemical and biophysical approaches have been combined to probe structure and heterogeneity within human erythrocyte membranes. Labelling methods to assess a novel combination of freeze fracture and autoradiographic techniques have been perfected.
KEYWORDS: CELL MEMBRANES;MOLECULAR BIOLOGY;ERYTHROCYTES;ION EXCHANGE;PERMEABILITY;PHYSIOLOGY;CYTOLOGY;SAMPLE PREPARATION;FREEZING;AUTORADIOGRAPHY;IN VITRO;IN VIVO;NEOPLASMS;ANIMAL CELLS;BIOCHEMISTRY

<087711>
TITLE: Mechanisms for Radiation Damage in DNA
PROJECT NUMBER: 006776
PRINCIPAL INVESTIGATOR: Sevilla, M.D.
ADDRESS: Dept. of Chemistry, Oakland University, Rochester, MI 48063
AFFILIATION: Oakland Univ., Rochester, Mich. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental and Biomedical Research
MONITOR: Duda, George D.
TELEPHONE: F233-4177
TYPE OF FUNDING: Contract No.-E(11-1)-2364
77 FUNDING: Energy Research and Development Administration FY77:$16,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION/Radiation damage to DNA (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECT
PROJECT DESCRIPTION: This research project proposes mechanisms for radiation damage in DNA by radiation produced radicals and details a series of experiments utilizing electron spin resonance (ESR) spectroscopy to test the proposed mechanisms.
APPROACH: Studies are along the following lines: (1) The production and reaction of the positive and negative ions of DNA components and DNA. (2) Spin Trapping Experiments on DNA. (3) gamma-irradiation studies of frozen concentrated aqueous solutions of DNA components and DNA.
RESULTS: We expect to elucidate various mechanisms for radiation damage in DNA, specifically the role of ion radicals.
PROJECT MILESTONES: Thus far we have found that: (1) Thymine anion protonated at position 6. (2) Thymine cation deprotonates at the methyl group. (3) Electron transfer in DNA is such as to localize the electron on thymine. (4) The cation in DNA is localized on guanine.
KEYWORDS: DNA;CHEMICAL RADIATION EFFECTS;GAMMA SOURCES;AQUEOUS SOLUTIONS;FREEZING;TESTING;ELECTRON SPIN RESONANCE;RADIATION INJURIES;RADICALS;RADIOINDUCTION;BIOCHEMICAL REACTION KINETICS;IN VITRO;MOLECULAR BIOLOGY;ULTRAVIOLET RADIATION

<087712>
TITLE: Design and Construction of a Detection System for the Determination of Lead in Blood using X-Ray Fluorescence Analysis
PROJECT NUMBER: 006779
PRINCIPAL INVESTIGATOR: Kneip, T.J.;Laurer, G.R.
ADDRESS: New York University Medical Center, Institute of Environmental Medicine, 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: C(301)353-3213
TYPE OF FUNDING: Contract No.-E(11-1)-3040
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/Trace metals in general in air;METALS/Water;METALS/And biological tissues (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Develop portable system for rapid sample preparation and analysis of lead in low-volume blood samples.
APPROACH: Develop method to rapidly produce toroidal-shaped dried blood sample from less than 0.5 cc whole blood. Develop small 4 mm diameter radioisotope x-ray excitation source to use with toroidal blood sample. Develop XRF system, including detector and fluorescent x-ray energy spectrometer, to give optimum sample-source-detector geometry and counting statistics to permit the analysis of down to 0.2 ppM of lead in blood within a measurement time of 10 minutes.
RESULTS: The objectives of the R and D approach have been achieved. The system has been shown to have potential application to the rapid multielement analysis of trace pollutants in biological and environmental samples in addition to blood. The system was effectively applied to the NYUMC problem of measuring zinc in baboon blood.
PROJECT MILESTONES: The lead-in-blood project has been completed. A new proposal is expected related to multielement analysis in biological and environmental samples using basic techniques developed under this contract.
KEYWORDS: XRF;RADIOISOTOPE EXCITATION;ENVIRONMENTAL SAMPLE ANALYSIS;BIOLOGICAL SAMPLE ANALYSIS;RAPID SCREENING;LEAD;X-RAY FLUORESCENCE ANALYSIS;BLOOD;CHEMICAL ANALYSIS;METALS

<087713>
TITLE: Sorption of Pollutant Gases by Soils
PROJECT NUMBER: 006789
PRINCIPAL INVESTIGATOR: Bremner, J.M.
ADDRESS: Department of Agronomy, Iowa State University, Ames, IA 50011
AFFILIATION: Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Agronomy
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-E(11-1)-2530
77 FUNDING: Energy Research and Development Administration FY77:$49,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide;NOXIOUS GAS/Hydrogen sulfide;NOXIOUS GAS/Nitrogen oxides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To study the ability of soils to sorb important air pollutants and to assess the potential of soil for purification of polluted air. (2) To determine the factors affecting sorption of pollutant gases by soils and to study the mechanisms of pollutant gas sorption by soils.
APPROACH: The soils used will be selected to obtain a wide range in properties, including pH, texture, organic-matter content, and cation-exchange capacity. The pollutant gases will include major air pollutants generated by combustion of fossil fuels or by microbial transformations of sulfur and nitrogen compounds in soils and natural waters (SO/sub 2/, H/sub 2/S, NO, NO/sub 2/, etc.). Sorption of pollutant gases by soils will be studied by performing appropriate soil and gas analyses before and after exposure of air-dry and moist soils to air containing different levels of these gases. Static and flow systems will be used, and gas analyses will be performed by gas chromatographic techniques.
RESULTS: Results will permit assessment of the ability of soils to sorb pollutant gases and indicate (a) soil properties affecting the rate and extent of sorption of different gases and (b) the mechanisms of sorption of nitrogen and sulfur gases by soils.
PROJECT MILESTONES: Interim reports distributed. The importance of soil as a sink for gaseous atmospheric pollutants and the need for reassessment of the role of soils in the atmospheric nitrogen and sulfur cycles will be demonstrated.
KEYWORDS: CHEMICAL EFFLUENTS;AIR POLLUTION;GASEOUS WASTES;SULFUR COMPOUNDS;NITROGEN COMPOUNDS;SOILS;AIR CLEANING;ABSORPTION;EARTH ATMOSPHERE;ENVIRONMENTAL TRANSPORT

<087714>
TITLE: Study of the Significance of Frost Action and Surface Soil Characteristics to Wind Erosion at Rocky Flats, Colorado
PROJECT NUMBER: 006795
PRINCIPAL INVESTIGATOR: Caine, T.N.
ADDRESS: Inst. Arctic and Alpine Res., University of Colorado, Boulder, CO 80309
AFFILIATION: Colorado Univ., Boulder (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osburn, William S.
TELEPHONE: F233-4903
TYPE OF FUNDING: Contract No.-E(11-1)-2517
77 FUNDING: Energy Research and Development Administration FY77:$38,000

TECHNOLOGY: NUCLEAR/Fission (50%);GENERAL SCIENCE (50%)
POLLUTANTS: PARTICULATES (67%);RADIATION/With contaminated soil (33%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To evaluate the influence of soil freezing and thawing on soil surface characteristics which are influential on wind erosion and dust transport.
APPROACH: (1) Field monitoring of frost effects on soil surfaces at Rocky Flats. (2) Field mapping of soil units for frost susceptibility. (3) Laboratory experimentation on soils from Rocky Flats to evaluate susceptibility to different forms of ground ice.
RESULTS: (1) An evaluation (map) of the susceptibility of soils on Rocky Flats to frost induced changes in surface structure which might lead to later wind erosion of surface material. (2) An evaluation of frequency with which such events occur naturally at Rocky Flats. (3) An estimate of the amounts of surface material capable of being eroded from the soil surface by such influences.
PROJECT MILESTONES: (1) Computer and Laboratory simulation of soil freezing events and their influence on soil surface characteristics. (2) Occurrence of an ''ideal cycle'' under natural conditions. This would involve sequentially, snowfall, drifting, diurnal freeze-thaw and then relatively high wind speeds. Very unlikely. (3) Statistical fitting of results from test site to longer term records from Rocky Flats Plant. (4) Production of a soil-frost map for Rocky Flats area. (5) Production of a snow-drift map for same area.
KEYWORDS: ROCKY FLATS PLANT;CLIMATES;SEASONS;SOILS;FREEZING;THAWING;PARTICLES;DUSTS;DISPERSIONS;EROSION;WIND;VELOCITY;TURBULENCE METEOROLOGY;EARTH CRUST;AEROSOLS;ICE

<0087715>
TITLE: Thermoregulation and Temperature Relations of Alligators and Other Large Ectotherms Inhabiting Thermally Stressed Habitats
PROJECT NUMBER: 006796
PRINCIPAL INVESTIGATOR: Spotila, J.R.
ADDRESS: Department of Biology, State University College, Buffalo, NY 14222
AFFILIATION: State Univ. of New York, Buffalo (USA). Dept. of Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-E(11-1)-2502
77 FUNDING: Energy Research and Development Administration FY77:$29,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Arsenic (20%);HEAT, THERMAL/Heated water (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Great Lakes;HYDROGRAPHIC AREAS/Other hydrographic areas Small lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine quantitatively some of the mechanisms by which fish, alligators, and turtles adjust to thermal stress in their natural environment.
APPROACH: To construct mathematical models to describe the thermoregulation of these animals in their aquatic habitats and to test these predictive models by laboratory experiments and field studies. Climate spaces will be determined for these organisms and then tested. Field studies will be conducted at the Savannah River Ecology Laboratory.
RESULTS: Upon completion of this study we will be better able to predict the response of these animals to thermal effluents from steam and nuclear power plants. In addition, a model will be developed for the study of the effects of environmental alterations on the biology of affected organisms. If this procedure proves effective it can reduce the difficulty of dealing with complex environmental effects of energy activities in the future.
PROJECT MILESTONES: (1) Completion of steady state climate space for alligator July 74. (2) Laboratory testing of same July 76. (3) Completion of steady state model of fish climate space July 76. (4) Completion of steady state climate space for turtle July 76. (5) Testing steady state model of fish July 77. (6) Testing steady state model for turtle December 77. (7) First manuscript on field studies of turtles at the Savannah River Ecology Laboratory July 77. (8) Testing transient model for alligators June 78. (9) Develop time dependent model for turtles June 78. (10) Develop time dependent model for fish June 78.
KEYWORDS: REPTILES;BIOLOGICAL STRESS;ALLIGATORS;TURTLES;FISHES;ENVIRONMENT;MATHEMATICAL MODELS;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;NUCLEAR POWER PLANTS;TEMPERATURE EFFECTS;CONTROL

<0087716>
TITLE: Effect of Mountain-Valley Terrains on Dispersion of Pollutants
PROJECT NUMBER: 006811
PRINCIPAL INVESTIGATOR: Kao, S.K.
ADDRESS: Department of Meteorology, University of Utah, Salt Lake City, UT 84112
AFFILIATION: Utah Univ., Salt Lake City (USA). Dept. of Meteorology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-4488
TYPE OF FUNDING: Contract No.-E(11-1)-2455
77 FUNDING: Energy Research and Development Administration FY77:$47,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
POLLUTANTS: NOXIOUS GAS (30%);PARTICULATES (25%);VISUAL AESTHETICS (15%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This research will investigate the meteorological and topographical factors for the dispersion and transport of pollutants in valleys and terrains of the western United States. Field

experiments on turbulent dispersion of pollutants in the planetary boundary layer in valleys will be conducted, and models for turbulent diffusion will be constructed. This research will provide information which is essential in the establishment of optimum site selections for oil shale plants in mountain-valley terrains of the western United States.
APPROACH: (1) Field experiments on diffusion of pollutants in mountain-valley terrains will be conducted. (2) Models for turbulent diffusion in mountain-valley terrain will be constructed for this investigation. (3) Analyses of diffusion characteristics in the planetary boundary layer will be made. (4) Analyses of the mean and turbulent motions in the planetary boundary layer in mountain-valley terrains will be made.
RESULTS: Airborne experiments with SO2 in mountain-valley terrains indicate that the effect of mountains is to increase the turbulent intensity, therefore, EDDY diffusivity. Turbulent diffusivity in the planetary boundary layer was found to be largest near mountains and decreased toward the center of the valley. The along-wind component of the turbulent diffusivity in the PBL was about six times the lateral component.
PROJECT MILESTONES: Additional full experiments will be conducted in the Salt Lake Valley.
KEYWORDS: CHEMICAL EFFLUENTS;AIR POLLUTION;DIFFUSION;SURFACE AIR;BOUNDARY LAYERS;METEOROLOGY;TOPOGRAPHY;MATHEMATICAL MODELS;WIND;TURBULENCE;MOUNTAINS;REGIONAL ANALYSIS;PARTICLES;ENVIRONMENT;POLLUTION;ENVIRONMENTAL TRANSPORT;HYDROCARBONS;EARTH ATMOSPHERE;SULFUR DIOXIDE

<087717>
TITLE: Studies of the Environmental Impact of Evaporative Cooling Tower Plumes
PROJECT NUMBER: 6815
PRINCIPAL INVESTIGATOR: Thomson, D.W.
ADDRESS: Department of Meteorology, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA). Dept. of Meteorology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Moses, Harry
TELEPHONE: C(301)353-5572;F233-5572
TYPE OF FUNDING: Contract No.-EY-76-S-02-2463
77 FUNDING: Energy Research and Development Administration FY77:$88,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (25%);HEAT, THERMAL (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objectives of this research are to characterize the environmental effects of evaporative cooling tower plumes. This involves obtaining a variety of field data around the Keystone-Connemaugh power plant in SW Pennsylvania such as: (a) plant operating conditions as an input to a plant energy balance model to specify the tower as a source of heat and moisture for plume model validation studies; (b) temperature and droplet concentrations inside towers to relate environmental effects to tower characteristics; (., aircraft turbulence measurements of temperature, water vapor and vertical velocity inside plumes for tests of plume model predictions and a better understanding of plume behavior; (d) surface based Doppler Sodar measurements; (e) drift-drop size distribution measurements in plumes; (f) measurements of aerosol size distributions, particle identification and SO2 in merging stack and cooling tower plumes to define the sulfur balance in this region and predict deposition of sulate; (g) measurement of ambient conditions from the surface to 10,000 feet altitude to provide background information for models.
APPROACH: (1) Measurements within cooling tower. (2) Ground based measurements such as with the Sodar equipment. (3) Use of instrumented aircraft for plume measuremnts of temperature, velocities, drift particle size, and SO2 concentration.
RESULTS: (a) Published plume data from over 20 flights and over 200 plume aircraft. (b) Measurements of plume drift drop size distributions as a function of distance from the tower and some model estimates of salt deposition. (c) Elucidation of two critical and competing mechanisms for the formation of sulfate in merging stack and cooling tower plumes. (d) The first continuous measurements of turbulence (temperature structure constant) in plumes from ground based sodar and demonstration of desirability of this approach. (e) The first latent heat flux measurements in a cooling tower plume. (f) Detailed plant energy balance model for Keystone Power Plant. (g) Sensitivity testing on one-dimensional plume modal.
PROJECT MILESTONES: (1) Publication of volume on measurements of plume and associated meteorological data for 20 flights. (2) Completion of measurements on cooling tower plume at Keystone-Connemaugh complex. (3) Complete and publish analysis of Keystone-Connemaugh plume measurements.
KEYWORDS: COOLING TOWERS;ENVIRONMENTAL IMPACTS;AIR POLLUTION;PLUMES;METEOROLOGY;ENVIRONMENTAL TRANSPORT;FOSSIL-FUEL POWER PLANTS;PENNSYLVANIA;MATHEMATICAL MODELS;EARTH ATMOSPHERE;THERMAL EFFLUENTS;PRECIPITATION SCAVENGING;AEROSOL MONITORING;SULFATES

<087718>
TITLE: Improved Substrates for Electron Microscopy
PROJECT NUMBER: 006814
PRINCIPAL INVESTIGATOR: Beer, M.
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$26,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<087719>
TITLE: Behavior of Technetium-99 in Soils and Plants
PROJECT NUMBER: 006829
PRINCIPAL INVESTIGATOR: Gast, R.G.
ADDRESS: Department of Soil Science, University of Minnesota, St. Paul, MN 55108
AFFILIATION: Minnesota Univ., St. Paul (USA). Dept. of Soil Science
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Franklin, Ralph E.
TELEPHCNE: F233-4904
TYPE OF FUNDING: Contract No.-E(11-1)-2447

77 FUNDING: Energy Research and Development Administration FY77:$12,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The overall objective of the project is to establish the extent that technetium-99 is retained by soils and taken up by plants. This involves the following two more specific objectives: (1) to determine the extent that Tc-99 is retained by specific soils and soil materials and the relative contributions of ion-exchange, precipitation/coprecipitation, chelation or other sorbing mechanisms on soil retention, and (2) to determine the extent that Tc-99 is taken up by plants from both true solution and soil systems and its distribution within the plant.
APPROACH: The extent that Tc-99 is adsorbed from solution by soils will be determined by equilibrating aqueous solutions containing Tc-99 in the form of TcO/sup -//sub 4/ with a given quantity of soil and determining the reduction of Tc-99 in solution as a function of time. Soils having a wide range of properties will be used and adsorption following various soil treatments or in different ionic environments will be studied. Plant uptake of Tc-99 under growth chamber and greenhouse conditions will be determined from both true solutions and soils to which Tc-99 has been added.
RESULTS: Results should show the extent that Tc-99 is taken up by plants and distributed in the photosynthetic tissue and seeds and ultimately into the food chain. Soil adsorption studies are designed to determine both the extent and mechanisms by which Tc-99 is retained by soils.
KEYWORDS: TECHNETIUM 99;ISOMERIC NUCLEI;DIFFUSION;TERRESTRIAL ECOSYSTEMS;SOILS;PLANTS;ROOT ABSORPTION;TISSUE DISTRIBUTION;ENVIRONMENT;FOOD CHAINS;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;RADIOECOLOGICAL CONCENTRATION

<087720>
TITLE: Iodine 129: A Study of its Transport in the Environment and Distribution in Biological Systems
PROJECT NUMBER: 006831
PRINCIPAL INVESTIGATOR: Manuel, O.K.
ADDRESS: Chemistry Department, University of Missouri, Rolla, MO 65401
AFFILIATION: Missouri Univ., Rolla (USA). Dept. of Chemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Div. of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(11-1)-2450
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Iodine-129 (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);FULL SCALE DEMONSTRATION (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The research objective is an understanding of the modes of transport and accumulation of the long-lived fission product, /sup 129/I, in different trophic levels and major segments of the local environment.
APPROACH: Iodine is chemically isolated from representative samples of precipitation, milk, surface waters, terrestrial and aquatic fauna and flora and surface soils. Neutron irradiation is used to produce /sup 130/I, /sup 128/I and /sup 126/I from /sup 129/I(n,gamma)/sup 130/I, /sup 127/I(n,gamma)/sup 128/I and /sup 127/I(n,2n)-/sup 126/I, respectively. Mass spectrometric measurements of the stable decay products, /sup 130/Xe, /sup 128/Xe and /sup 126/Xe, are used to determine the /sup 129/I and /sup 127/I in each sample.
RESULTS: The levels of I-129 in representative samples of local environment will be measured and the modes of transport and accumulation evaluated by measurements on the I-129/I-127 ratio in representative samples. Since this area is remote from environmental sources of I-129, the I-129/I-127 ratio will decrease as the fission product moves through the local environment.
PROJECT MILESTONES: The first results of analyses on I-129 in systematic samplings of milk, surface waters and precipitation will become available this summer and will begin a quantitative evaluation of seasonal variations in the local influx of I-129. This fall we will obtain the results of isotopic analyses on iodine in aerosol samples containing ''carrier'' iodine and thus determine if our aerosol collection program is capable of providing reliable measurements on I-129 in aerosols.
KEYWORDS: IODINE 129;DIFFUSION;ENVIRONMENT;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;SURFACE AIR;SAMPLING;MILK;SURFACE WATERS;ATMOSPHERIC PRECIPITATIONS;SEASONAL VARIATIONS;RADIOACTIVE AEROSOLS;PLANTS;ANIMALS;SOILS;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;FOOD CHAINS;HEALTH HAZARDS

<087721>
TITLE: Synthesis and Biological Incorporation of ICONS into Macromolecules for NMR Study
PROJECT NUMBER: 006840
PRINCIPAL INVESTIGATOR: Grant, D.M.
ADDRESS: University of Utah, Salt Lake City, UT 84112
AFFILIATION: Utah Univ., Salt Lake City (USA). Dept. of Chemistry
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Carter, N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-2451
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Develop methods for bioincorporation of stable isotopes into living systems. These studies will provide a safe method for studying labeled molecules in humans and other living animals.
APPROACH: (1) Develop organic synthesis methods for preparing precursors. (2) Incorporation using bacteria, antibody-antigen specificity, etc.

RESULTS: Use of C-13 NMR methods in a clinical monitoring of labeled molecules. As a nonradioactive isotope C-13 has the potential for tracing more dangerous pollutants in air and water media.
PROJECT MILESTONES: (1) Injection of labeled compounds in animals and dogs and isolation of metabolic products from bile, blood or urine samples. (2) Good methods for enriching RNA and other genetic materials
KEYWORDS: MEDICINE;TRACER TECHNIQUES;DIAGNOSTIC TECHNIQUES;METABOLIC DISEASES;PATIENTS;DIAGNOSIS;LABELLED COMPOUNDS;MOLECULAR BIOLOGY;CARBON 13;TISSUE DISTRIBUTION;BACTERIA;BIOCHEMISTRY;ENZYMES;RNA;MOLECULAR BIOLOGY;NITROGEN COMPOUNDS

<087725>
TITLE: Combined Toxicity Effects of Chlorine, Ammonia, and Temperature on Marine Plankton
PROJECT NUMBER: 006848
PRINCIPAL INVESTIGATOR: Ryther, J.H.
ADDRESS: Woods Hole Oceanographic Inst., Woods Hole, MA 02543
AFFILIATION: Woods Hole Oceanographic Institution, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-AT(11-1)-2532
77 FUNDING: Energy Research and Development Administration FY77:$117,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (33%);ORGANICS (33%);HEAT, THERMAL (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To investigate the combined and synergistic effects of chlorine, temperature, ammonia, and other organic wastes upon marine plankton organisms that may be subject to these multiple stresses within the cooling water system and the nearby receiving waters of power generating stations located in estuarine and coastal marine waters. The organisms to be studied will include phytoplankton, zooplankton and both invertebrate and fin fish larvae. The latter two categories will include indigenous species that are important for commercial or recreational values.
APPROACH: The studies will be experimental in nature, making use of the new Environmental Systems Laboratory of the Woods Hole Oceanographic Institution. Rapidly-growing species (i.e., phytoplankton) will be studied in continuous culture while the planktonic animals will be studied in continuous flow-through systems. Survival, growth, behavior and other biological criteria will be used to assay both immediate and long-term effects of the environmental stresses produced on the organisms by chlorine, temperature, and ammonia, singly and in combination.
RESULTS: Attempts will be made to develop standard bioassay techniques that may be generally applicable to the assessment of these and similar environmental stresses on marine plankton. Major emphasis will be placed on fitting the experimental data to simple mathematical models. The models may then have widespread use in the evaluation of toxicity stresses in natural waters.
KEYWORDS: CHLORINE;AMMONIA;TEMPERATURE EFFECTS;PLANKTON;COOLING SYSTEMS;COASTAL WATERS;ESTUARIES;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;POWER PLANTS;THERMAL EFFLUENTS;CHEMICAL EFFLUENTS;TOXICITY;POLLUTION;AQUATIC ECOSYSTEMS;FISHES;INVERTEBRATES

<087727>
TITLE: Plutonium and Cesium Radionuclides in the Hudson River Estuary
PROJECT NUMBER: 006855
PRINCIPAL INVESTIGATOR: Simpson, H.J.
ADDRESS: Lamont-Doherty Geological Observatory of Columbia University, Palisades, NY 10964
AFFILIATION: Columbia Univ., Palisades, N.Y. (USA). Lamont-Doherty Geological Observatory
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-AT(11-1)2529
77 FUNDING: Energy Research and Development Administration FY77:$65,000; Environmental Protection Agency
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: METALS/Trace metals (10%);PARTICULATES/Sediments;PARTICULATES/Suspended (10%);RADIATION/Plutonium;RADIATION/Cesium;RADIATION/Cobalt-60 (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Hudson River
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To collect sediment samples in the Hudson River Estuary and adjacent continental shelf, and to analyze them for Cs-137, Cs-134, Co-60 and Mn-54 by direct gamma counting and for Pu-239, Pu-240 and Pu-238 by alpha-spectrometry. Our purpose is to describe the behavior of fallout-derived plutonium in estuarine sediments as a function of a number of environmental parameters, and to exploit the reactor-release tag of Hudson sediments as an indicator of the sediment transport and accumulation patterns which control the distribution of plutonium in the sediments.
KEYWORDS: HUDSON RIVER;SEDIMENTS;COASTAL WATERS;ESTUARIES;CONTINENTAL SHELF;SAMPLING;CESIUM 137;CESIUM 134;COBALT 60;MANGANESE 54;PLUTONIUM 239;PLUTONIUM 240;PLUTONIUM 238;FALLOUT;AQUATIC ECOSYSTEMS;DIFFUSION;RADIATION MONITORING;RADIOACTIVITY;RADIONUCLIDE MIGRATION;ENVIRONMENTAL TRANSPORT

<087728>
TITLE: Reproductive Temperature Tolerance of a Desert Pupfish
PROJECT NUMBER: 006866
PRINCIPAL INVESTIGATOR: Gerking, S.D.
ADDRESS: Department of Zoology, Arizona State University, Tempe, AZ 85282
AFFILIATION: Arizona State Univ., Tempe (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324

TYPE OF FUNDING: Contract No.-E(11-1)-2498
77 FUNDING: Energy Research and Development Administration FY77:$39,000
TECHNOLOGY: GENERAL SCIENCE (100%)
NERGY CYCLE: ELECTRICITY GENERATION (100%)
)LLUTANTS: HEAT, THERMAL (100%)
HARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental;COASTS/Par West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To define the temperature range for successful reproduction and relate it to the critical thermal lateral limits. Both constant and fluctuating temperatures are involved.
APPROACH: Measure reproductive success as eggs laid /g/day at 10 temperatures ranging from 18 to 36C and 5 fluctuating temperatures ranging from 24-18C to 36-30C.
RESULTS: Final paper is prepared. Under constant temperatures the range for successful reproduction is 24-30C and from 24-18C to 28-34C.
PROJECT MILESTONES: (1) Oogenesis is the most sensitive stage of the life history to temperature. (2) The pupfish acclimates to the mean of extremes of fluctuating temperatures. (3) The reproductive temperature tolerance range is 1/7 that of the critical thermal maximum and minimum. (4) The narrow temperature range for successful reproduction may require a re-evaluation of thermal limits of the effluents power plants and other industries.
KEYWORDS: FISHES;REPRODUCTION;TEMPERATURE DEPENDENCE;DESERTS;MEDIUM TEMPERATURE;ENDANGERED SPECIES;POPULATION DYNAMICS;POWER PLANTS;THERMAL EFFLUENTS;BIOLOGICAL ADAPTATION

<087734>
TITLE: Cellular System for Screening and Analysis of Mutagenic, Carcinogenic and Teratogenic Agents. A Cellular Approach to Agricultural Genetics
PROJECT NUMBER: 006935
PRINCIPAL INVESTIGATOR: Carlson, P.S.
ADDRESS: Department of Crop and Soils, Michigan State University, East Lansing, MI 48824
AFFILIATION: Michigan State Univ., East Lansing (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-2528
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (75%);DEVELOPMENT/Laboratory scale (25%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is the aim of this project to develop and characterize a higher plant system to quantitatively and reliably detect mutagenic, carcinogenic and teratogenic agents. The system will utilize higher plant cells cultured in vitro. Many of the difficulties inherent in higher eukaryote assay systems can be circumvented by employing single cells as the assay material. Furthermore, the high resolution procedures developed in microbiological assay systems can be directly transferred for use with plant cell cultures.
APPROACH: This project is aimed at utilizing the techniques and methods of in vitro cell cultures obtained from higher plants in developing an effective and reliable screening system to detect, characterize and analyze mutagenic, carcinogenic and teratogenic agents. In vitro methods using higher plant cells circumvent many of the difficulties inherent in other higher eukaryote (e.g., mammalian) assay systems. Genetic and epigenetic events can be distinguished by regenerating whole plants from variants recovered in vitro. This system utilizes haploid single cells and high resolution screening systems as the basis for all of its manipulations. These factors permit the scoring of large test populations with the recovery of rare biological events. Furthermore, mutagenic, carcinogenic and teratogenic effects are all scored from one homogeneous cell population and under defined growth conditions.
RESULTS: It is imperative that an adequate battery of methods be developed for evaluating the mutagenic, carcinogenic and teratogenic properties of chemicals and other biologically active agents. These methods should utilize a range of biological materials and provide a rapid and quantitative assay of the biological activity of a range of agent. Although satisfactory screening methods are currently being developed with microbial and animal material, no methods are available or being developed with botanical materials. An adequate battery of methods for evaluating potentially harmful agents would certainly include plant materials primarily because plants offer a less expensive and less ambiguous system to evaluate mutagenic, carcinogenic and teratogenic effects than other higher eukaryote systems. It is the aim of this proposal to develop a higher plant assay which can be rapidly and routinely utilized to determine the biological effects of a range of chemical and physical agents.
KEYWORDS: GENETICS;AGRICULTURE;MUTAGENS;CARCINOGENS;PLANT CELLS;CELL CULTURES;BIOLOGICAL EFFECTS;COMPARATIVE EVALUATIONS;MUTAGENESIS;CARCINOGENESIS;TERATOGENESIS;IN VITRO

<087735>
TITLE: Interrelationship Between Certain Hydrographic Features Associated with Currents and Primary Production
PROJECT NUMBER: 6936
PRINCIPAL INVESTIGATOR: Yentseh, C.S.
ADDRESS: Boothbay Harbor, Maine
AFFILIATION: Bigelow Lab. for Ocean Sciences, Boothbay Harbor, Maine (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-E(11-1)-2538
77 FUNDING: Energy Research and Development Administration FY77:$22,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The broad aspects of this proposal overlap the areas of physical and biological

oceanography. The goals are to understand how the energies associated with meteorological and hydrographic events control the quantity of primary production. The research program involves experimental testing of planktonic organisms in hydrographic regimes developed largely from climatological change.
PROJECT MILESTONES: This project was terminated because of lack of progress.
KEYWORDS: OCEANOGRAPHY;METEOROLOGY;HYDROLOGY;PLANKTON;BASELINE ECOLOGY;CLIMATES;BIOMASS;REPRODUCTION

<087736>
TITLE: Immunological and Viral Aspects of Radiation-Induced Tumors
PROJECT NUMBER: 006940
PRINCIPAL INVESTIGATOR: Reif, A.E.
ADDRESS: Mallory Institute of Pathology Foundation, Boston City Hospital, Boston, MA 02118
AFFILIATION: Boston City Hospital, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-AT(11-1)-2539 Modification No. 2
77 FUNDING: Energy Research and Development Administration FY77:$37,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Bone-seeking radioisotopes and viruses (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Strontium-90 is one of the hazardous products of both peaceful and military use of nuclear energy. While high doses (1 mu c/gm) are highly carcinogenic in man, the human population comprises individuals with dissimilar genetics and susceptibility to cancer. The objective of this study is to test strontium-90 carcinogenesis at various doses in mice with different susceptibility to cancer and carrying different types of tumor viruses. Also, the therapy of osteogenic sarcoma by immunological means will be investigated.
APPROACH: Strontium-90 carcinogenesis will be studied at different doses in various strains of mice. Mice of a healthy strain will also receive immunosuppression by different means to determine if this will influence the final incidence of tumors by strontium-90. Especially whole-body irradiation will be studied in this connection. Immunotherapy trials will be run on tumors induced in inbred mouse strains by strontium-90 and by FBJ osteosarcoma virus. The relationship between the tumors induced by these two agents will be investigated.
RESULTS: We hope to obtain new data relevant for prevention and therapy of tumors induced by strontium-90 and other bone-seeking radioisotopes produced through use of nuclear energy.
KEYWORDS: MICE;CARCINOGENESIS;STRONTIUM 90;BIOLOGICAL RADIATION EFFECTS;INTERNAL IRRADIATION;DOSE-RESPONSE RELATIONSHIPS;RESPONSE MODIFYING FACTORS;IMMUNE REACTIONS;ONCOGENIC VIRUSES;IMMUNOSUPPRESSION;OSTEOSARCOMAS;THERAPY;BIOLOGICAL EFFECTS;CARCINOGENS;IMMUNOLOGY;NEOPLASMS;RADIOISOTOPES;TOXICITY

<087737>
TITLE: Effects of Sublethal Levels of Heat and Oil on the Behavior of Aquatic Animals
PROJECT NUMBER: 006967
PRINCIPAL INVESTIGATOR: Atema, J.
ADDRESS: Boston University Marine Program, Marine Biological Laboratory, Woods Hole, MA 02543
AFFILIATION: Boston Univ., Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D. Heyward
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-E(11-1)-2546
77 FUNDING: Energy Research and Development Administration FY77:$58,000; Environmental Protection Agency FY77:$50,300
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (20%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS/Petroleum hydrocarbons (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers and ponds
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To describe and, where possible, to explain the sublethal effects of oil fractions and temperature changes on the behavior of freshwater catfish and marine snails and lobsters.
APPROACH: Measure alterations in feeding and social behavior of the organisms to determine pollutant effects. Monitor changes in neurophysiological responses of chemoreceptors to understand the mechanism of action on the organism. Test organisms: (1) Nassarius obsoletus, mud snail; (2) Homarus americanus, lobster; and (3) Ictalurus nebulosus, catfish. Pollutants: (1) no. 2 fuel oil; whole oil and oil fractions at concentrations from 10 ppb to 50 ppm; and (2) heat; applied in 5 degrees C increases over baseline values from 10-30 degrees C. Exposure: (1) oil, mudsnail: 1 hour static system, 1-14 days flowthrough; lobster: 5 day static system, one time oil application; and (2) heat, lobster and catfish: 5 days at elevated temperature between a 10-day pre heat and a 5-day post heat control period.
RESULTS: Theoretical models have been proposed in the course of our earlier studies and these are now being tested to determine basic mechanisms of interference. Changes in behavior may be the essential areas to be reflected at the population level and effects on chemo-reception may be generalized across different species. If such a generalized model of oil interference proves to be valid, realistic safety standards can be set up based on these experimental data.
PROJECT MILESTONES: A generalized model of pollutant interference with chemo-reception and animal behavior: (1) Documentation of heat effects on social behavior 1976-1977; and (2) Documentation of fuel oil effects on feeding and social behavior 1978-1979.
KEYWORDS: PETROLEUM;BIOLOGICAL EFFECTS;FISHES;SNAILS;LOBSTERS;TEMPERATURE DEPENDENCE;BEHAVIOR;HYDROCARBONS;NEUROLOGY;THERMAL POLLUTION;TEMPERATURE EFFECTS

<087738>
TITLE: Sediment Response to Inner Shelf Hydraulic Regimes
PROJECT NUMBER: 006968
PRINCIPAL INVESTIGATOR: Palmer, H.D.
ADDRESS: Westinghouse Electric Corp., Oceanic Div., P.O. Box 1488, Annapolis, MD 21404
AFFILIATION: Westinghouse Electric Corp., Annapolis, Md. (USA). Oceanic Div.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, A.B.
TELEPHONE: F233-3035;C(301)353-3035
TYPE OF FUNDING: Contract No.-E(11-1)-2553
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To determine the hydraulic regime under which nearshore marine sediments are placed in motion, and assess the rate, magnitude duration and direction of such transport.
APPROACH: Deployment of instruments on the sea floor which measure waves, currents, sediment transport and pore water pressure within the sea floor to a depth of 2.5 meters.
RESULTS: Capability of predicting sediment transport events on basis of wave and current data.
PROJECT MILESTONES: (1) August 1975 Initial deployment. (2) June 1976 Deployment of auxiliary arrays. (3) October 1976 Proposal for third year support. (4) January 1977 Implement third year activity (if funded). Data collection, reduction, interpretation and documentation are continuous.
KEYWORDS: SEDIMENTS;ENVIRONMENTAL TRANSPORT;OCEANOGRAPHY;DATA ACQUISITION;COASTAL WATERS;SHORES;MEASURING INSTRUMENTS;FORECASTING;HYDRAULICS

<087740>
TITLE: Revegetation Following Artificial Disturbance
PROJECT NUMBER: 006989
PRINCIPAL INVESTIGATOR: Fraley, L. Jr.
ADDRESS: Department of Radiology and Radiation Biology, Colorado State University, Ft. Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Radiology and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(11-1)-2743
77 FUNDING: Energy Research and Development Administration FY77:$5,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Gamma (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Determine the potential for revegetation at Rocky Flats. (2) Determine recovery of grasslands vegetation following exposure to ionizing radiation or being disturbed by fire, tilling or scraping. (3) Determine the radiosensitivity of grassland vegetation to chronically administered radiation.
APPROACH: (1) Remove existing vegetation by tilling and reseed with various mixtures of native species under varying conditions. (2) Expose grasslands vegetation to ionizing radiation on burn, rototill or scrap and measure secondary succession. (3) Chronically expose grassland vegetation to ionizing radiation.
RESULTS: (1) Determine feasibility of revegetation and/or reclamation at Rocky Flats. (2) Comparison of recovery of grasslands after damage by ionizing radiation to recovery after other types of disturbance. (3) Determine equilibrium radiosensitivity of grasslands vegetation.
PROJECT MILESTONES: Determined radiosensitivity of grasslands vegetation.
KEYWORDS: FLORA;NEVADA;LAND RECLAMATION;GRASS;IONIZING RADIATIONS;RADIOSENSITIVITY;CHRONIC IRRADIATION;REVEGETATION;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL RECOVERY;FIRES;AGRICULTURE;GAMMA RADIATION;PLANTS

<087741>
TITLE: Ecology-Meteorology Workshop
PROJECT NUMBER: 006992
PRINCIPAL INVESTIGATOR: Gates, D.M.
ADDRESS: University of Michigan, Department of Botany, Ann Arbor, MI 48105
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-2757
77 FUNDING: Energy Research and Development Administration FY77:$8,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Open avenues of communication between ecologists and meteorologists; to identify unique areas involving cooperative research between the two disciplines and to stimulate the initiation of such research programs.
APPROACH: A workshop with four panels lasting a total of four days with a total of about 80 participants.
RESULTS: Preparation of a document describing the state of knowledge concerning the topics, including specific recommendations on future developments.
OJECT MILESTONES: The first two workshops were held in June 1975 and August 1976. The third workshop is scheduled for August 1977.
KEYWORDS: ECOLOGY;METEOROLOGY;TERRESTRIAL ECOSYSTEMS;POLLUTION;CLIMATES;DIFFUSION;FORESTS;PLANTS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;PLANNING

<087743>
TITLE: Strip Mine Reclamation: An Island Biogeographical and Ecosystem Energetic Approach
PROJECT NUMBER: 006998
PRINCIPAL INVESTIGATOR: Carrel, J.E.
ADDRESS: 407 Tucker Hall, University of Missouri, Columbia, MO 65201
AFFILIATION: Missouri Univ., Columbia (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: F233-5078
TYPE OF FUNDING: Contract No.-E(11-1)-2758
77 FUNDING: Energy Research and Development Administration FY77:$54,000; National Science Foundation FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS/Iron (5%);VISUAL AESTHETICS/Strip mine revegetation (50%);SPECIFIED OTHER POLLUTANTS/Sulfuric acid, land disturbance (45%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (80%);FULL SCALE DEMONSTRATION (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) To describe quantitatively the natural recovery of strip mines. (2) To design a technique for rapid strip mine restoration by endemic organisms.
APPROACH: The island biogeographical and ecosystem energetic approaches of ecology are being used in stripped grasslands.
RESULTS: (1) A novel technique to measure easily vegetative cover on small areas from aerial photographs is being developed. (2) A quantitative understanding of limiting factors and basic processes involved in natural strip mine recovery. Rates of natural reclamation have been determined for strip-mined land. These baselines indicate that natural ecosystems will be re-established after 40 to 90 years depending on size of the strip mine and on condition of spoil.
PROJECT MILESTONES: (1) The photointerpretation technique for vegetative cover will be perfected by September 1976. (2) The spatial aspects of natural vegetative recovery of strip mines will be obtained by 10/77. (3) Energetics of strip mine recovery should be available 10/78.
KEYWORDS: SURFACE MINING;LAND RECLAMATION;ECOLOGY;PLANTS;MEASURING METHODS;PHOTOGRAPHY;BACTERIA;TERRESTRIAL ECOSYSTEMS

<087744>
TITLE: Physiological Studies on Environmental Pollutants
PROJECT NUMBER: 007050
PRINCIPAL INVESTIGATOR: Lengemann, F.W.;Wentworth, R.A.
ADDRESS: Department of Physical Biology, N.Y. State College of Veterinary Medicine, Ithaca, NY 14853
AFFILIATION: Cornell Univ., Ithaca, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research Division
MONITOR: Hobbs, Charles
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(11-1)-2784
77 FUNDING: Energy Research and Development Administration FY77:$26,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (75%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (30%);RADIATION (70%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (75%);ANALYTICAL (25%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This study is designed to identify, quantify and describe processes whereby hazardous waste products from energy production processes are transferred through milk to humans. One objective of these studies is to look at the transfer of heavy elements into milk. Among these will be members of the actinide series.
APPROACH: Among the procedures to be used will be oral and I.V. doses of a radio tracer to lactating animals. When it is determined that an element transfers across the mammary gland an attempt will be made to look at the transfer constants across the mammary epithelium.
RESULTS: In addition to obtaining quantitative information on amounts of potentially harmful substances entering milk as a function of time after exposure by animals, it is a long range objective of the study to develop a general theory of the accumulation of the ions in milk.
PROJECT MILESTONES: From results of the first year of the project it is apparent that in goats less than 1% of an oral dose of thallium, lead, polonium or bismuth will be found per liter of milk. The goat seems to transfer more of these elements to milk than the cow.
KEYWORDS: ENERGY;POLLUTION;FOOD CHAINS;MILK;MAN;ACTINIDES;UPTAKE;CONTAMINATION;ANIMALS;CHEMICAL EFFLUENTS;INGESTION;METABOLISM;RADIONUCLIDE KINETICS;ENVIRONMENTAL EXPOSURE PATHWAY

<087746>
TITLE: Molecular Mechanisms of Epithelial Transport of Toxic Metal Ions
PROJECT NUMBER: 007052
PRINCIPAL INVESTIGATOR: Wasserman, R.H.
ADDRESS: Department of Physical Biology, N.Y.S. College of Veterinary Medicine, Cornell University, Ithaca, NY 14853
AFFILIATION: Cornell Univ., Ithaca, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office, Contracts Management Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-2792
77 FUNDING: Energy Research and Development Administration FY77:$77,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/Cadmium;METALS/Zinc;METALS/Mercury;METALS/Lead (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To investigate, by physiological, biophysical and other pertinent techniques, the mode of transport of toxic metal ions across epithelial membranes (particularly intestine), interactions among different metal ions, macromolecules possibly involved in toxic metal transport, and characterization of metal binding protein.
APPROACH: Initial investigations were designed to assess turnover and distribution of Cd-109 in model animals (chicks and rats) as a function of stable cadmium concentration of diet, and the effect of dietary cadmium on animal growth, intestinal function, synthesis of Cd-binding proteins, histopathology of various tissues, and ultrastructural electron microscopic alterations of epithelial tissues (intestine, kidney). Subsequent investigations will assess rate of intestinal absorption of Cd and other metal ions as a function of total metal ion concentrations in animals acclimated to different concentrations of that specific metal ion, the transport path of that metal ion, and effect of nutritional deficiencies and other variables on metal ion absorption.
RESULTS: To understand more completely the manifestation of Cd and other toxic metals poisoning on the physiology and biochemistry of epithelial tissues, and the mode of transport of Cd and other toxic metal ions across the epithelial membrane.
PROJECT MILESTONES: The initial studies have shown: the presence of a Cd-inducible Cd-binding protein (presumably metallothionein) not only in kidney and liver but also in intestinal mucosa; that toxicity Cd has adverse effects on growth and the synthesis of a specific protein in the intestine; that Cd toxicity depresses the absorption and retention of Cd-109 is inversely related to the Cd concentration of the diet; that the turnover of orally-administered Cd-109 can be described by a two or more component curve and that the slow component represents primarily Cd-109 residual to the gastrointestinal tract of chicks and Cd-109 residual to the carcass minus gastrointestinal tract in rats. These observations represent both new information and background information for the subsequent physiological and biophysical investigations.
KEYWORDS: METALS;ION MOBILITY;CELL MEMBRANES;EPITHELIUM;INTESTINES;CHEMICAL BONDS;PROTEINS;CADMIUM;METABOLISM;BIOLOGICAL EFFECTS;ANIMAL GROWTH;TISSUES;ULTRASTRUCTURAL CHANGES;KIDNEYS;BIOLOGICAL EFFECTS;TISSUE DISTRIBUTION;PERMEABILITY;ANIMALS;BIOCHEMISTRY;INGESTION;MOLECULAR BIOLOGY;TOXICITY

<087047>
TITLE: Physiopathology of Blood Platelets and Development of Platelet Substitutes
PROJECT NUMBER: 007054
PRINCIPAL INVESTIGATOR: Baldini, M.G.
ADDRESS: Division of Hematologic Research, Memorial Hospital, Pawtucket, RI
AFFILIATION: Memorial Hospital, Pawtucket, R.I. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)-2783;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: NUCLEAR/General (40%);GENERAL SCIENCE (60%)
POLLUTANTS: RADIATION/X-ray (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: Research will continue on four main subjects of platelet physiology: (1) To identify platelet functions and stimuli which result in changes in cyclic nucleotides and to study the mechanism by which these nucleotides affect the platelet response. To measure the levels of cyclic AMP and cyclic GMP in platelets during storage at 4 and 22 degrees C and to see whether the platelets' ability to synthesize these compounds deteriorates with storage. To measure changes in the major intracellular nucleotide pools in relation to platelet-aging in the circulation. (2) The effect of high doses of x-irradiation on the functional capacities of human platelets will also be studied. Furthermore, investigations will continue. (3) Ways to determine platelet ''activation'' in patients so that the imminent risk of thromboembolism can be predicted and possibly suppressed by a combination of platelet inhibiting drugs. Work will also continue on improved methods of detection, measurement and treatment of platelet alloimmunization.
RESULTS: During the past year the effect of platelet transfusions in patients previously alloimmunized to blood platelets was greatly improved by adsorption of the alloantibody with a suspension of platelet membranes infused prior to platelet transfusion. Studies on cyclic nucleotides were also continued and demonstrated that addition of serotonin to a platelet suspension caused a 6 to 10 fold increase in cyclic GMP within 30 sec. Alpha-tocopherol was found to suppress platelet lipid peroxidation and inhibit platelet aggregation. Adhesivity of platelet to collagen was found to be dependent on cell age. Technical details in the utilization of frozen platelets in patients in need of platelet transfusion were also studied and improved.
KEYWORDS: NUCLEAR ENERGY;HEALTH HAZARDS;PHYSIOLOGY;PATHOLOGICAL CHANGES;BLOOD PLATELETS;X RADIATION;MAN;BIOLOGICAL RADIATION EFFECTS

<087048>
TITLE: Determination of Sulfur Speciation in Industrial Aerosols
PROJECT NUMBER: 007048
PRINCIPAL INVESTIGATOR: Eatough, D.
ADDRESS: Thermochemical Institute, Brigham Young Univ., Provo, UT 84602
AFFILIATION: Brigham Young Univ., Provo, Utah (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, D.S.
TELEPHONE: F233-4488;C(301)353-4488
TYPE OF FUNDING: Contract No.-EY-76-S-02-2988
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Southwest;HYDROGRAPHIC AREAS/Great Lakes
ESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) To identify concentrations of sulfite, sulfate, trace metals and nitrite species in particulates produced by smelting and fossil fuel industries. (2) To establish the conditions and mechanism of sulfite formation and study the stability of the various sulfur species in the ambient atmosphere.

APPROACH: Develop appropriate measurement techniques with emphasis on calorimetric titration and ESCA techniques. Determine the stability of sulfur (IV) aerosol species with time. Correlate the trace metal content humidity and temperature with the sulfur (IV) species and attempt to devise an explanatory mechanism.
RESULTS: Accumulate samples in the Four Corners power plant area and in the vicinity of the copper smelter at Garfield, Utah, and analyze for sulfur (IV) species and other relevant parameters.
PROJECT MILESTONES: Prepare annual report on project findings.
KEYWORDS: SULFUR COMPOUNDS;NITROGEN COMPOUNDS;AEROSOLS;CHEMICAL EFFLUENTS;AIR POLLUTION;REGIONAL ANALYSIS;FOSSIL-FUEL POWER PLANTS;COPPER;SMELTING;PYROMETALLURGY;ENVIRONMENTAL TRANSPORT;CHEMICAL COMPOSITION;METEOROLOGY;ENVIRONMENTAL EFFECTS

<087749>
TITLE: Molecular Basis for the Mutagenic and Lethal Effects of Ultraviolet Irradiation
PROJECT NUMBER: 007068
PRINCIPAL INVESTIGATOR: Grossman, L.
ADDRESS: Johns Hopkins University, Department of Biochemical and Biophysical Sciences, School of Hygiene and Public Health, Baltimore, MD 21218
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). School of Hygiene and Public Health
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(11-1)2814;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$57,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: An enzyme demonstrating the unusual potential for editing and excising damaged regions of DNA is to be studied in terms of (1) exact biochemical mechanisms of excision and editing, (2) cooperative effects with nuclear and cytoplasmic DNA polymerases, (3) concerted protein-protein interactions with polymerases, (4) its level in repair deficient human cell lines and (5) its ability and the ability of other repair enzymes to complement missing functions in repair-deficient cell lines. The last project is part of a proposed collaborative effort with Professor P. Cerutti of the University of Florida School of Medicine.
KEYWORDS: ANIMAL CELLS;DNA;CHEMICAL RADIATION EFFECTS;BIOLOGICAL RADIATION EFFECTS;ULTRAVIOLET RADIATION;POLYMERASES;BIOCHEMICAL REACTION KINETICS;BIOLOGICAL REPAIR;STRAND BREAKS;RADICINDUCTION;ULTRAVIOLET RADIATION;MUTAGENESIS

<087750>
TITLE: Studies of Lymphocyte Growth and Differentiation
PROJECT NUMBER: 007069
PRINCIPAL INVESTIGATOR: Rubin, A.D.
ADDRESS: College of Medicine and Denistry of New Jersey, New Jersey Medical School, Newark, NJ 07103
AFFILIATION: College of Medicine and Dentistry of New Jersey - New Jersey Medical School, Newark (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-AT(11-1)-2806-3;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$8,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project involves functional comparison of normal lymphocytes and their sub-populations with respect to kinetics of growth in vitro. Another area deals with basic investigations into the control of lymphocyte growth at the molecular level. Studies into ribosome synthesis and the regulation of RNA transcription will be carried on in a parallel fashion.
APPROACH: To date we have: (1) Described the interaction between ribosomal protein and RNA synthesis in the regulation of ribosome assembly in resting and stimulated lymphocytes; (2) Demonstrated direct effect of PHA on lymphocyte chromatin; (3) described the patterns of abnormal growth kinetics in lymphocytes from lymphoproliferative disorders.
KEYWORDS: LYMPHOCYTES;GROWTH;IN VITRO;RIBOSOMES;BIOSYNTHESIS;PHYTOHEMAGGLUTININ;RNA;CHROMATIN

<087751>
TITLE: Investigation of the Pulmonary Effects of Intermetallic Beryllium Compounds
PROJECT NUMBER: 007071
PRINCIPAL INVESTIGATOR: Stemmer, K.L.
ADDRESS: Department of Environmental Health, University of Cincinnati, Cincinnati, OH 45267
AFFILIATION: Cincinnati Univ., Ohio (USA). Dept. of Environmental Health
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin L., Jr.
TELEPHONE: C(301)353-3681
TYPE OF FUNDING: Contract No.-E(11-1)-2836
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Beryllium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To ascertain the solubility of intermetallic beryllium compounds. (2) To determine the pulmonary morphologic response to these compounds and the timely development of pulmonary lesions. This will be compared to beryllium metal. (Toxicity of compounds). (3) To determine if the compounds are carcinogenic and do cause pulmonary neoplasms.
APPROACH: (1) The solubility will be determined in water and serum over a period of up to 12 months. The compounds will be suspended in these fluids. After centrifugation the amount of beryllium will be determined by A.A.S. (2) The compounds are intubated into the trachea of rats, 5 mg of beryllium per sample per rat. Serial sacrifices will be done and the morphologic alterations will be recorded and

evaluated by light microscopy. All other organs will be examined for possible toxic effects.
RESULTS: The solubility of the compounds is expected to be low. The toxic or carcinogenic effects cannot be predicted.
YWORDS: BERYLLIUM;TOXICITY;LUNGS;PATHOLOGICAL CHANGES;RATS;MORPHOLOGICAL CHANGES;INTERMETALLIC COMPOUNDS;DOSE-RESPONSE RELATIONSHIPS;CARCINOGENS;NEOPLASMS

<087756>
TITLE: SIMS Three Year Study on Statistics and Environmental Factors in Health
PROJECT NUMBER: 007134
PRINCIPAL INVESTIGATOR: Thomsen, D.L. Jr.
ADDRESS: SIMS, 97 Parish Road South, New Canaan, CT 06840
AFFILIATION: SIAM Inst. for Mathematics and Society, New Canaan, Conn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(11-1)-2874
77 FUNDING: Energy Research and Development Administration FY77:$83,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Far West;COASTS/Northeast;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: SIMS: During 1976 SIMS will continue to coordinate the Study as outlined in the Proposal (February 1976). This coordination will in part consist of ensuring communication between the Review Panel and the centers at Columbia and Stanford; it will also consist of ensuring direct communication between the two centers in the form of both personal visitations by members of the Study and seminars as appropriate. As soon as any technical reports and papers are produced as a result of the Study, SIMS will see that there is suitable distribution. Columbia: The first steps will be taken towards the construction of a doubly stochastic Poisson process as a model for mortality and morbidity data in which the rate parameter is itself a random variable depending on time, weather, and pollution. Research will begin to develop sounder statistical methods than so far employed for detecting geographic areas in which there is nonrandom clustering of cases of a certain disorder, with proper control for such factors as size of population, proximity to treatment facilities, and utilization of those facilities. Principal components analysis for individual pollutants will begin of correlations, covariances, and raw cross-products between readings from the 40 monitoring stations in the New York City aerometric network. Stanford: During the first year, research will include the following:
PROJECT MILESTONES: (1) Research Application Conference on Environmental Health, July 1976, supported by grant from NSF (grant not included in Study funding). (2) First Review Panel meeting, October 1976.
KEYWORDS: AIR POLLUTION;MORTALITY;MATHEMATICAL MODELS;STATISTICS;HUMAN POPULATIONS;EPIDEMIOLOGY;METEOROLOGY;AIR;CARCINOGENS;HEART

<087757>
TITLE: Determination of Pu-239 in New York City Autopsy Tissue Samples
PROJECT NUMBER: 7156
PRINCIPAL INVESTIGATOR: Eisenbud, M.
ADDRESS: 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Contract No.-EY76-S-02-2968
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Pu-239 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Site specific NY city
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project deals with the analysis of plutonium in human tissues from environmental sources.
APPROACH: Conduct analysis on 50 sets of autopsy tissues which include the right lung, liver, kidney, helar lymph nodes, blood, and half the bodies of three thoracic vertebrae. The results of these studies will be compared with calculated values derived from lung modeling techniques and air concentration data to verify transport models of these materials in the environment and their metabolism and kinetics in the body.
RESULTS: Accomplishments during the first year included tissue acquisition, radiochemical method development, and analysis of a small subset of the available tissues.
PROJECT MILESTONES: Complete analysis of the 50 sets of autopsy tissues, September 30, 1978.
KEYWORDS: FATE;MAN;NEW YORK CITY;PLUTONIUM 239;AUTOPSY;TISSUES;SAMPLING;RADIONUCLIDE KINETICS;RADIOMETRIC ANALYSIS;ENVIRONMENTAL TRANSPORT;RADIOACTIVITY;RADIOMETRIC ANALYSIS;INHALATION;KIDNEYS;LUNGS

<087760>
TITLE: Hallam Nuclear Power Facility, Environmental Surveillance
PROJECT NUMBER: 800003
PRINCIPAL INVESTIGATOR: Helton, R.
ADDRESS: 1003 O Street, Lincoln, NB 68508
AFFILIATION: Nebraska Dept. of Health, Lincoln (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-AT-(11-1)-2097
77 FUNDING: Energy Research and Development Administration FY77:$2,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)

POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Site specific Hallam, Nebraska;COASTS/Other coasts Mid-west;HYDROGRAPHIC AREAS/Other hydrographic areas Ground water
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To sample and measure surface waters in the immediate vicinity of the decommissioned Hallam Nuclear Power Plant facility to determine the radioactivity of such waters to ascertain whether there has been any migration of the radioactive material sealed and buried on the plant site.
APPROACH: Conduct a sampling of the ten wells and two surface water supplies closely adjacent to the entombed radioactive material and conduct a radiochemical analysis of each sample for gross alpha and beta radioactivity and do a gamma scan of a composite of all the samples to determine quantity and identify gamma emitters.
RESULTS: (1) We expect to determine the radioactivity twice a year to the water (surface and ground) adjacent to the plant site. (2) Report all results of the environmental surveillance program to the U.S. Energy Research and Development Administration as required by Contract AT(11-1)-2097.
KEYWORDS: NUCLEAR POWER PLANTS;RADIOACTIVE WASTES;UNDERGROUND DISPOSAL;RADIONUCLIDE MIGRATION;SURFACE WATERS;RADIATION MONITORING;GROUND WATER;RADIOACTIVE EFFLUENTS;NUCLEAR FACILITIES;DECOMMISSIONING;ENVIRONMENTAL EFFECTS

<087761>
TITLE: Structural Response of Nuclear Shipping Containers Under Accident Conditions
PROJECT NUMBER: 800045
PRINCIPAL INVESTIGATOR: Robinson, R.A.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Sisler, James A.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-W-7405-Eng-92
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: NUCLEAR/General (50%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (40%);NUCLEAR/Fusion Magnetic;NUCLEAR/Fusion Laser (10%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To assess the effects of accident conditions on the structural response of high level waste and spent fuel transportation containers to aid in determining safety and potential environmental consequences.
APPROACH: The approach is to use scale modeling techniques to experimentally study the behavior of typical nuclear high level waste and spent fuel transportation systems during simulated accident conditions as specified in 10 CFR 71, Appendix B. 1/8, 1/4, and 1/2-linear scale models of uranium- and lead-shielded shipping containers are tested at various temperatures, impact angles and inertial loads.
RESULTS: The measured inertial loads and strains induced onto the nuclear shielding and primary containment vessel will provide the base line data necessary for safety analyses and licensing of ERDA shipping casks; correlation of new computer codes being developed by LASL; standard development; safety and risk assessment studies; and will aid in gaining public confidence in the transportation of nuclear energy waste materials.
PROJECT MILESTONES: FY 76-76T. (1) Select range of experimental parameters for investigation. (2) Review status of dynamic materials properties. (3) Design and fabricate SS/Pb models. (4) Develop scaling criteria for SS/Pb models. (5) Develop test matrix. (6) Complete scaling and strain rate experiments with SS/Pb models. (7) Complete temperature, g-load, impact angle, and containment experiments on SS/Pb models. (8) Begin design of SS/U models.
KEYWORDS: RADIOACTIVE WASTES;SPENT FUEL ELEMENTS;TRANSPORT;CASKS;SAFETY;TESTING;GAMMA RADIATION;PLUTONIUM

<087763>
TITLE: Plutonium Patient Analysis
PROJECT NUMBER: 002651
PRINCIPAL INVESTIGATOR: Waterhouse, C.
ADDRESS: University of Rochester, Rochester, NY 14627
AFFILIATION: Rochester Univ., N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview/Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
77 FUNDING: Energy Research and Development Administration FY77:$2,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<087764>
TITLE: Studies of Semiconducting Metal Oxides in Conjunction with Silicon for Solid State Gas Sensors
PROJECT NUMBER: 7460
PRINCIPAL INVESTIGATOR: Jordan, A.G.
ADDRESS: 5000 Forbes Avenue, Pittsburgh, PA 15213
AFFILIATION: Carnegie-Mellon Univ., Pittsburgh, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: F233-5349
TYPE OF FUNDING: Contract No.-EE-77-S-02-4346.A000
77 FUNDING: Energy Research and Development Administration FY77:$210,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (10%);SOLAR/General (10%);CONSERVATION/General (10%);GENERAL SCIENCE (20%)
POLLUTANTS: NOXIOUS GAS (70%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (60%);DEVELOPMENT/Laboratory

scale (40%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
JECT DESCRIPTION: Research to investigate semiconducting metal oxides (SnO2, ZnO and others) in the form of thin films for toxic or flammable pollutants gas detection. Develop test dosimeter materials and determine responses to a variety of gases and gaseous mixtures. Identify processes involved in solid-state gas sensor systems in order to provide reliable dosimetry systems.
APPROACH: Thin films of semiconducting metal oxides will be deposited on substrates using various approaches. Response to exposure to known gases and mixtures will be investigated and analyzed.
RESULTS: Basic and applied data on performance of semiconducting metal oxide films for selectively measuring exposure to toxic or potentially hazardous gases.
PROJECT MILESTONES: Final report prepared and delivered around early fall of 1978.
KEYWORDS: AIR POLLUTION MONITORS;PERFORMANCE TESTING;GASEOUS WASTES;CHEMICAL EFFLUENTS;SEMICONDUCTOR MATERIALS;TESTING;TIN OXIDES;ZINC OXIDES;MONITORING;AIR SAMPLERS;PERSONNEL;HEALTH HAZARDS

<087765>
TITLE: Health Effects of Combustion Generated Soots and Polynuclear Aromatic Hydrocarbons
PROJECT NUMBER: 7293
PRINCIPAL INVESTIGATOR: Thilly, W.
ADDRESS: Massachusetts Institute of Technology, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$219,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Screen samples of chemically characterized particulates and associated hydrocarbons for mutagenic (carcinogenic) activity.
APPROACH: Use in-vitro cultures of human lymphoblasts subject to graded levels of hydrocarbons extracted from particulates from experimental combustor. Provide dose-effect data for mutagenic classes of compounds and isolated compounds.
RESULTS: In-vitro dose-response data for toxic hydrocarbons in coal generated soots.
KEYWORDS: COMBUSTION PRODUCTS;SOOT;POLYCYCLIC AROMATIC HYDROCARBONS;HEALTH HAZARDS;TOXICITY;CARBON COMPOUNDS;COAL;CARCINOGENS;MUTAGENESIS;COAL INDUSTRY;ENVIRONMENTAL IMPACTS;HUMAN POPULATIONS;LYMPHOCYTES;COMBUSTORS;PARTICLES;AEROSOLS;AIR POLLUTION;CELL CULTURES;GENETIC EFFECTS

<087766>
TITLE: Characterization of Ionizing Radiation Damage in DNA
PROJECT NUMBER: 7447
PRINCIPAL INVESTIGATOR: Hawkins, R.B.
ADDRESS: Washington University, St. Louis, MO 63110
AFFILIATION: Washington Univ., St. Louis, Mo. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: These studies are directed toward understanding crosslinkage and chain breakage in DNA following exposure to ionizing radiation.
KEYWORDS: DNA;BIOLOGICAL RADIATION EFFECTS;ANIMAL CELLS;STRAND BREAKS;DNA REPLICATION;RADIOINDUCTION

<087767>
TITLE: Effect of LET and Microdistribution of Radiation on the Induction of Transformation In Vitro and In Vivo
PROJECT NUMBER: 7450
PRINCIPAL INVESTIGATOR: Little, J.B.
ADDRESS: Harvard University, Boston, MA 02115
AFFILIATION: Harvard Univ., Boston, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$180,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The RBE for cancer induction of high LET radiation is very difficult to establish especially at low radiation dose rates. These studies are directed toward understanding the relationships between cell transformation in vitro and lung cancer induction in vivo for uniform and non-uniform radiation exposure.
APPROACH: Slow growing cell cultures will be exposed to alpha irradiation from 238-PuO2 particles and uniform alpha radiation exposure. Their ability to transform will be related to exposure conditions. These data will be compared to tumor induction in rat lung following particulate and more uniform exposure to alpha particles.
RESULTS: The effects of non-uniform dose distribution should be determined and used for hazard evaluation.
KEYWORDS: CARCINOGENESIS;BIOLOGICAL MODELS;ALPHA PARTICLES;LUNGS;NEOPLASMS;CELL CULTURES;PLUTONIUM 238;PLUTONIUM DIOXIDE;RATS;BIOLOGICAL RADIATION EFFECTS;IN VITRO;IN VIVO

<087768>
TITLE: Comparative Evaluation of Effects of Ozonated and Chlorinated Thermal Discharges
PROJECT NUMBER: 7215
PRINCIPAL INVESTIGATOR: Guerra, C.R.
ADDRESS: 80 Park Place, Newark, NJ 07101
AFFILIATION: Public Service Electric and Gas Co., Newark, N.J. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324;C(301)353-5324
TYPE OF FUNDING: Contract No.-7215
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/Fission (50%)
POLLUTANTS: ORGANICS/Organo-halides and epoxides (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The work proposed involves three kinds of evaluation, using side-by-side ambient, chlorinated and ozonated effluents from an experimental condenser system.
APPROACH: The kinds of studies proposed are as follows: (1) Test organisms for this work will represent typical estuarine and freshwater fishes. (2) Acute (96 hour) and chronic (28 day) toxicity studies will be conducted in flow-through proportional dilution toxicity systems. (3) The stress study is to detect effects of the treated effluents at concentrations below those which elicit the type of behavioral avoidance response evaluated in the behavior portion of the program.
RESULTS: An engineering, economical, and biological evaluation of the applicability of ozonation as a method for condenser fouling control.
PROJECT MILESTONES: (1) Project starts 1 May 1977; project ends 30 April 1979; (2) Design of test facilities: July to August 1977; (3) Construction of test facilities: August to September 1977; (4) Activities: start up:site 1, 77/10;site 2, 78/07; avoidance/preference studies, toxicity studies, physiological stress, pathology, primary productivity: site 1, 77/11 to 78/5; site 2, 78/08 to 79/02; seminars: site 1, 78/03; site 2, 79/02; reports: interim, 78/11; final: 79/04.
KEYWORDS: CHLORINE;OZONE;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;ENVIRONMENTAL IMPACTS;ORGANIC HALOGEN COMPOUNDS;EPOXIDES;TOXICITY;AVOIDANCE;BEHAVIOR;FISHES;BIOLOGICAL FOULING;CONDENSERS;CONTROL;INTERCHANGEABILITY;BIOLOGICAL STRESS;PATHOLOGICAL CHANGES;MICROORGANISMS

<087769>
TITLE: Plutonium Decorporation by Mixed Ligand Chelates
PROJECT NUMBER: 7478
PRINCIPAL INVESTIGATOR: Shubert, J.
ADDRESS: Holland, MI 49423
AFFILIATION: Hope Coll., Holland, Mich. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Contract No.-EE-77-S-02-4369
77 FUNDING: Energy Research and Development Administration FY77:$59,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To substantially improve plutonium removal from exposed animals as compared to the commonly used chelating agents, EDTA and DTPA.
APPROACH: The approach utilizes the formation of mixed ligand chelate of plutonium and thorium.
RESULTS: A marked superiority of the mixed ligand chelate systems was demonstrated.
PROJECT MILESTONES: 79/04/14 Evaluation of acute toxicity in vivo of various mixed chelate systems.
KEYWORDS: PLUTONIUM;CHELATES;LIGANDS;TOXICITY;IN VIVO;EXCRETION;ANIMALS;TOXICITY;PERFORMANCE TESTING

<087770>
TITLE: Histocompatibility Typing in Mongrel Populations, Man and Dog
PROJECT NUMBER: 6049
PRINCIPAL INVESTIGATOR: Blumenstock, D.A.
ADDRESS: Atwell Road, Copperstown, NY 13326
AFFILIATION: Mary Imogene Bassett Hospital, Cooperstown, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-3327 Mod. No. 2-1
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our basic objectives are the development of satisfactory procedures for the clinical treatment of serious radiation exposure in man and trouble free transplantation of large organs using the dog as a model.
APPROACH: Lethal radiation of dogs and transplants of marrow and lung or kidney from donors matched for histocompatibility antigens on the basis of typing their peripheral blood lymphocytes with a battery of cytotoxic alloimmune sera.
RESULTS: Chimeric dogs obtained by the above procedure of lethal radiation exposure followed by successful

transplant of allogeneic marrow have been shown to tolerate completely without immunosuppression a lung or kidney transplant from the original donor of marrow.
KEYWORDS: DOGS;MAN;LETHAL IRRADIATION;BONE MARROW;LUNGS;KIDNEYS;TRANSPLANTS;IMMUNE REACTIONS;LYMPHOCYTES;IMMUNE SERUMS;RADIATION CHIMERAS;IMMUNOSUPPRESSION;RADIATION INJURIES;THERAPY;NEOPLASMS

<087774>
TITLE: Temporal Aspects of Tumor Response to Individual and Mixed Carcinogen Exposures
PROJECT NUMBER: 008001
PRINCIPAL INVESTIGATOR: Albert, R.E.
ADDRESS: NYU Institute of Environmental Medicine, 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., N.Y. (USA). Inst. of Environmental Medicine
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Carter, C.E.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-AT(11-1)2737
77 FUNDING: Energy Research and Development Administration FY77:$350,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The time patterns of tumor induction in mouse and rat skin and hamster lung are being studied when two or more carcinogens are present simultaneously or sequentially for long periods of time. Various carcinogens, such as, ionizing radiation, ultraviolet light, benzo(a)pyrene, nitroquinolinoxide, beta propriolactone and diepoxybutane will be applied directly or topically to skin either alone or in combination with one other carcinogen.
APPROACH: A powerful tumor promoter, phorbol myristate acetate, will then be applied repeatedly in order to accelerate the appearance of the tumors. The carcinogenic effect of BaP and electron radiation given repeatedly for long periods will be analyzed in terms of a model that relates the weekly dose rate (d) to the 50% induction time T/sub 50/ in accordance with the formula dT/sub 50//sup m/ - constant and the utility of promotion as an indicator of potential carcinogenicity will be determined.
RESULTS: The temporal characteristics of the response will be assessed in terms of log normal or Weibel functions and the possible progressive characteristics of the conversion from benign papillomas to malignant carcinomas will be included in the analysis. The binding of the carcinogens to cell constituents, especially proteins and nucleic acids, will be utilized as a dosimetric technique and small populations of transformed cells will be studied by cytofluorometry.
PROJECT MILESTONES: (1) Completion of single dose experiments. (2) Completion of dual dose experiments. (3) Start of chronic studies with radiation.
KEYWORDS: IONIZING RADIATIONS;CARCINOGENESIS;CARCINOGENS;TESTING;SKIN;MICE;RATS;LUNGS;HAMSTERS;CARCINOGENS;NEOPLASMS;HYDROCARONS

<087775>
TITLE: Repair of DNA Treated with Gamma-Irradiation and Chemical Carcinogens
PROJECT NUMBER: 008013
PRINCIPAL INVESTIGATOR: Goldthwait, D.A.
ADDRESS: Department of Biochemistry, Case Western Reserve University, Cleveland, OH 44106
AFFILIATION: Case Western Reserve Univ., Cleveland, Ohio (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Shepherd, George
TELEPHONE: F233-5037
TYPE OF FUNDING: Contract No.-E(11-1)2725
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (20%);PARTICULATES (30%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To define enzymatic mechanisms involved in the repair of DNA treated with chemical carcinogens and gamma-irradiation.
APPROACH: Isolation, purification and characterization of enzymes which recognize DNA treated with methylnitrosourea, 7-bromomethyl-12-methylbenz[a]anthracene, beta-propiolactone, dimethylsulfate, etc., from procaryotic and eucaryotic sources.
RESULTS: Clarification of the mechanisms of DNA repair which to date in mammalian systems are not clear. If specific enzymes can be identified and measured accurately in extracts, then levels can be measured to determine who in the population may be susceptible to chemical carcinogens.
PROJECT MILESTONES: (1) The identification of a mammalian endonuclease or N-glycosidase which recognizes O-6-methylguanine in DNA treated with methylnitrosourea. (2) Identification of altered enzyme levels in a genetic disease or in cancer prone individuals. (3) Definition of the nature of the gamma-irradiation damage to purines.
KEYWORDS: GAMMA RADIATION;BIOLOGICAL RADIATION EFFECTS;CARCINOGENS;BIOLOGICAL EFFECTS;DNA;BIOLOGICAL REPAIR;ENZYMES;X RADIATION;BIOCHEMISTRY

<087776>
TITLE: Development of Advanced Physical Chemical Methods for the More Complete Isolation and Identification of Individual Polycyclic Aromatic Hydrocarbons and Associated Structures Present in Complex Mixtures
PROJECT NUMBER: 007145
PRINCIPAL INVESTIGATOR: Lipsky, S.R.
ADDRESS: Yale University School of Medicine, 333 Cedar Street, New Haven, CT 06510
AFFILIATION: Yale Univ., New Haven, Conn. (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: F233-5468

TYPE OF FUNDING: Contract No.-E(11-1)-2958
77 FUNDING: Energy Research and Development Administration FY77:$252,000
TECHNOLOGY: FOSSIL FUEL/General (60%);GENERAL SCIENCE (40%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To develop advanced physical chemical techniques which can be used in association with biological methods which can aid in the identification of certain mutagens and/or carcinogens.
APPROACH: With the develcpment of polar and non-polar high resolution gas chromatographic capillary columns used in conjunction with mass spectrometry and high performance liquid chromatography as well as other techniques, attempts will be made to identify at a very early stage and with great reliability 'chemical fingerprints' of those substances introduced into a variety of biological assay systems which eventually prove to be mutagenic and/or carcinogenic.
RESULTS: (1) The development of a rapid, reliable chemical procedure which hopefully could be eventually used to determine whether or not man has been exposed to certain mutagens and/or carcinogen by examining his urine, blood, saliva, tissues, etc. (2) The development of a rapid, reliable chemical procedure which can be employed to augment the reliability of certain biological assay systems in determining the mutagenicity and/or carcinogenicity of certain chemical compounds.
PROJECT MILESTONES: Successful early identification by chemical means of certain mutagens and carcinogens present in biological systems.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;MIXTURES;MUTAGENS;CARCINOGENS;CHEMICAL ANALYSIS;GAS CHROMATOGRAPHY;MASS SPECTROMETERS;BIOASSAY;BIOLOGICAL EFFECTS

<087778>
TITLE: Chemical and Biological Studies on Nuleic Acids and Derivatives
PROJECT NUMBER: 007149
PRINCIPAL INVESTIGATOR: Brown, G.
AFFILIATION: Sloan-Kettering Inst. for Cancer Research, New York (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$37,000
TECHNOLCGY: GENERAL SCIENCE (100%)

<087780>
TITLE: Mechanisms of Mutagenesis: Analysis Through the Use of Alcohol Dehydrogenase in Drosophila
PROJECT NUMBER: 007166
PRINCIPAL INVESTIGATOR: Sofer, W.H.
ADDRESS: Dept. of Biology, Johns Hopkins University, Baltimore, MD 21218
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA). Dept. of Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISICN: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles
TYPE OF FUNDING: Contract No.-E(11-1)-2965
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (90%);RADIATION (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this study is to attempt to probe the question: How do mutagens act in higher organisms.
APPROACH: The test species is Drosophila melanogaster. We will be exposing these animals to a variety of chemical mutagens, most of which will be ingested or breathed. Then, using two unique chemical selection systems which were developed in my laboratory, we will select for alcohol dehydrogenase negative mutants and revertants to wild type.
RESULTS: These experiments should allow us to characterize how mutagens get in an animal system. By studying the reversion frequencies it should be possible to tell, at the molecular level, how the mutant has affected the organism's genetic material.
PROJECT MILESTONES: This will be the first demonstration at the molecular level of how mutagens act in higher organisms.
KEYWORDS: DROSOPHILA;MUTATIONS;MUTAGENS;BIOLOGICAL EFFECTS;MUTAGENESIS;BIOCHEMICAL REACTION KINETICS;CARCINOGENS;GENETICS;MOLECULAR BIOLOGY;DEHYDROGENASES

<087782>
TITLE: Toxicity of Heavy Metals
PROJECT NUMBER: 002497
PRINCIPAL INVESTIGATOR: Clarkson, T.W.
ADDRESS: University of Rochester, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(11-1)-3490
77 FUNDING: Energy Research and Development Administration FY77:$39,000; National Inst. of Environmental Health Sciences FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To study the metabolism, toxicity, and mode of action of heavy metals, with special emphasis on hazards to human health. (2) To develop assay systems for monitoring somatic mutations in vivo and in vitro (cell culture) in populations exposed to mutagenic agents. (3) To develop methods for assessing effects of environmental agents on oogenesis in a mouse model system.
APPROACH: (1) Epidemiological and toxicological studies on exposed populations. (2) Observations on human

volunteers given tracer doses of radioactive heavy metals. (3) Studies on mechanisms of metabolism and toxicity in experimental animals. (4) Studies, in a life cycle perspective, of genetic, reproductive, and developmental effects of environmental agents, particularly mercury and lead.
RESULTS: (1) Determination of the kinetic parameters for uptake, translocation, and excretion of inhaled mercury in man. (2) Assessment of the relationship between dose-effects and dose-response in man. (3) Improved methods of monitoring exposures to hazardous agents in human populations. (4) Improved analytical methods for measuring heavy metals in biological samples. (5) Improved procedures for removing toxic heavy metals from the human body. (6) Improved risk assessments in exposed human populations.
PROJECT MILESTONES: (1) Completion of initial studies on volunteers, including tracer doses of radioactive mercury vapor Jan. 1976. (2) Development of methylmercury metabolic model using data from inbred mouse Oct. 1977. (3) Completion of somatic cell mutation assay and assessment of feasibility of population screening Oct. 1977. (4) Integration of mouse and human data to provide metabolic model for methylmercury in man Oct. 1978.
KEYWORDS: METALS;METABOLISM;TOXICITY;HEALTH HAZARDS;EPIDEMIOLOGY;HUMAN POPULATIONS;RADIOACTIVE MATERIALS;MERCURY;UPTAKE;EXCRETION;INHALATION;LUNGS

<087783>
TITLE: Cell Structure and Function
PROJECT NUMBER: 002498
PRINCIPAL INVESTIGATOR: Coleman, J.R.
ADDRESS: University of Rochester Medical School, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-3490
77 FUNDING: Energy Research and Development Administration FY77:$373,000
TECHNOLOGY: NUCLEAR/Fission (5%);GENERAL SCIENCE (75%);MEDICAL APPLICATIONS OF NUCLEAR TECHNOLOGY (20%)
ENERGY CYCLE: ELECTRICITY GENERATION (5%)
POLLUTANTS: METALS (40%);ORGANICS (5%);RADIATION (15%);HEAT, THERMAL (5%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (15%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Develop detailed understanding of metabolism in bone of Ca/sup ++/ and other bone-seeping metal cations as a basis for protecting the skeleton from damage by toxic metals. (2) Develop improved radiopharmaceuticals for the early diagnosis of inflammatory responses to pollutant stress. (3) Characterize viscoelastic properties, tensile strength, and membrane stabilizing systems of blood cells in order to define how pollutants may affect cell function and survival. (4) Define role of the liver in overall response of the intact animal organism to environmental and other stresses.
APPROACH: (1) Transmission electron microscopy and electron probe microanalysis are used to identify cell organelles involved in Ca/sup ++/ transport and bone formation. (2) Standard immunologic techniques are used in conjunction with radiolabeling methods to develop new tissue-specific radiopharmaceuticals. (3) A variety of physical and chemical techniques (including electron microscopy and EPR spectroscopy) are being used to study the structure and function of blood-cell membranes and membrane components. (4) The technique of prolonged perfusion of the isolated rat liver will be used to study factors (hormones, injury, stress, pollutants) that affect net hepatic synthesis of specific plasma proteins.
RESULTS: (1) Identify which cell organelles function in Ca/sup ++/ transport across epithelial membranes; identify cell types, and cell organelles, that are responsible for movement of Ca/sup ++/ to sites of bone formation. (2) Improved method for the early detection of inflammatory responses by scintillation scanning after administering a radiolabeled antibody preparation. (3) Develop base of information relative to elasticity, resistance to deformation, and membrane integrity of blood cells, plus insights into the degree to which radiation, heavy metals, or other stresses may adversely affect overall membrane stability. (4) Definition of the role of the liver and its re-responsiveness to hormonal signals in the body's response to stress or injury.
PROJECT MILESTONES: (1) Devise conditions for preserving intestine and chick allantoic membrane in functional state by freeze drying July 1977. (2) Conduct studies in vivo to detect initial signs of inflammation using radiolabeled antibody as diagnostic agent July 1978. (3) Describe ion distribution in freeze-dried intestine and chick allantoic membrane Aug. 1978. (4) Describe ion and element distribution in bone and bone-forming tissue Dec. 1978. (5) Initiate studies utilizing radiolabeled antibodies as diagnostic agents in detection of pollutant effects in vivo July 1979. (6) Establish and apply techniques for prolonged (12-30 hours) perfusion of the isolated rat liver as a model test system for evaluating role of the liver in the total response of the organism to injury - no date presented.
KEYWORDS: HEAVY METALS;CALCIUM COMPOUNDS;METABOLISM;BONE TISSUES;SKELETON;RADIOPHARMACEUTICALS;DIAGNOSIS;INFLAMMATION;POLLUTION;BIOLOGICAL EFFECTS;BLOOD;MOLECULAR BIOLOGY;INGESTION;ANIMAL CELLS

<087784>
TITLE: Mineral Metabolism and Physical Biochemistry
PROJECT NUMBER: 002499
PRINCIPAL INVESTIGATOR: Neuman, W.F.
ADDRESS: University of Rochester Medical School, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E(11-1)-3490
77 FUNDING: Energy Research and Development Administration FY77:$364,000
TECHNOLOGY: FOSSIL FUEL/General (8%);NUCLEAR/General (12%);GENERAL SCIENCE (80%)
ENERGY CYCLE: COMBUSTION OR END USE (8%);ELECTRICITY GENERATION (12%)
POLLUTANTS: METALS (75%);RADIATION (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Define role of bone cells and, in particular, the bone cell membrane in controlling fluxes of material into and out of the skeleton. Attention now centers on cellular mechanisms controlling the turnover and retention of material in bone. (2) Elucidate mechanisms of active transcellular transport of divalent ions. (3) Characterize conformational changes induced by substrate, cofactors, and various

metal ions in isozymes of yeast hexokinase, a magnesium-requiring enzyme. (4) Study binding properties of specific serum proteins to gain a better understanding of mineral transport in the blood.
APPROACH: (1) Calvaria (rat, mice, chick) with intact membrane systems are studied (as model systems) in conjunction with the principal hormonal agents known to affect bone cell activity and membrane function. (2) Transcellular transport is studied in vitro using the embryonic chick allantoic membrane. (3) Fluorescence spectroscopy is utilized as a sensitive and versatile method of studying conformational changes in the hexokinase system. (4) The binding of a model compound, novobiocin, to serum albumin is quantitatively examined. The quantity bound is measured by equilibrium dialysis. A change in circular dichroic spectrum accompanies the binding reaction and provides, via analysis of the Scatchard plot, information on the binding process.
RESULTS: (1) Information on fluxes and gradients of Ca/sup 2+/, phosphate, H/sup +/, K/sup +/, lactate, etc. across the periosteal and endosteal bone membranes under a variety of stresses. This should provide a partial understanding of the homeostatic mechanisms employed by bone to control blood levels of calcium and phosphate. (2) Better understanding of how cells transfer material, physiologic or toxic, through the cytosol of a cellular membrane and into the recipient organ. (3) Additional information on the circulatory transport and metabolism of materials involved in skeletal metabolism.
PROJECT MILESTONES: (1) Reports on the colloidal nature of radionuclides in seawater and the results of a physicochemical study of a novobiocin-bovine serum albumin complex are expected to be published Fall 1976. (2) Direct measurement of subperiosteal pH by means of microelectrodes, if possible, will be completed in normal rats January 1977. (3) Most correlations of lactate fluxes with Ca/sup 2+/, inorganic phosphate, and perhaps K/sup +/ as well should be completed July 1977. (4) Significant accomplishments are expected during the 1976-78 period in the study of divalent cation transport by epithelial tissues. However, it is difficult to predict milestones and such forecasts are omitted.
KEYWORDS: BONE TISSUES;ANIMAL CELLS;CELL MEMBRANES;MINERALS;METABOLISM;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;BLOOD;CALCIUM;ENZYMES;MOLECULAR BIOLOGY;RADIOISOTOPES;FLUORESCENCE

<087785>
TITLE: Physiopathology of Blood Platelets and Development of Platelet Substitutes
PROJECT NUMBER: 006009
PRINCIPAL INVESTIGATOR: Baldini, M.G.
ADDRESS: The Memorial Hospital, Pawtucket, RI 02860
AFFILIATION: Brown Univ., Providence, R.I. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations Office
MONITOR: Miller, Harold N.
TELEPHONE: C(312)739-7711
TYPE OF FUNDING: Contract No.-E(11-1)-2783
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Research will be done to increase basic knowledge of platelet function and structure and apply this knowledge (1) to improve methods of platelet transfusion and storage; (2) to prevent platelet damage caused by ionizing irradiation; (3) to find new methods of inhibition of platelet adhesion and aggregation for the prevention of thromboembolic disorders.
APPROACH: (1) Human platelets will be utilized throughout the study. Platelet alloimmunization will be studied in multitransfused patients by measuring survival of Cr-51-labeled donor platelets in the sensitized recipients. Effect of antibody adsorption by infusion of platelet antigenic material will be studied. (2) The levels of cyclic AMP and cyclic GMP will be measured by radioimmunoassay in platelets during storage at 4 degrees C and at 22 degrees C to see whether the platelets' ability to synthesize these compounds deteriorates with storage. The effect of modified preservation media in preventing these changes will be studied. (3) To study the effect of high doses of ionizing irradiation on the platelets, membrane vesicles will be isolated after exposure. The structural changes in these platelet membranes will be studied by two-dimensional polyacrylamide gel electrophoresis. Electrophilic probes will be used to study changes in cell surface topography. (4) Prethrombotic phenomena in the platelets will be studied in postoperative patients by measuring platelet viscosity to assess early changes leading to increased platelet adhesion and aggregation. Methods to prevent these changes will also be investigated.
RESULTS: It is expected that (1) Improved survival and hemostatic effectiveness of platelets will be obtained in allcimmunized recipients; (2) Specific changes in platelet cyclic nucleotides may be found which can shed new light on the reasons why human platelets lose viability and function during storage; (3) Changes in reactivity of irradiated platelets may be found and the effect of high dose irradiation may be elucidated; (4) Measurement of platelet ''activation'' will serve in the detection and prevention of thromboembolic phenomena in patients.
PROJECT MILESTONES: Our piloting experiments have shown that adsorption of platelet alloantibodies can effectively be obtained in vivo by the infusion of purified antigen. Our recent studies have shown that contact of the platelets with altered surfaces causes a number of changes (''activation'') which precede and lead to platelet aggregation and thrombus formation.
KEYWORDS: THROMBOEMBOLISM;BLOOD PLATELETS;PHYSIOLOGY;IONIZING RADIATIONS;BIOLOGICAL RADIATION EFFECTS;PATIENTS;IMMUNITY;CHROMIUM 51;AMP;RADIOIMMUNOASSAY;MEMBRANES;NUCLEOTIDES;AGING;BIOCHEMISTRY;IMMUNOLOGY;X RADIATION;PRESERVATION

<087786>
TITLE: Environmental Consequences of Atmospheric Kr-85
PROJECT NUMBER: 7214
PRINCIPAL INVESTIGATOR: Boeck, W.
ADDRESS: Niagara University, Buffalo, NY 14109
AFFILIATION: Niagara Univ., N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert W.
TELEPHONE: F233-3764;C(301)353-3764
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$17,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)

CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The proposed study will examine the possibility that Kr-85 may lead to inadvertent weather modification through perturbation of the atmospheric electric climate. Such perturbations may result in changed electric fields, changed precipitation patterns and other anomalies related to increased ionization.
APPROACH: Calculations of the role of Kr-85 ionization on the earth's electrostatic field will be made and the related change in ion concentration determined and related to the role of charge in precipitation processes.
KEYWORDS: KRYPTON 85;AIR POLLUTION;ENVIRONMENTAL EFFECTS;RADIATION EFFECTS;METEOROLOGY;WEATHER;MODIFICATIONS;ENVIRONMENTAL TRANSPORT;GEOPHYSICAL SURVEYS

<087787>
TITLE: Impact of Atmospheric Sulfur Dioxide and Carbon Dioxide on the Ecophysiology and Competitiveness of Plants
PROJECT NUMBER: 007232
PRINCIPAL INVESTIGATOR: Bazzazz, F.A.
ADDRESS: Department of Botany, University of Illinois, Urbana, IL 61801
AFFILIATION: Illinois Univ., Urbana (USA). Dept. of Botany
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TYPE OF FUNDING: Contract No.-E-77-S-02-4329
77 FUNDING: Energy Research and Development Administration FY77:$46,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to determine the effects of elevated concentrations of sulfur dioxide and carbon dioxide on the physiology and competitiveness of plants.
APPROACH: Different plant species will be exposed to combinations of sulfur dioxide and carbon dioxide and measurements will be made of growth rate, survival, diversity of species, photosynthesis, respiration, and transpiration.
RESULTS: Results will help answer the following questions: will increasing carbon dioxide concentrations alter plant response to sulfur dioxide; do plants differ in their capacity to adapt to long-duration exposures to sulfur dioxide; does sulfur dioxide at different carbon dioxide concentrations change the composition of plant communities.
KEYWORDS: EMISSIONS;PLANTS;ENVIRONMENTAL EFFECTS;CARBON DIOXIDE;SULFUR DIOXIDE;PHYSIOLOGY;REPRODUCTION;GENETIC VARIABILITY;PLANT GROWTH;SURVIVAL TIME;POPULATION DYNAMICS;PHOTOSYNTHESIS;RESPIRATION;TRANSPIRATION;AIR;NITROGEN COMPOUNDS

<087788>
TITLE: Air Pollution Effects on Food Quality
PROJECT NUMBER: 007234
PRINCIPAL INVESTIGATOR: Pell, E.J.
ADDRESS: Department of Plant Pathology, The Pennsylvania State University, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA). Dept. of Plant Pathology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-EE-77-C-02-4331
77 FUNDING: Energy Research and Development Administration FY77:$54,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to determine the effect of ozone on the nutritive quality of food crops.
APPROACH: Soybean, potato and alfalfa plants will be exposed to controlled concentrations of ozone in chambers and analyses will be performed to determine nutritional value for human or animal consumption.
RESULTS: Results of this study will help answer the question of whether exposure to ozone alters the nutritional quality of soybeans, potatoes and alfalfa.
KEYWORDS: OZONE;BIOLOGICAL EFFECTS;PLANTS;CROPS;NUTRIENTS;ALFALFA;POTATOES;SOYBEANS;TESTING;EXPOSURE CHAMBERS;CONTROLLED ATMOSPHERES;PLANT GROWTH;ENVIRONMENT;AIR POLLUTION

<087789>
TITLE: Likelihood Estimations of Vegetative Alteration Near Known or Proposed Sources of Air Pollution
PROJECT NUMBER: 007297
PRINCIPAL INVESTIGATOR: Davis, D.D.
ADDRESS: Department of Plant Pathology, Pennsylvania State University, University Park, PA 16802
AFFILIATION: Pennsylvania State Univ., University Park (USA). Dept. of Plant Pathology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
E OF FUNDING: Contract No.
FUNDING: Energy Research and Development Administration FY77:$85,000
HNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS

PROJECT DESCRIPTION: The purpose of this project is to construct a computer model to simulate and predict injury to vegetation by sulfur dioxide.
APPROACH: Characteristics of pollutant dose, climate, and species susceptibility will be obtained from literature reviews and experimental studies and used to construct a mathematical model which will predict the probability of foliar injury to vegetation.
RESULTS: The results will provide a means of determining the effects of increases in SO2 emissions on forest trees and crop plants and would aid in the evaluation of sites for locating power plants.
KEYWORDS: SULFUR DIOXIDE;BIOLOGICAL EFFECTS;PLANTS;BIOLOGICAL MODELS;TOXICITY;MATHEMATICAL MODELS;DOSE-RESPONSE RELATIONSHIPS;AIR POLLUTION;TREES;CROPS

<087791>
TITLE: Genetic and Developmental Study of Complex Locus in the House Mouse
PROJECT NUMBER: 7380
PRINCIPAL INVESTIGATOR: Bennett, D.
ADDRESS: Sloan-Kettering Institute, 1275 York Avenue, New York, NY 10021
AFFILIATION: Sloan-Kettering Inst. for Cancer Research, New York (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-EE-77-S-02-4159
77 FUNDING: Energy Research and Development Administration FY77:$21,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This is a broad program of study and maintenance of mutant alleles at T locus or chromosome 17 of the mouse. Its objective is the maintenance of a complete panel of different types of mutant alleles at the T-locus the mouse on chromosome 17, as well as other known marker genes of that chromosome. The genetic study of these genes with special reference to their interactions with one another and the fine structure of the portion of chromosome occupied by the T-region.
APPROACH: The maintenance and inbreeding of 35 stocks of mice carrying different mutations in the T/t region of chromosome 17 will continue. Detailed genetic analysis of these mutations and their interrelationship with one another will be performed with particular emphasis on (1) experiment designed to map T/t locus mutations and their marker relative to one another. (2) embryological and cytogenetic analysis of two dominant T-like factors that may be chromosome deletions (3) the genetic and embryological analysis of new f-alleles that arise in the laboratory by mutation or are found in the wild population.
RESULTS: The product of their work is increased understanding of a complex genetic locus in the mouse and the resultant implications that this has in a variety of practical problems whose solution requires such knowledge about genetic characteristics of mammals.
PROJECT MILESTONES: Continuing examinations.
KEYWORDS: MICE;MUTANTS;CHROMOSOMAL ABERRATIONS;ANIMAL BREEDING;LABORATORY ANIMALS;MUTAGENESIS;BIOLOGICAL MODELS

<087792>
TITLE: Assessment of Energy Alternatives for New England
PROJECT NUMBER: 7452
PRINCIPAL INVESTIGATOR: Sievers, W.E.
ADDRESS: The Mitre Corporation, Bedford, MA 01730
AFFILIATION: Mitre Corp., Bedford, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$269,000
TECHNOLOGY: FOSSIL FUEL/General (45%);NUCLEAR/General (25%);SOLAR/General (10%);CONSERVATION/General (20%)
ENERGY CYCLE: TRANSPORTATION (20%);STORAGE (20%);COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (25%);WASTE MANAGEMENT (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Define issues related to energy growth and environmental protection in New England, and evolve a consensus on action plans to address to issues.
APPROACH: Conduct a forum in which representatives of industries, utilities, states, universities, financial institutions, federal agencies, consumer groups, and environmental groups can exchange information, define issues, and develop action plans.
RESULTS: Definition of the New England Energy Problem, evaluation of options to address the problem, and definition of action programs to implement the desirable options.
PROJECT MILESTONES: 9/78 Forum proceedings and results.
KEYWORDS: ENERGY SOURCES;USA;EVALUATION;INTERCHANGEABILITY;ENERGY SOURCE DEVELOPMENT;ENERGY CONSERVATION;FOSSIL FUELS;NUCLEAR FUELS;SOLAR ENERGY;ENVIRONMENTAL IMPACTS;SAFETY;MEETINGS;PLANNING;IMPLEMENTATION;ECONOMIC DEVELOPMENT;INFORMATION;POWER GENERATION;ENERGY STORAGE;TRANSPORT;COMBUSTION;WASTE MANAGEMENT;ENERGY CONSUMPTION

<087793>
TITLE: Chemical Composition of Atmospheric Precipitation in Minnesota, with Special Reference to the Role of Windblown Dust in Neutralizing Acid Precipitation Resulting from the Combustion of Fossil Fuels
PROJECT NUMBER: 007439
PRINCIPAL INVESTIGATOR: Gorham, E.
ADDRESS: Department of Ecology and Behavioral Biology, University of Minnesota, St. Paul, MN 55108
AFFILIATION: Minnesota Univ., St. Paul (USA). Dept. of Ecology and Behavioral Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert
TELEPHONE: C(301)353-3764
TYPE OF FUNDING: Contract No.-E-77-S-02-4327
77 FUNDING: Energy Research and Development Administration FY77:$51,000

TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
LUTANTS: NOXIOUS GAS (75%);PARTICULATES (25%)
RACTER OF STUDY: RESEARCH (100%)
IONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The purpose of this study is to determine the deposition of nutrients and pollutants in dust, rain and snow at polluted and unpolluted sites in Minnesota and North Dakota.
APPROACH: Automatic precipitation and bulk deposition collectors will be used for sampling dust, rain and snow and analyses will be performed for major cations and anions and physical characteristics of samples.
RESULTS: The results should help answer the following questions: (1) what is the present-day composition of wet and dry deposition in polluted and non-polluted areas of the upper mid-West; (2) is dustfall a significant contributor of phosphorus and nitrogen to soils and lakes; (3) is the gradient in pH of snow across Minnesota and North Dakota caused by changes in atmospheric particulate matter; and (4) will the development of coal-burning power plants in the western U.S. change the composition and properties of rain and snow in the upper mid-West.
KEYWORDS: MINNESOTA;NORTH DAKOTA;AIR POLLUTION;AEROSOLS;DUSTS;RAIN;SNOW;NUTRIENTS;PRECIPITATION SCAVENGING;SAMPLING;PHOSPHORUS;NITROGEN;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;GASEOUS WASTES;ENVIRONMENTAL TRANSPORT;WATER POLLUTION;CHEMICAL COMPOSITION

<087794>
TITLE: Integrated Alternative Fuels and Energy Supplies and Environmental Control for the California Region. Phase I: Community of Riverside, California, Energy Plan
PROJECT NUMBER: 007470
PRINCIPAL INVESTIGATOR: Allen, C.M.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Office
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-W-7405-ENG-92
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
ENERGY CYCLE: TRANSPORTATION (20%);STORAGE (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%);ELECTRICAL TRANSMISSION (20%)
POLLUTANTS: NOXIOUS GAS (20%);PARTICULATES (20%);NOISE, VIBRATION (20%);HEAT, THERMAL (20%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Far West;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop an integrated alternative energy plan and to implement this plan for the City of Riverside, California.
APPROACH: To characterize the energy end-use by category; i.e., residential, industrial, and commercial; and develop a projection of energy needs for the remainder of this century. Alternative energy resources will be identified and fitted into an integrated energy master plan. Supporting studies of institutional and public education will be performed.
RESULTS: A final report and conference.
PROJECT MILESTONES: (1) Program plan June 15, 1977. (2) Monthly letter reports. (3) Quarterly progress meetings, July 1, Oct. 1, 1977, Jan. 1, April 1, 1978. (4) Final report draft Feb. 15, 1978. (5) Sponsor review of final report Mar. 15, 1978. (6) Issue final report April 1, 1978. (7) Oral report to sponsor May 1, 1978. (8) Conference June 1, 1978.
KEYWORDS: CALIFORNIA;ENERGY MODELS;COMMUNITIES;ENVIRONMENT;ENERGY DEMAND;POLLUTION;PLANNING;TECHNOLOGY ASSESSMENT;SOCIOLOGY

<087795>
TITLE: Uptake of Sulfuric Acid Mist by Plant Canopies
PROJECT NUMBER: 007476
PRINCIPAL INVESTIGATOR: Wedding, J.B.
ADDRESS: Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Civil Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert
TELEPHONE: C(303)353-3764
TYPE OF FUNDING: Contract No.-EE-77-S-02-4367
77 FUNDING: Energy Research and Development Administration FY77:$43,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to determine the deposition of sulfuric acid aerosol on plant canopies and to determine injurious effects on foliage.
APPROACH: Plants with different canopy densities will be exposed to a simulated aerosol in a wind-tunnel and mass and number of droplets intercepted will be determined as a function of aerosol and canopy characteristics. Plants will be exposed to sulfuric acid aerosols in a growth chamber and anatomical, cytological and physiological measurements will be made.
RESULTS: This study will provide information related to the following questions: what is the capacity of vegetation to scavenge atmospheric aerosols; what is the effect of canopy characteristics on filtering capacity; and what is the minimum concentration of sulfuric acid aerosol that produces harmful effects on vegetation.
KEYWORDS: FLORA;AEROSOLS;ACID RAIN;BIOLOGICAL EFFECTS;SULFURIC ACID;PLANTS;LEAVES;SPRAYS;AQUATIC ECOSYSTEMS;SULFUR COMPOUNDS

<087796>
TITLE: Trace Elements in Oil Shale
PROJECT NUMBER: 007098
PRINCIPAL INVESTIGATOR: Chappell, W.
ADDRESS: University of Colorado, Boulder, CO
AFFILIATION: Colorado Univ., Boulder (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: F233-5078
TYPE OF FUNDING: Contract No.-F(11-1)4017
77 FUNDING: Energy Research and Development Administration FY77:$230,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The program has three major parts: a baseline study, a mass balance study, and a transport/biological effects study. The purpose of the baseline study is to establish the natural levels of several trace metals in soils, stream sediments and biota in the regions which will be subjected to impact during oil shale development. Some trace metals will be volatilized during the retorting process and others will either be released in liquid waste effluents or are subject to leaching from spent shale. The mass balance studies will involve measurement of the trace metal contents of raw shale and spent shale. Some of this work can be done with spent shale from pilot and industrially-owned units of varying scales which are now operating. Some work will be done with bench scale models. An extension of the mass balance studies will include work on the transport of trace metals after release as in stack gases or after mobilization from the spent shale. These studies will be concentrated on the mobilization of trace elements in spent shale and the potential for contamination of ground or surface waters and the role of stream sediments and soil in eliminating or reducing this potential problem. The third major effort will deal with biological availability of the trace metals to plants used to revegetate the massive amounts of spent shale which will be generated.
KEYWORDS: OIL SHALES;CHEMICAL COMPOSITION;METALS;TRACE AMOUNTS;OIL SHALE PROCESSING PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;STACK DISPOSAL;WATER POLLUTION;LAND POLLUTION;SEDIMENTS;SURFACE WATERS;LAND RECLAMATION;REVEGETATION;PLANT GROWTH;SPENT SHALES;BIOLOGICAL EFFECTS;GEOCHEMISTRY

<087797>
TITLE: Rehabilitation Potential and Practices of Colorado Oil Shale Lands
PROJECT NUMBER: 007100
PRINCIPAL INVESTIGATOR: Cook, W.
ADDRESS: Department of Range Science, Colorado State University, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Range Science
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: F233-5078
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$279,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This proposal treats various aspects of rehabilitation of lands affected by oil shale development. The research is divided into six subprojects which utilize four different types of field study plots. Development of a Handbook: This is intended to be a detailed characterization of the Piceance Creek Basin ecosystem. It would describe the attributes of the area and the ecosystems prior to disturbance. It would present risk factors associated with development. In one sense it will summarize the baseline conditions, and it would present this information in a form useful to a wide range of people. Evaluation of the Long-Term Fertility Requirements of Disturbed Areas: This work would deal with the long-term need for nitrogen and phosphorus for success of revegetation, particularly for stabilization of spent shale piles. Both nutrients are expected to be critical due to their very low concentrations in processed shale. Long-term stability of established vegetation may be limited by the development of a stable soil organic matter component in these new ''soils.'' Soil Microbiology Study: Whenever soil is disturbed, the microbiological community it supports is altered. This is particularly true in mining operations. New communities are established through natural mechanisms for innoculation
KEYWORDS: COLORADO;OIL SHALES;OIL SHALE PROCESSING PLANTS;ENVIRONMENTAL EFFECTS;LAND RECLAMATION;REVEGETATION;PLANT GROWTH;FERTILIZERS;NITROGEN;PHOSPHORUS;NUTRIENTS;SPENT SHALES;CHEMICAL COMPOSITION;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL EFFECTS;WILD ANIMALS;SOILS;GENETICS;MYCORRHIZAS;MICROORGANISMS

<087798>
TITLE: Comparative Study of Effluents and Their Control from Four Dry Ash Lurgi Gasification Plants
PROJECT NUMBER: 800134
PRINCIPAL INVESTIGATOR: Somerville, M.H.
ADDRESS: Engineering Experiment Station, P.O. Box 8103, University Station, Grand Forks, ND 58202
AFFILIATION: North Dakota Univ., Grand Forks (USA). Engineering Experiment Station
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Witmer, Fred
TELEPHONE: C(301)353-5587
TYPE OF FUNDING: Contract No.-EY-76-5-02-4035.001
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (80%);METALS (10%);PARTICULATES/Fly ash (10%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: This study is to assist ERDA and industry in defining future research and development needs in the area of environmental controls and equipment for utilization in the gasification industry. The proposed effort identifies and categorizes the effluents from and control methods utilized in the four proposed gasification facilities so that the proposed designs can be evaluated with respect to existing and probable environmental regulations and best available technology. The specific objectives are to: (1) Determine the effluent control levels for the four gasification facilities for each pollutant as specified by: law (state and federal), plant design, and ''best available'' equipment. (2) Determine the ''cost'' of the pollution control for each pollutant analyzed in terms of monetary units and energy units. (3) Determine the operational reliability of the design effluent control equipment and the design reliability of projected effluent levels, for each pollutant identified. (4) Identify the probable future environmental regulations and the control technology available for these effluents. (5) Identify effluent control weaknesses in the designs and what research and development is needed to strengthen the design.
APPROACH: The environmental impact statements and filing information for each of the proposed facilities is used as the primary data base. The Environmental Protection Agency and state agencies have provided the regulatory information. Control technology status has been established with the appropriate vendors.
RESULTS: The product of this work will be a report.
PROJECT MILESTONES: Not applicable due to the short term (16 months).
KEYWORDS: COAL GASIFICATION;LURGI PROCESS;ENVIRONMENTAL IMPACTS;POLLUTION CONTROL;COST;POLLUTION CONTROL EQUIPMENT;RELIABILITY;WASTE MANAGEMENT;POLLUTION REGULATIONS;HYDROCARBONS;SULFUR COMPOUNDS

<087799>
TITLE: Feasibility Study on Transformer Noise Reduction System
PROJECT NUMBER: 800183
PRINCIPAL INVESTIGATOR: Yannucci, D.A.
ADDRESS: 469 Sharpsville Ave., Sharon, PA 16146
AFFILIATION: Westinghouse Electric Corp., Sharon, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas
TELEPHONE: C(301)353-5511
TYPE OF FUNDING: Contract No.-EE-77-C-02-4376
77 FUNDING: Energy Research and Development Administration FY77:$22,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: NOISE, VIBRATION/Transformer (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (10%);DEVELOPMENT/Laboratory scale (80%);ANALYTICAL (10%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: The objective of this project is to demonstrate the feasibility of reducing the far field low frequency audio noise spectrum (120 Hz to 360 Hz) of a model transformer by means of an active sound cancellation system. Cost studies will be made to determine applied estimated cost of the noise reduction system to a 30 MVA, OA, power transformer.
APPROACH: The system operates by sensing the acoustic radiation from a sound source, conditions and amplifies this acoustic radiation to drive a sound projector in phase opposition to the sound source. The conditioning and amplification of the acoustic signal is continuously modified through a feedback loop so that changes in the transformer environment or applied voltage may be compensated.
RESULTS: Two engineering prototype sound cancellation units will be designed and built. A model, one cubic foot transformer will be designed and built. The system will serve as a demonstration model.
PROJECT MILESTONES: (1) Model transformer built 10/15/77. (2) Sound reduction system built 10/15/77. (3) Test of system 10/22/77.
KEYWORDS: NOISE POLLUTION CONTROL;POWER SUBSTATIONS;DEMONSTRATION PROGRAMS;FEASIBILITY STUDIES;ELECTRIC POWER;ENVIRONMENTAL IMPACTS;ECONOMICS;TRANSFORMERS

<087800>
TITLE: Maintenance of a Rural Precipitation Chemistry Center at Whiteface Mountain
PROJECT NUMBER: 7099
PRINCIPAL INVESTIGATOR: Mohnen, V.
ADDRESS: Atmospheric Sciences Research Center, Albany, NY
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert W.
TELEPHONE: F233-3764
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/ (80%);PARTICULATES (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: A research precipitation chemistry station in support of MAP35 will be installed on Whiteface Mountain.
KEYWORDS: AIR POLLUTION;MONITORING;ATMOSPHERIC PRECIPITATIONS;SAMPLING;CHEMICAL ANALYSIS;NEW YORK;RURAL AREAS;ENVIRONMENT;ACID RAIN;EARTH ATMOSPHERE

<087801>
TITLE: Analysis of LNG Storage and Transportation Characteristics
PROJECT NUMBER: 800187
PRINCIPAL INVESTIGATOR: Anderson, P.J.
ADDRESS: 3424 South State Street, Chicago, IL 60616
AFFILIATION: Institute of Gas Technology, Chicago, Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Walter, Henry F.
TELEPHONE: F233-5510
TYPE OF FUNDING: Contract No.-EE-77-S-02-4234
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);STORAGE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Alaska
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To provide an analysis of LNG storage facilities and transportation units. The data to be compiled will include, as appropriate: owner/operator; location; construction/start-up date; storage tank description; containment description; services description; primary jurisdiction; population density; points of cargo loading and discharge. Data will be tabulated, aggregated, and analyzed for time trends.
APPROACH: Surveys of LNG companies will provide updating information for existing records. Past experience of the IGT staff will guide the analysis of the data.
RESULTS: In addition to the Tables which describe the LNG industry today in the United States, projections are made of numbers and capacity for base-load import terminals and LNG vessels. During the 1976-1977 winter heating season, LNG accounted for about 12% of total peakshaving supplies for the gas industry. (The balance of 88% came from underground storage.) In New England, LNG provided 9% of total out of 11 companies during the winter heating season.
PROJECT MILESTONES: (1) Project begun May 1977. (2) Project ended August 1977. (3) Final report received August 1977.
KEYWORDS: LIQUEFIED NATURAL GAS;STORAGE;POPULATION DENSITY;DATA ANALYSIS;INDUSTRY;TRANSPORT

<087802>
TITLE: Water Use and Wastewater Production at Solid Waste Processing/Energy Recovery Facilities
PROJECT NUMBER: 800121
PRINCIPAL INVESTIGATOR: Young, J.C.
ADDRESS: Civil Engineering Department, Iowa State University, Ames, IA 50011
AFFILIATION: Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Civil Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas
TELEPHONE: C(301)353-5511
TYPE OF FUNDING: Contract No.-W-7505-ENG-82
77 FUNDING: Energy Research and Development Administration FY77:$88,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;COASTS/Other coasts U.S.
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The use of large scale mechanical systems for processing and burning municipal solid wastes for energy production has, since about 1968, been receiving a great deal of consideration. Studies to date primarily have been directed at the mechanical aspects of the individual system elements used for processing the solid waste and for energy production. Environmental impacts of such systems have been given little consideration in past work except possibly for air pollution. Almost no attention has been directed toward possible problems of excessive use of water and production of wastewater which might present mechanical or economical limitations to design and application. Consequently a study was initiated in October 1977 to make an evaluation of water use and wastewater production at municipal solid waste processing/energy recovery systems to identify possible adverse environmental impacts.
APPROACH: The study consists of three phases. Phase I (Oct. 1976--Sept. 1977) involves surveying existing technology through literature reviews and site visits and working with design engineering and manufacturing firms. This survey will help identify points of water use and wastewater production and document available information, and will serve as a basis for developing follow-up procedures for collecting additional data needed to accomplish the objectives of the evaluation program. Phase II and III (Oct. 1977 and following) will involve detailed follow-up studies to determine the treatability of wastewaters produced, to evaluate the availability and suitability of water pollution control technology to treat these wastewaters, and to identify possible ways to reduce water use and wastewater production.
RESULTS: Phase I (FY 77) has shown that water is used at solid waste processing/energy recovery facilities for scrubbing off-gases from burning operations, quenching incinerator residues, sluicing ash from incinerators and air pollution control devices, cooling, lubricating, fire fighting and miscellaneous housekeeping. There has been essentially no documentation of the volumes of water used for or wastewater produced by these purposes. In most cases, no measurements of wastewater quantities have been made and very little data are available on the quality of wastewaters and, in most cases, wastewater streams are discharged to sanitary sewers without regard to their treatability or impact on municipal wastewater treatment system.
PROJECT MILESTONES: Reports will be completed according to the following schedule: Phase I Interim Report: Prepared Sept. 1977, available FY 78; Phase II Interim Report: Prepared Sept. 1978, available FY 79; and Phase III Final Report: Prepared June-Sept. 1979, available Oct. 1979.
KEYWORDS: MUNICIPAL WASTES;INCINERATORS;ENERGY SOURCES;REFUSE DERIVED FUELS;LIQUID WASTES;WATER REQUIREMENTS;WATER POLLUTION;ENVIRONMENTAL EFFECTS;WASTE DISPOSAL

<087803>
TITLE: Study of By-Products and Potential Pollutants from High Temperature Entrained Flow Gasifiers
PROJECT NUMBER: 800162
PRINCIPAL INVESTIGATOR: Lee, M.L.
ADDRESS: 106 ESC, Chemistry Department, Brigham Young University, Provo, UT 84602
AFFILIATION: Brigham Young Univ., Provo, Utah (USA). Dept. of Chemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Witmer, Fred D.
TYPE OF FUNDING: Contract No.-EE-77-S-02-4377
77 FUNDING: Energy Research and Development Administration FY77:$88,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (70%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);PARTICULATES (25%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This study proposes to: (1) perform a detailed characterization of pollutants associated with a high temperature entrained gasification process; (2) determine the relationship between coal composition, ash composition, coal particle size, coal feed rate, steam/coal ratio, oxygen/coal ratio, reactor pressure, reactor temperature, residence time, and the resultant pollutants; and (3) recommend preferred environmental control strategies.
APPROACH: Samples will be collected during at least five different tests with each of four coals. These samples will be taken (1) from both the cooled and water-scrubbed gas stream; (2) from the scrubber effluent liquor; (3) from the gas evolved on depressurization of the scrubber liquor; and (4) from the settleable solids which collect in the gas-scrub liquor disengaging section. The composition of these samples will be determined using gas chromatography, proton induced x-ray emission spectroscopy, atomic absorption spectroscopy, and thermometric titrimetry.
RESULTS: (1) A qualitative and quantitative listing of process by-products. (2) A determination of process parameters that affect the magnitude and nature of the by-products generated. (3) A recommendation of environmental control modifications.
PROJECT MILESTONES: (1) Development of all analytical methodologies. (2) Acquisition of data. (3) Process design studies.
KEYWORDS: COAL GASIFICATION;ENVIRONMENTAL IMPACTS;POLLUTION CONTROL;RECOMMENDATIONS;COAL;CHEMICAL COMPOSITION;PARTICLE SIZE;FLY ASH;FLUE GAS;CHEMICAL ANALYSIS;BY-PRODUCTS;DATA ACQUISITION;PROCESS CONTROL;MEASURING METHODS;CHEMICAL EFFLUENTS

<087804>
TITLE: Noise: Its Biomedical and Environmental Considerations in the Energy Technologies
PROJECT NUMBER: 800160
PRINCIPAL INVESTIGATOR: Keast, D.N.
ADDRESS: 50 Moulton Street, Cambridge, MA 02138
AFFILIATION: Bolt, Beranek, and Newman, Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Grua, Charles
TELEPHONE: C(301)353-5517
TYPE OF FUNDING: Contract No.-EE-77-C-02-4389
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (10%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (10%);FOSSIL FUEL/Oil and Gas (10%);FOSSIL FUEL/Oil Shale (10%);NUCLEAR/Fusion Magnetic;NUCLEAR/Fusion Laser (5%);HYDROELECTRIC (5%);GEOTHERMAL/General (5%);GEOTHERMAL/Hydrothermal (5%);GEOTHERMAL/Geopressurized (5%);GEOTHERMAL/Hot dry rock (5%);SOLAR/General (10%);SOLAR/Ocean, wind (10%);CONSERVATION/General (5%);CONSERVATION/Improved conversion efficiency (5%)
ENERGY CYCLE: EXTRACTION (12%);COMBUSTION IN SITU (11%);TRANSPORTATION (11%);STORAGE (11%);PROCESSING, CONVERSION (11%);COMBUSTION OR END USE (11%);ELECTRICITY GENERATION (11%);ELECTRICAL TRANSMISSION (11%);WASTE MANAGEMENT (11%)
POLLUTANTS: NOISE, VIBRATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this study is to survey the developing energy technologies to determine the existing and/or anticipated environmental control needs for noise level control. This survey will identify practical noise control procedures and/or process modifications to mitigate the impact of noise where appropriate. An essential product of the survey is the identification of areas where existing environmental noise control is inadequate, and the development of recommendations for a program to address such inadequacies.
APPROACH: Literature search, some field measurements, and analysis.
RESULTS: Final study report with recommendations.
PROJECT MILESTONES: Final report.
KEYWORDS: NOISE;HEALTH HAZARDS;VIBRATIONAL STATES;SOCIOLOGY

<087805>
TITLE: Improved Water Management of Coal Conversion Processes by Preliminary Absorption of Halides
PROJECT NUMBER: 800161
PRINCIPAL INVESTIGATOR: Parsons, W.A.
ADDRESS: 6200 Oak Tree Blvd., Cleveland, OH 44131
AFFILIATION: McKee (Arthur G.) and Co., Cleveland, Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Witmer, Fred E.
TELEPHONE: C(301)353-5517
TYPE OF FUNDING: Contract No.-EE-77-C-02-4375
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (30%);WASTE MANAGEMENT (70%)

POLLUTANTS: METALS/Halide salts (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Coal conversion processes produce raw gas containing particulates and other undesirable chemical constituents that are removed prior to use of the gas for fuel. The study will evaluate the feasibility and advantages of the capture of ammonium chloride and strong acid gases from the raw gas in a low volume purge to facilitate disposal and water management.
APPROACH: The study will analyze technical and economic factors associated with the implementation of the concept on a 60 ton per day fixed bed gasifier operating in conjunction with appropriate effluent regulations. Engineering analysis and cost estimation will be employed to evaluate gas cleaning alternatives, effluent treatment alternatives, effluent disposal alternatives and recycle/reuse alternatives.
RESULTS: It is expected that preliminary absorption of halides will be revealed as an important water management concept that will be particularly attractive for application to high halide coals such as predominate in the Eastern and Midwestern United States.
PROJECT MILESTONES: (1) Assessment of technical feasibility--Month No. 8 of study. (2) Assessment of economic feasibility--Month No. 13 of study.
KEYWORDS: COAL LIQUEFACTION;COAL GASIFICATION;WATER REQUIREMENTS;GASEOUS WASTES;WASTE MANAGEMENT;AMMONIUM CHLORIDES;WATER POLLUTION CONTROL;ORGANIC ACIDS;WASTE DISPOSAL;FEASIBILITY STUDIES;ECONOMICS;RECYCLING;PURIFICATION;REMOVAL;PROCESS CONTROL;POLLUTION REGULATIONS;WATER RESOURCES;RESOURCE CONSERVATION

<087806>
TITLE: Scale Effects in LNG Hazard Analysis and Testing
PROJECT NUMBER: 800188
PRINCIPAL INVESTIGATOR: Fay, J.A.
ADDRESS: Department of Mechanical Engineering, MIT, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Mechanical Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Walter, Henry F.
TELEPHONE: F233-5510
TYPE OF FUNDING: Contract No.-EE-77-S-02-4204
77 FUNDING: Energy Research and Development Administration FY77:$69,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);STORAGE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Alaska
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To review existing analytical and experimental information on the properties of LNG spills on water and land (vapor generation; dispersion, and fire), and to compare predicted or extrapolated characteristics for very large spill sizes. Significant discrepancies will be discussed and an assessment made of the possibility of resolving disagreements with the limited measurements which might become available from a few large tests. An analytical framework will be developed for deciding what measurements should be made to answer certain key questions.
APPROACH: The volume of spilled LNG is considered the major variable defining the size of a spill. The description of the complete history of an unignited spill is a necessary prelude to understanding the full range of possible fire hazards. Other physical properties (e.g., thermal or mechanical properties of soil or water, storage vessel shape, wind speed, atmospheric stability) are considered parameters which affect the extent of the hazard but which need not necessarily be taken into account explicitly in determining the effects of scale.
RESULTS: Preliminary results for unconfined water spills, unconfined land spills, and confined land spills show that thermal radiation intensity and vapor concentration vary nearly in proportion to the spill volume, but that the time scale on which the spill events proceed increases only slightly with spill size. A striking result of the analysis is that many of the effects or observable quantities vary as a small fractional power of the spill volume (e.g., evaporation time, fireball burnup time, critical wind speed for plume formation.) A special note should be made of the effect of wind speed on the nature of cloud dispersion process. The distinction between low and high wind speed, as it affects plume shape or mixing, is practically independent of spill size. Thus field tests of spills should be carried out for a range of wind speeds and atmospheric stabilities independent of spill size. Extrapolation can then be made for fixed metecrological states.
PROJECT MILESTONES: (1) Project begun 1 Dec 1976. (2) First annual report 1 Dec 1977.
KEYWORDS: LIQUEFIED NATURAL GAS;GAS SPILLS;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;PLUMES;ENVIRONMENTAL TRANSPORT;HAZARDS;SAFETY

<087807>
TITLE: Detection of Atmospheric Methane--Assessment of Some Detectors
PROJECT NUMBER: 800221
PRINCIPAL INVESTIGATOR: Dewey, C.F.
ADDRESS: Department of Mechanical Engineering, MIT, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Mechanical Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Walter, Henry F.
TELEPHONE: F233-5510
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$48,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);STORAGE (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To assess three different measurement concepts for an inexpensive, accurate, reliable, and rapidly responding instrument for measuring atmospheric concentration of methane. For each of the concepts, quantitative data will be obtained on response time, absolute accuracy, and concentration ranges

over which the technique is useful. Emphasis will be placed on conditions representative of those which would be encountered in field tests of the dispersion of vapors from LNG spills.
APPROACH: To build breadboard models of several feasible systems and to measure the response parameters as they are affected by various factors in the laboratory, so that credible extrapolations may be made for field use.
RESULTS: An assessment of the capabilities (advantages and disadvantages) of three types of methane detectors for use in field experiments involving spills of LNG on land and water.
PROJECT MILESTONES: (1) Project began June 1977. (2) Simulated field test March 1978. (3) Final report June 1978.
KEYWORDS: SURFACE AIR;AIR POLLUTION MONITORS;METHANE;MONITORING;PERFORMANCE TESTING;LIQUEFIED NATURAL GAS;GAS SPILLS;AIR POLLUTION

<087808>
TITLE: LPG Boiling Rates on Water
PROJECT NUMBER: 800225
PRINCIPAL INVESTIGATOR: Reid, R.C.
ADDRESS: Chemical Engineering Dept., Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemical Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Cece, J.M.
TELEPHONE: C(301)353-5486
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$46,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (70%);STORAGE (30%)
POLLUTANTS: NOXIOUS GAS (5%);PARTICULATES (5%);ORGANICS (5%);HEAT, THERMAL (75%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Other hydrographic areas All
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Measure boiling rates of LPG on water; measure vapor fractionation occurring and compare with theory.
APPROACH: Conduct laboratory-scale experiments, develop analytical models and compare with present theory.
RESULTS: Research team assembled.
KEYWORDS: LIQUEFIED PETROLEUM GASES;BOILING;PHASE TRANSFORMATIONS;WATER;ENVIRONMENTAL EFFECTS;SAFETY;PLUMES;FUELS;CRYOGENICS

<087809>
TITLE: Assessment of Environmental Control Aspects of Treatment of EOR Wastewaters Using Membranes
PROJECT NUMBER: 800229
PRINCIPAL INVESTIGATOR: Thompson, R.
ADDRESS: Department of Chemical Engineering, Tulsa University, Tulsa, OK 74104
AFFILIATION: Tulsa Univ., Okla. (USA). Dept. of Chemical Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Walter, Henry F.
TELEPHONE: F233-5510
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;COASTS/Gulf
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To assess the efficacy and practicability of membrane processes for treatment of wastewaters produced by tertiary oil recovery techniques.
APPROACH: An experimental study to determine the effectiveness of membrane ultrafiltration process in the concentration and removal of sulfonates and crude oil from EOR wastewaters.
RESULTS: Information that will permit operating and capital costs for full sized units to be estimated. Assessment of environmental effectiveness of these techniques.
PROJECT MILESTONES: (1) Project began 1 Sept. 1977. (2) First annual report 1 Sept. 1978.
KEYWORDS: ASSESSMENT;WASTE WATER;WASTE PROCESSING;ENHANCED RECOVERY;PETROLEUM;MEMBRANES;SULFONATES;OIL WELLS

<087810>
TITLE: Evaluation of the Effect of Coal Cleaning on Fugitive Elements
PROJECT NUMBER: 800236
PRINCIPAL INVESTIGATOR: Boyer, J.F. Jr.;Ford, C.T.
ADDRESS: 350 Hochberg Road, Monroeville, PA 15146
AFFILIATION: Bituminous Coal Research, Inc., Monroeville, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
TYPE OF FUNDING: Contract No.-EE-77-S-02-4427
77 FUNDING: Energy Research and Development Administration FY77:$375,000; Bureau of Mines FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (1%);TRANSPORTATION (1%);PROCESSING, CONVERSION (96%);COMBUSTION OR END USE (1%);WASTE MANAGEMENT (1%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (96%);ANALYTICAL (4%)
IONS OF INTEREST: GEOGRAPHIC AREAS/Continental
EARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
ROJECT DESCRIPTION: By virtue of its origin, coal has been found to contain nearly every naturally occurring element. During coal mining, preparation, and utilization these elements may be released to the environment. The primary objective of this project is to assess the effect of controlled coal cleaning on fugitive elements present in run-of-mine coal. The second project objective is to prepare a comprehensive state-of-the-art report on the effect of coal mining, preparation, transportation, and utilization on the

trace elements found in coal. The third objective is to provide a description of accurate analytical methods that can be used by coal industry and commercial laboratories for determining the concentration of selected trace elements in a variety of coals.
APPROACH: The effect of coal cleaning on fugitive elements will be evaluated by exhaustively studying 20 samples of ROM coal obtained from various geographical locations throughout the United States. All ROM samples will be subjected to controlled coal cleaning at the BCR laboratory. Each coal will be crushed to a 1-1/4-inch topsize, sampled, and then screened into 1-1/4 x 1/4-inch, 1/4-inch x 30-mesh, and minus 30-mesh fractions which are typical of present cleaning plant circuitry. The 1-1/4 x 1/4-inch and the 1/4-inch x 30-mesh fractions will be gravity separated at the following gravities: 1.35, 1.55, and 1.80. The minus 30-mesh material will be separated into four distinct fractions, using a hydraulic classifier. Each fraction produced by the coal cleaning task will be characterized by general chemical and trace element analysis, as well as petrographic analyses where appropriate, and the data will be evaluated to determine the trace element concentrations in the various clean coal and reject fractions.
RESULTS: Conclusions to be drawn from this study will concern the potential for coal cleaning as a strategy for controlling trace elements that otherwise may become an environmental problem during subsequent utilization of a particular coal.
PROJECT MILESTONES: (1) July 1978 State-of-the-art review. (2) July 1979 Analytical procedure report. (3) July 1979 Final report on the effect of coal cleaning on fugitive elements.
KEYWORDS: TRACE AMOUNTS;CHEMICAL EFFLUENTS;COAL PREPARATION;ELEMENTS;CLEANING;COAL MINING;TRANSPORT;BY-PRODUCTS;WASTE PRODUCT UTILIZATION;CHEMICAL COMPOSITION;COAL;AIR POLLUTION ABATEMENT;COAL INDUSTRY;FEASIBILITY STUDIES;TESTING

<087811>
TITLE: Treatment of Coal Gasification Wastewater
PROJECT NUMBER: 800238
PRINCIPAL INVESTIGATOR: Haynes, W.P.
ADDRESS: Pittsburgh Energy Research Center, Pittsburgh, PA 15213
AFFILIATION: Energy Research and Development Administration, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Witmer, Fred E.
TELEPHONE: C(301)353-5517
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (25%);WASTE MANAGEMENT (75%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Synthane process wastewater (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: The objective of this project is to characterize SYNTHANE process wastewaters, to evaluate concentrations of effluents in relation to established standards, and to devise treatment methods capable of meeting such legally established or proposed regulations.
APPROACH: Treatment steps being considered are oil and tar separation, solvent extraction, ammonia and acid gas stripping, biological oxidation (aerobic or anaerobic), char or charcoal adsorption, reuse in cooling towers and blowdown concentration and evaporation. Many of these steps have been researched at PERC on wastewater from the SYNTHANE PDU gasifier. This gasifier is a scaled model of a commercial unit and the water generated should be representative of what is expected from larger units. Further treatability studies are needed.
RESULTS: Characterization and correlation of SYNTHANE process by-product water, investigation of the treatability of by-product water using various biological and physico-chemical processes, the continuation of char sorption studies, the initiation of a program to construct and operate an integrated wastewater treatment system and an investigation of using acids for oil and tar removal by depressing the pH into the 2-5 region.
PROJECT MILESTONES: (1) Complete construction-continuous unit 1 January 1978. (2) Solvent extraction 30 March 1978. (3) Cooling tower tests 1 June 1978.
KEYWORDS: COAL GASIFICATION;WASTE WATER;WASTE PROCESSING;WATER TREATMENT;SYNTHANE PROCESS;WATER POLLUTION CONTROL;SOLVENT EXTRACTION;ADSORPTION;EVAPORATION;WASTE PRODUCT UTILIZATION;SYNTHETIC FUELS

<087812>
TITLE: Evaluation of H2S Control Technology for Geothermal Energy Sources
PROJECT NUMBER: 800143
PRINCIPAL INVESTIGATOR: Gorman, P.
AFFILIATION: Midwest Research Inst., Kansas City, Mo. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas W.
TELEPHONE: F233-5511
TYPE OF FUNDING: Contract No.-EE-77-C-02-4255;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: GEOTHERMAL/General (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To evaluate H2S control technology for a number of existing and planned geothermal energy developments.
APPROACH: (a) Review of available literature on H2S removal technology for geothermal applications; (b) Review of actual experimental and operating data; (c) A systematic evaluation of available and potentially aavailable technology for planned geothermal energy projects.
RESULTS: Characterize emission sources; develop screening criterion depending on source/conversion

technologies.
PROJECT MILESTONES: State-of-the-Art review and prepare a report by March 1978; Control technology (development) by early 1978; submit report in 1978.
KEYWORDS: EFFLUENTS;EMISSIONS;HYDROGEN SULFIDES;POLLUTION CONTROL;GEOTHERMAL ENERGY;REMOVAL;TECHNOLOGY ASSESSMENT;ENVIRONMENTAL EFFECTS;AIR;SULFUR COMPOUNDS

<087813>
TITLE: Comparative Analysis of Hydrogen Fire and Explosion Accidents
PROJECT NUMBER: 600080
PRINCIPAL INVESTIGATOR: Zalosh, R.G.
ADDRESS: Factory Mutual Research, 1151 Boston Providence Turnpike, Norwood, MA 02062
AFFILIATION: Factory Mutual Research Corp., Norwood, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Weintraub, Arnold A.
TELEPHONE: C(301)353-5610
TYPE OF FUNDING: Contract No.-EE-77-C-02-4442
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: CONSERVATION/Energy storage (100%)
ENERGY CYCLE: STORAGE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Determine: relative hazards of hydrogen compared to conventional fuels and energy storage media; hazards of hydrogen production, transmission, utilization, disposal; needed safety research and code modification.
APPROACH: Acquire, compile, analyze, compare hydrogen accident/loss data.
RESULTS: Computer data file, final report with results, conclusions, recommendations.
PROJECT MILESTONES: (1) Data acquisition 12/31/77. (2) Data compilation 2/28/78. (3) Hydrogen/natural gas comparison 4/30/78. (4) Detailed hydrogen data analysis 7/15/78. (5) Final report 8/31/78.
KEYWORDS: ANALYSIS;HYDROGEN STORAGE;HYDROGEN;TRANSPORT;HAZARDS;FIRES;ECONOMICS;COMPARATIVE EVALUATIONS;FUELS;EXPLOSIONS

<087814>
TITLE: Detection of Nickel and Other Metal Carbonyls
PROJECT NUMBER: 007572
PRINCIPAL INVESTIGATOR: Stedman, D.H.
ADDRESS: University of Michigan, Ann Arbor, MI 48109
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No.-EE-77-S-02-4499
77 FUNDING: Energy Research and Development Administration FY77:$88,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/Carbonyls (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development and evaluation of an upgraded, portable field system for the low-level determination of metal carbonyls.
APPROACH: Reaction of nickel carbonyl with ozone in the presence of excess CO yields an excited state of NiO which relaxes by emission of visible light. This chemiluminescence is measured.
RESULTS: Development and field testing of a sensitive and selective detector for metal carbonyls.
PROJECT MILESTONES: (1) Development and laboratory testing of detector. (2) Successful field use at energy facilities.
KEYWORDS: AIR POLLUTION;TRACE AMOUNTS;MONITORING;METALS;CARBOXYLIC ACIDS;NICKEL COMPOUNDS;OZONE;CARBON MONOXIDE;AIR POLLUTION MONITORS;PERFORMANCE TESTING;CHEMILUMINESCENCE

<087815>
TITLE: Analytical Chemical System for Determination of Heavy Metals and Organic Compounds in Natural Waters
PROJECT NUMBER: 007444
PRINCIPAL INVESTIGATOR: Barnes, R.M.
ADDRESS: Department of Chemistry, Amherst, MA 01003
AFFILIATION: Massachusetts Univ., Amherst (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: C(301)353-5348
TYPE OF FUNDING: Contract No.-E-77-S-02-4320.A000
77 FUNDING: Energy Research and Development Administration FY77:$97,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS (75%);ORGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: A need exists for rapid, accurate, and precise simultaneous multielement methods of determining trace and ultratrace levels of inorganic and organic components in energy related materials. The goal of this project is to apply the selectivity of specially designed chelating and sequestering resins to the analysis of energy related materials for the determination of trace metallic and organic contaminants. The final analysis of metallic elements in eluants or by direct injection of the complete resin column into the inductively coupled plasma discharge will provide simultaneous, multielement

determination. Other chelating and sequestering resins are under development for organic materials, and conventional and new detection systems will be combined with the resins for selective analysis.
KEYWORDS: WATER POLLUTION;MONITORING;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;TRACE AMOUNTS;METALS;SEPARATION PROCESSES;QUANTITATIVE CHEMICAL ANALYSIS;SAMPLING;WATER POLLUTION MONITORS;PERFORMANCE TESTING

<087816>
TITLE: Development of a Rapid Scanning Spectrophotometer
PROJECT NUMBER: 007172
PRINCIPAL INVESTIGATOR: Shipp, W.S.
ADDRESS: Division of Biology and Medicine, Providence, RI 02912
AFFILIATION: Brown Univ., Providence, R.I. (USA). Div. of Biological and Medical Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No.-EY-76-S-02-2932
77 FUNDING: Energy Research and Development Administration FY77:$37,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Biological effects (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development of a rapid scanning spectrophotometer and signal processing system for studies in bioenergetics.
APPROACH: Development of a tunable acousto-optic filter.
RESULTS: A rapid scanning spectrophotometer system.
PROJECT MILESTONES: (1) Development of acousto-optic filter. (2) Development of front end controller. (3) Systems software.
KEYWORDS: SPECTROPHOTOMETERS;DESIGN

<087817>
TITLE: Determination of Fugitive Emissions from Coal Liquefaction Processes
PROJECT NUMBER: 002916
PRINCIPAL INVESTIGATOR: Sharkey, A.G.
ADDRESS: 4800 Forbes Avenue, Pittsburgh, PA 15213
AFFILIATION: Department of Energy, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duhamel, A. Paul
TELEPHONE: F233-4328
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: ORGANICS/Hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The principal objective of the program is to develop methods for collecting and quantitating fugitive emissions from coal liquefaction processes and coal conversion processes in general.
APPROACH: To develop a method based on various absorbant procedures for collection of fugitive emissions from coal liquefaction processes and to demonstrate the quantitation of the method using compounds which are found in coal liquids including alkyl derivatives of polynuclear aromatics, hydroaromatics compounds, and various heteroatom species containing O2, N2 and S. To demonstrate the method for collection of emissions from coal liquefaction processes at temperatures up to 450 degrees C.
RESULTS: The end result of this research effort will be the development of analytical techniques for determining and quantifying the fugitive emissions resulting from coal liquefaction processes. The determination of such emissions will be extremely useful in determining the in-plant environmental aspects of coal liquefaction processes.
PROJECT MILESTONES: Monthly end quarterly reports.
KEYWORDS: COAL LIQUEFACTION;CHEMICAL EFFLUENTS;AIR POLLUTION;AIR POLLUTION MONITORS;PERFORMANCE TESTING;COAL LIQUEFACTION PLANTS;ENVIRONMENTAL EFFECTS;HYDROCARBONS;CARCINOGENS

<087818>
TITLE: Cadmium Telluride Technology Development
PROJECT NUMBER: 006948
PRINCIPAL INVESTIGATOR: Entine, G.
ADDRESS: 6 Silver Lake Avenue, Newton, MA 02158
AFFILIATION: Radiation Monitoring Devices, Inc., Newton, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: F233-5349
TYPE OF FUNDING: Contract No.-EY-76-C-02-2541.A001
77 FUNDING: Energy Research and Development Administration FY77:$5,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Research and development on cadmium telluride crystal growth and applications to radiation monitoring and probes for nuclear medicine, health physics and nuclear physics.
APPROACH: Government-owned crystal growth and detector evaluation equipment is used to produce semiconductor materials and radiation detection devices. Funding support is primarily used for technology dissemination

and reporting costs, analysis of results, and consulting relative to CdTe detector applications.
RESULTS: Reports and applications information.
)JECT MILESTONES: Annual reports will be prepared and delivered.
'WORDS: RADIATION MONITORS;CDTE SEMICONDUCTOR DETECTORS;CADMIUM TELLURIDES;CRYSTAL GROWTH;PERFORMANCE TESTING

<087819>
TITLE: Estimation of the Skeletal Burden of ''Bone-Seeking'' Radionuclides from In-Vivo Scintillation Measurements of their Content in the Skull
PROJECT NUMBER: 7442
PRINCIPAL INVESTIGATOR: Cohen, N.
ADDRESS: 550 First Avenue, New York, NY 10016
AFFILIATION: New York Univ., Sterling Forest, N.Y. (USA). Inst. of Environmental Medicine
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: F233-5349
TYPE OF FUNDING: Contract No.-EE-77-S-02-4326.A000
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Research and development toward the development of an experimentally-proven, operationally acceptable in-vivo methodology for measuring the transuranic radionuclide activity associated with the human skeleton.
APPROACH: Spepcial low-energy photon scintillation counters will be developed for skull counting. Skull (head) phantoms and transuranic or simulated radiation sources will be prepared for calibration and laboratory intercomparison studies.
RESULTS: Prototype of skull counting systems and reports describing techniques and results of the research and intercomparison efforts. Information on skeletal deposition, retention and transformaton of transuranic elements.
PROJECT MILESTONES: Annual and topical reports. Demonstration of methodology by early 1979.
KEYWORDS: TRANSURANIUM ELEMENTS;TISSUE DISTRIBUTION;MAN;SKELETON;SKULL;RADIONUCLIDE KINETICS;SCINTILLATION COUNTING;SCINTILLATION COUNTERS;PERFORMANCE TESTING

<087820>
TITLE: Development of an Aerosol Size Classifier
PROJECT NUMBER: 7443
PRINCIPAL INVESTIGATOR: Forney, L.J.
ADDRESS: University of Illinois, Urbana, IL 61801
AFFILIATION: Illinois Univ., Urbana (USA). Dept. of Civil Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: F233-5349
TYPE OF FUNDING: Contract No.-EE-77-S-02-4319.A000
77 FUNDING: Energy Research and Development Administration FY77:$47,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (30%);GEOTHERMAL/General (20%);CONSERVATION/General (20%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: R and D to characterize the performance of a simple aerosol classifier using the principle of virtual impaction and a continuously variable slit width.
APPROACH: Conformal mapping techniques will be used to describe the properties of two-dimensional jets of ideal fluid impinging normally upon a void. The analysis includes fluid deflecting plates of finite length inclined at arbitrary angles to the incident jet. Particle trajectories will be numerically simulated for various theoretically admissible geometries. Scaled up water models will be used to record the flow field.
RESULTS: Report with experimental results and design data.
PROJECT MILESTONES: Final report should be received around the middle of 1978.
KEYWORDS: AIR POLLUTION;AEROSOLS;PARTICLE SIZE CLASSIFIERS;DESIGN

<087821>
TITLE: Evaluation of CO in Blood Samples from the Second Health and Nutrition Survey
PROJECT NUMBER: 7590
PRINCIPAL INVESTIGATOR: Radford, E.P.
ADDRESS: Pittsburgh, PA 15261
AFFILIATION: Pittsburgh Univ., Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
TYPE OF FUNDING: Grant No.-EY-76-S-02-4023
77 FUNDING: Energy Research and Development Administration FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO (100%)
~"\RACTER OF STUDY: RESEARCH/Laboratory (100%)
;IONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
;EARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: This study is extremely important for providing two types of information: (1) standard analytical methodology for COHb analysis, which, given NIOSH's indication that CO may be considered an indicator for PNA's in the workplace, makes COHb measurement important in medical surveillance, and (2) COHb levels in the 64 communities provide information on human COHb variations due to CO levels in

communities of different transportation/industry configurations. Complete medical and smoking histories of the individuals in HANES are available for future analysis by HHS contractors. Dr. Radford provides a subsample of bloods to Dr. Rodkey, Naval Medical Center, for ''blind'' analysis to compare with Radford's results. Comparison to date has been about 99% agreement of COHb measurement using different methodologies.
KEYWORDS: CARBON MONOXIDE;BLOOD;BIOLOGICAL ACCUMULATION;PUBLIC HEALTH;NUTRITION;HEMOGLOBIN;QUANTITATIVE CHEMICAL ANALYSIS;MAN;HUMAN POPULATIONS;COMMUNITIES;AIR POLLUTION

<087822>
TITLE: Structural Organization of Chloroplast Membranes: Correlation of Grana Stacking to Light Harvesting Efficiency
PROJECT NUMBER: 7604
PRINCIPAL INVESTIGATOR: Arntzen, C.L.
ADDRESS: Urbana, IL 61801
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
MONITOR: Duda, George D.
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To map the exposed surface proteins of the lamellar membranes of chloroplasts and to relate them to the organizational changes that occur in these membranes during the formation of grana.
APPROACH: Dr. Arntzen proposes first to study the transition from agranal to granal chloroplasts and will determine: (1) the unit size of photosystem I and photosystem II by their spectral response; (2) changes in the protein content during plastid membrane differentiation; and (3) changes in the membrane surface proteins during grana formation. Related experiments on the chloroplast lamella membranes include: (1) determination of the proteins on the interior of the membrane; and (2) determine whether or not membranes that are light energized (i.e., conducting light stimulated electron transport) will show suspected conformational changes in their surface proteins.
KEYWORDS: PLANT CELLS;CHLOROPHYLL;CHLOROPLASTS;CELL CONSTITUENTS;PROTEINS;CELL MEMBRANES;BIOCHEMICAL REACTION KINETICS;PHOTOCHEMICAL REACTIONS;MORPHOLOGICAL CHANGES;CHEMICAL COMPOSITION;PHOTOSYNTHESIS

<087823>
TITLE: Microbial Production of Aliphatic Hydrocarbons
PROJECT NUMBER: 7605
PRINCIPAL INVESTIGATOR: Tornabene, T.G.
ADDRESS: Fort Collins, CO 80521
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$79,000
TECHNOLOGY: SOLAR/General (75%);CONSERVATION/General (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This project addresses the prospect of use of efficient hydrocarbon-producing microorganisms to produce desirable fats and oils and other organics from a variety of simple substrates.
APPROACH: (1) Identify and screen microorganisms for optimal non-gaseous hydrocarbon production. (2) Determine the physiological conditions necessary to improve growth and hydrocarbon production. (3) Elucidate the genetic basis for hydrocarbon production. (4) Genetically transform cells to high hydrocarbon production. Heavy emphasis will be placed on micrococci and mycobacteria some species of which produce 1 to 2% of their dry weight in fats. Some green algae produce 17% by weight in actively growing culture. Reference is made to genetically transformed hybrids of micrococci with 10 fold increase in hydrocarbon content it is of great significance that some microbial species excrete a large fraction of the fatty hydrocarbons they produce.
KEYWORDS: HYDROCARBONS;FATS;OILS;BIOSYNTHESIS;MICROORGANISMS;GENETIC VARIABILITY;METABOLISM;BACTERIA;BIOMASS

<087824>
TITLE: Relationship of DNA Repair Processes to Mutagenesis and Carcinogenesis in Mammalian Cells
PROJECT NUMBER: 7606
PRINCIPAL INVESTIGATOR: Evans, H.H.
ADDRESS: Pittsburgh, PA 15213
AFFILIATION: Case Western Reserve Univ., Cleveland, Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$119,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project addresses an important issue in carcinogenesis and mutagenesis and that is whether post-replication repair of DNA (error-prone repair) is the molecular event for initiation of carcinogenesis and for induction of gene mutations.
APPROACH: Dr. Evans proposed to get at this problem by a novel mutagenization and selection technique using infection with damaged cytocidal viruses which can be reactivated only if cells have active repair systems. Thus, one can select repair deficient mutagens. The efficiency of the process is not known.
RESULTS: The first year effort will be to test the lethal effects of the mutagenizing agents and measurement

of mutagenic efficiency and cell transformation. Attempts will be made to define optimal conditions for mutagenesis and capability to conduct excision repair. Success will determine the fate of the remainder of the program.
WORDS: ANIMAL CELLS;CARCINOGENESIS;MUTAGENESIS;CARCINOGENS;MUTAGENS;BIOLOGICAL EFFECTS;MUTANTS;DNA REPLICATION;STRAND BREAKS;BIOLOGICAL REPAIR;VIRUSES;MOLECULAR BIOLOGY;DNA

<087825>
TITLE: PRF-Screen for Hazardous Chemicals: Rapid Detection of Health Hazards
PROJECT NUMBER: 7607
PRINCIPAL INVESTIGATOR: Smith-Sonneborn, J.
ADDRESS: Laramie, WY 82070
AFFILIATION: Wyoming Univ., Laramie (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations
77 FUNDING: Energy Research and Development Administration FY77:$83,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Develop and use protozoan system to screen for mutagens in process and waste water from shale oil processing.
APPROACH: The heaviest emphasis in her work would be on aqueous wastes and their route to ground and surface waters which can be looked at right now. The first year will be spent checking her screen against the popular Ames test for carcinogens and mutagens. The system once perfected will be used to screen the LERC aqueous effluents. Our hope would be that she would continue the 2-tiered test throughout the length of the project, and that Dr. Smith-Sonneborn would collaborate with analytical chemists at LERC.
KEYWORDS: LIQUID WASTES;CHEMICAL EFFLUENTS;OIL SHALE PROCESSING PLANTS;HEALTH HAZARDS;BIOASSAY;PROTOZOA;BIOLOGICAL EFFECTS;CARCINOGENS;MUTAGENS;TESTING;WATER POLLUTION;ENVIRONMENTAL TRANSPORT;SURFACE WATERS;GROUND WATER

<087826>
TITLE: Study of Photoexcitation Electronic States of Pollutants in Gases by the Positron Method
PROJECT NUMBER: 7608
PRINCIPAL INVESTIGATOR: Brandt, W.
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: Chicago Operations
77 FUNDING: Energy Research and Development Administration FY77:$42,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Photochemical reactions (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This project is intended to study the production and quenching cross sections of photoexcited triplet states through the concommitant conversion of the spin states of positronium.
APPROACH: Ortho positronium, when formed in a gas, decays with a characteristic lifetime of the order of 100 ns. Spin conversion of ortho positronium to para positronium on an excited triplet state is expected to shorten the lifetime drastically, by 2 to 3 orders of magnitude. Measurements of the concommitant reduction in the long-lived component of the positron annihilation spectrum can be measured with high accuracy tc give access to experimental spin conversion cross sections pertinent to the prediction of the photochemical reactivity of impurities in gases.
KEYWORDS: POSITRONIUM;EXCITED STATES;SPIN;LIFETIME;ENERGY-LEVEL TRANSITIONS;PHOTOCHEMISTRY;AIR POLLUTION;GASES;ANNIHILATION;ELECTROMAGNETIC RADIATION;SPECTRA;MEASURING METHODS

<087827>
TITLE: Microbiological Air Quality--Ames S.W. Disposal
PROJECT NUMBER: 002485
PRINCIPAL INVESTIGATOR: Kniseley
AFFILIATION: Ames Lab., Iowa (USA)
MONITORING AGENCY: Ames Lab., Iowa (USA)
77 FUNDING: Energy Research and Development Administration FY77:$77,000
TECHNOLOGY: CONSERVATION/General (100%)
KEYWORDS: AIR POLLUTION;MICROORGANISMS;ENVIRONMENTAL TRANSPORT

<087828>
TITLE: 60-Hz Bioeffects in Mammals
PROJECT NUMBER: 002823
PRINCIPAL INVESTIGATOR: Miller;De Lorge
AFFILIATION: Rochester Univ., N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: CONSERVATION/General (100%)
KEYWORDS: ELECTROMAGNETIC FIELDS;BIOLOGICAL EFFECTS;MAMMALS;HEALTH HAZARDS

<087829>
TITLE: Net Energy Constraints on Coal Utilization and Conversion
PROJECT NUMBER: 002938
PRINCIPAL INVESTIGATOR: Scott, R.
AFFILIATION: Department of Energy, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$3,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: COAL RESERVES;ENERGY SOURCES;COAL GASIFICATION;COAL LIQUEFACTION;ECONOMICS

<087830>
TITLE: Cell Proliferation in Lymphoid Tissue and the Seminiferous Epithelium Under Continuous Low-Level Irradiation
PROJECT NUMBER: 006024
PRINCIPAL INVESTIGATOR: Fabrikant, J.I.
AFFILIATION: Connecticut Univ., Storrs (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: NUCLEAR/Fission (100%)
KEYWORDS: LYMPHATIC SYSTEM;EPITHELIUM;CELL PROLIFERATION;BIOLOGICAL RADIATION EFFECTS;CHRONIC IRRADIATION;MALE GENITALS;TESTES;MAMMALS;RADIOBIOLOGY

<087831>
TITLE: Studies on Mammalian DNA
PROJECT NUMBER: 006576
PRINCIPAL INVESTIGATOR: Prescott, D.M.
AFFILIATION: Kansas State Univ., Manhattan (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$48,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: MAMMALS;DNA;BIOLOGICAL MODELS

<087832>
TITLE: Electrical Power Generation--Comparative Risks and Benefits
PROJECT NUMBER: 006721
PRINCIPAL INVESTIGATOR: Shultis, J.K.
AFFILIATION: Kansas State Univ., Manhattan (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
DIVISION: CHO
77 FUNDING: Energy Research and Development Administration FY77:$12,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ELECTRIC POWER;POWER GENERATION;PUBLIC UTILITIES

<087833>
TITLE: Electrical Power Generation--Comparative Risks and Benefits
PROJECT NUMBER: 006725
PRINCIPAL INVESTIGATOR: Meyer, W.
AFFILIATION: Missouri Univ., Rolla (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$13,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ELECTRIC POWER;POWER GENERATION;COST BENEFIT ANALYSIS;ENVIRONMENT;ECONOMICS

<087834>
TITLE: Electrical Power Generation--Comparative Risks and Benefits
PROJECT NUMBER: 006729
PRINCIPAL INVESTIGATOR: Carbon, M.
AFFILIATION: Wisconsin Univ., Madison (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ELECTRIC POWER;POWER GENERATION;COST BENEFIT ANALYSIS

<087835>
TITLE: Research on the Health Effects of Fossil Fuel Combustion Products
PROJECT NUMBER: 007175
PRINCIPAL INVESTIGATOR: Hilberg, A.W.
AFFILIATION: National Academy of Sciences - National Research Council, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: FOSSIL FUELS;COMBUSTION PRODUCTS;COMBUSTION;ENVIRONMENTAL IMPACTS;HEALTH HAZARDS;AIR POLLUTION;WATER POLLUTION

<087836>
TITLE: Evaluation of Carbon Monoxide in Blood Samples from the Second Health and Nutrition Survey
JECT NUMBER: 007190
NCIPAI INVESTIGATOR: Radford, E.
AFFILIATION: Johns Hopkins Univ., Baltimore, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$7,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: CARBON MONOXIDE;BLOOD;METABOLISM;BIOLOGICAL ACCUMULATION;HEALTH HAZARDS;MEDICAL SURVEILLANCE;QUANTITATIVE CHEMICAL ANALYSIS;NUTRITION;HUMAN POPULATIONS

<087837>
TITLE: Raft River Geothermal Ecology
PROJECT NUMBER: 007228
PRINCIPAL INVESTIGATOR: Musgrave, C.
AFFILIATION: Idaho Univ., Moscow (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$114,000
TECHNOLOGY: GEOTHERMAL/General (100%)
KEYWORDS: GEOTHERMAL INDUSTRY;ENVIRONMENTAL IMPACTS;IDAHO;BASELINE ECOLOGY;TERRESTRIAL ECOSYSTEMS

<087838>
TITLE: Mapping Project on Energy and the Social Sciences
PROJECT NUMBER: 007412
PRINCIPAL INVESTIGATOR: Gould, L.
AFFILIATION: Yale Univ., New Haven, Conn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$101,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: MAPS;ENERGY SOURCE DEVELOPMENT;SOCIO-ECONOMIC FACTORS;SOCIAL IMPACT;ECONOMIC IMPACT

<087839>
TITLE: Alternative Technologies Available for the Development of Northern Great Plains Coal Resources
PROJECT NUMBER: 007423
PRINCIPAL INVESTIGATOR: Markell, C.
AFFILIATION: Teknekron, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: INTERCHANGEABILITY;TECHNOLOGY ASSESSMENT;COAL RESERVES;ENERGY SOURCE DEVELOPMENT

<087840>
TITLE: Study of Intermolecular Interactions of Ozone
PROJECT NUMBER: 007445
PRINCIPAL INVESTIGATOR: Muenter, J.S.
AFFILIATION: Rochester Univ., N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: OZONE;PHOTOCHEMICAL OXIDANTS;BIOCHEMICAL REACTION KINETICS;MOLECULAR BIOLOGY;BIOLOGICAL EFFECTS

<087841>
TITLE: Development of New Fluorescent Markers for Chromosome Study
PROJECT NUMBER: 007448
PRINCIPAL INVESTIGATOR: Tsou, K.C.
AFFILIATION: Pennsylvania Univ., Philadelphia (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$85,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: FLUORESCENCE SPECTROSCOPY;CHROMOSOMES;LABELLING;TRACER TECHNIQUES

<087842>
TITLE: Genetic Reccmbination in Mammalian Cells in Culture
PROJECT NUMBER: 007449
PRINCIPAL INVESTIGATOR: Morse, M.L.
AFFILIATION: Colcrado Univ., Boulder (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$53,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: MAMMALS;CELL CULTURES;GENETICS;BIOLOGICAL MODELS;CYTOLOGY;HELICAL CONFIGURATION;COLORADO

<087843>
TITLE: Formation and Transformation of Polycyclic Organic Matter from Coal Combustion
PROJECT NUMBER: 007464
PRINCIPAL INVESTIGATOR: Natusch, D.
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;COAL;COMBUSTION PRODUCTS;ENVIRONMENTAL TRANSPORT;TRANSLOCATION;AIR POLLUTION;HEALTH HAZARDS;CARCINOGENS

<087844>
TITLE: Sequence of Operator-Promoter Regions in the DNA of Bacteriophage
PROJECT NUMBER: 007467
PRINCIPAL INVESTIGATOR: Ptashne, M.
AFFILIATION: Harvard Univ., Cambridge, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: DNA;BACTERIOPHAGES;BIOCHEMICAL REACTION KINETICS

<087845>
TITLE: Fluorescent Scattering by Molecules Embedded in Small Particles
PROJECT NUMBER: 007469
PRINCIPAL INVESTIGATOR: Chew, H.W.
AFFILIATION: Clarkson Coll. of Tech., Potsdam, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: MOLECULES;FLUORESCENCE;PARTICLES;MOLECULAR BIOLOGY;AEROSOLS;DISPERSION RELATIONS;SCATTERING;FLUORESCENCE SPECTROSCOPY;ENVIRONMENTAL TRANSPORT

<087846>
TITLE: Polycyclic Aromatic Hydrocarbon--Protein Interactions
PROJECT NUMBER: 007477
PRINCIPAL INVESTIGATOR: Fujimori, E.
AFFILIATION: Boston Biomedical Research Inst., Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$111,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;TOXICITY;METABOLISM;PROTEINS;PHYSIOLOGY

<087847>
TITLE: Succession in Weedy Communities
PROJECT NUMBER: 007218
PRINCIPAL INVESTIGATOR: Knight, C.
AFFILIATION: Wyoming Univ., Laramie (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)

<087848>
TITLE: Development of Ecological Awareness Center
PROJECT NUMBER: 007360
PRINCIPAL INVESTIGATOR: Moore, P.
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$14,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<087849>
TITLE: Studies and Environmental Policy Analysis: Water Quality and Quantity Issues that Affect ERDA Programs
PROJECT NUMBER: 007435
PRINCIPAL INVESTIGATOR: none
AFFILIATION: Energy Resources Co., Inc., Cambridge, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Chicago, Ill. (USA). Chicago Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: GENERAL SCIENCE (100%)

Energy Research and Development Administration/Idaho Operations Office

<088001>
TITLE: Toxicity of Radioelements
PROJECT NUMBER: 000473
PRINCIPAL INVESTIGATOR: Olson, D.G.
ADDRESS: 550 2nd Street, Idaho Falls, ID 83401
AFFILIATION: Energy Research and Development Administration, Idaho Falls, Idaho (USA). Idaho Health Services Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, R.L.
TELEPHONE: F233-4155
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (5%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The development of analytical procedures for the identification and determination of radioactive elements in environmental and biological materials, including the direct in vivo determination in humans. The procedures must be reliable and have sufficient accuracy and sensitivity to meet the needs of existing standards and guides. The same radiochemical procedures are equally applicable and necessary whether characterization of source terms and pollutants, measurement technology, or monitoring are being considered.
APPROACH: The best chemical techniques and modern instrumentation will be exploited to develop, modify or adapt new procedures to the particular types of samples requiring analyses, or to provide extraordinary sensitivity, accuracy or precision for the problems encountered.
RESULTS: New analytical radiochemical procedures are expected to be more sensitive, precise and, particularly, more accurate and reliable when applied to various sample matrices than existing procedures. For example, only total decomposition by appropriate fusion techniques will be permitted before chemical separations are begun in the determination of refractory elements. All final procedures will be published in the permanent literature.
KEYWORDS: BIOLOGICAL MATERIALS;RADIOMETRIC ANALYSIS;RADIONUCLIDE KINETICS;SAMPLING;TISSUES;BODY FLUIDS;ENVIRONMENT;RADIATION DETECTORS;DESIGN;RADIOISOTOPES;TOXICITY;GAMMA RADIATION;RADIOCHEMISTRY;ALPHA SPECTROSCOPY

<088002>
TITLE: Controlled Environmental Release Test (CERT) Program
PROJECT NUMBER: 0527
PRINCIPAL INVESTIGATOR: Markham, O.D.
ADDRESS: 550 Second Street, ERDA, Idaho Falls, ID 83401
AFFILIATION: Energy Research and Development Administration, Idaho Falls, Idaho (USA). Idaho Health Services Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION/Fission products (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To study the processes whereby airborne contaminants are deposited on and removed from natural and man-made surfaces.
APPROACH: Physical and biological variances believed to be significant to deposition and removal processes are documented in field and laboratory experiments in which gaseous or particulate radioactive tracers are released. Transfer of the tracer to vegetation or other surfaces and retention of the transferred material are evaluated.
RESULTS: Topical reports and publications in the open literature.
PROJECT MILESTONES: Paper-Deposition and Retention of Radioactive Aerosols on Northern Desert Vegetation, AAAS Regional Meeting, June 1977. Paper-Radioactive Aerosol Deposition and Retention by Vegetation in a Cool Desert Biome, AIBS, August 1977. Ph.D. Dissertation, FY 1978.
KEYWORDS: CERIUM 141;CESIUM 134;FOLIAR UPTAKE;RETENTION;GRAMINEAE;PLANTS;AIR POLLUTION;DEPOSITION;WIND;RADIONUCLIDE KINETICS;FOOD CHAINS;RADIONUCLIDE MIGRATION;AIR CLEANING;EARTH ATMOSPHERE;EIOADSORBENTS;CHEMICAL EFFLUENTS;RADIOACTIVE EFFLUENTS;PLUMES;RADIOACTIVE AEROSOLS;AEROSOL MONITORING

<088004>
TITLE: Idaho National Engineering Laboratory National Environmental Research Park
PROJECT NUMBER: 983
PRINCIPAL INVESTIGATOR: Dahl, A.H.
ADDRESS: 550 2nd Street, Idaho Falls, ID 83401
AFFILIATION: Energy Research and Development Administration, Idaho Falls, Idaho (USA). Idaho Health Services Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, R.L.
TELEPHONE: F233-4155

TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$36,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (10%);STORAGE (10%);PROCESSING, CONVERSION (10%);ELECTRICITY GENERATION (10%)
POLLUTANTS: RADIATION/Fission and activation (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To administer environmental studies on the Idaho National Engineering Laboratory National Environmental Research Park. To provide field facilities, site characterization and dissemination of information.
APPROACH: The objectives are being met through the appointment of a NERP coordinator. Several studies are in progress to characterize the INEL Site environment. Meetings have been held with all personnel involved in ecological studies at the INEL and proceedings are currently being mailed. A NERP brochure and two displays describing the INEL NERP are being planned.
RESULTS: The INEL Site environment will be characterized. A series of studies will result in knowledge concerning the best land-use for desert areas similar to the INEL. The environmental impact of energy development programs will be better understood. Natural research areas are being established. The environmental impact of various types of land use policy will be better understood.
KEYWORDS: IDAHO NATIONAL ENGINEERING LABORATORY;TERRESTRIAL ECOSYSTEMS;RESEARCH PROGRAMS;ENVIRONMENT;LAND USE;PLANNING;DATA COMPILATION;RADIOACTIVE EFFLUENTS;ANIMALS;PLANTS

<088005>
TITLE: Idaho National Engineering Laboratory Site Ecological Studies
PROJECT NUMBER: 000988
PRINCIPAL INVESTIGATOR: Markham, O.D.
ADDRESS: 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: Energy Research and Development Administration, Idaho Falls, Idaho (USA). Idaho Health Services Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, R.L.
TELEPHONE: F233-4155
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$74,000
TECHNOLOGY: FOSSIL FUEL/General (10%);NUCLEAR/General (70%);GENERAL SCIENCE (20%)
ENERGY CYCLE: EXTRACTION (10%);STORAGE (20%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (10%)
POLLUTANTS: RADIATION/Fission and activation products (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To obtain basic information on the flora and fauna of the Idaho National Engineering Laboratory Site which will enhance future environmental planning, preparation of environmental impact statements, and provide data to determine the movements and effects of radioactive materials in the ecosystem involved. Characterize the environment of the INEL National Environmental Research Park.
APPROACH: The objectives will be met through several ecological studies conducted on the INEL by graduate students (supervised by ERDA personnel). These studies will be conducted to obtain basic ecological information of the INEL Site environment. The studies being conducted or in planning are: (a) a study of raptor species; (b) demographic analysis of the burrowing owl; (c) vegetation analyses on grazed and ungrazed areas; (d) faunal population levels correlated with different/and use practices; (e) validation study of rodent populations; (f) plant and animal succession on a burned area; (g) a study of plant succession by use of long-established (26 yr) plant transects (h) seasonal diet of coyotes; (j) a demographic analysis of the pygmy rabbit (k) a study of amphibian and reptilian fauna; (l) periodic distribution and food habit relationship of fishes.
RESULTS: Baseline data on animal and plant populations and communities on the INEL Site will be obtained from these studies. Information on species composition, movement and density of animals on the INEL Site can be used to assess potential radionuclide movements through food chains and can be used to determine the effects of nuclear power plants on radionuclide accumulation in man. The concentration and transport of radioactive contaminant will be more accurately evaluated as a result of these studies. Some of the sub-projects will provide new ecological information on certain species such as the pygmy rabbit. The information gleaned from these studies will also enhance our ability to prepare Environmental Impact Statements for nuclear reactor construction and operation.
PROJECT MILESTONES: Acquired understanding of fish population dynamics and movement of fish within the INEL site. 1977, Evaluation of ERDA's water management program in conjunction with aquatic life. 1977, Obtain a better understanding of fish home ranges, migration, and dispersal in relation to biotic parameters, and the significance to fishery management. 1978, Development of water management program to lessen environmental impact to aquatic life by INEL activities. 1979, Development of methodologies and predictable tools to aid future research and land use planning.
KEYWORDS: IDAHO NATIONAL ENGINEERING LABORATORY;RADIOECOLOGY;RADIONUCLIDE MIGRATION;ENERGY;ENVIRONMENTAL IMPACT STATEMENTS;PLANNING;RADIOECOLOGICAL CONCENTRATION;ENVIRONMENT;TERRESTRIAL ECOSYSTEMS;SITE SELECTION;BIOLOGICAL MODELS;BIRDS;RABBITS;WILD ANIMALS;FOOD CHAINS;FISHES;BIOMASS

<088006>
TITLE: Radiation Measurement Technology
PROJECT NUMBER: 001352
PRINCIPAL INVESTIGATOR: Helmer, R.G.
ADDRESS: Aerojet Nuclear Company, Nuclear Technology Division, 550 2nd Street, Idaho Falls, ID 83401
AFFILIATION: Aerojet Nuclear Co., Idaho Falls, Idaho (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(10-1)-1375;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (25%);ELECTRICITY GENERATION (50%);WASTE MANAGEMENT (25%)
POLLUTANTS: RADIATION (90%);SPECIFIED OTHER POLLUTANTS/Technology transfer to other pollutants (10%)

CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The purpose of this program is to provide a technology base to assure that new advances in technology associated with radiation measurements will be assessed and utilized. The need for develcpment of well documented measurement techniques and proven instrumentation is expanding at a rapid rate. To meet this need it is essential that advanced concepts in detection systems, measurement techniques and remote sensor operation be developed. It is also essential that for the specialized equipment required, performance criteria be identified and developed to a useful state. To meet these needs, the major objective of this program is to provide a continuing effort in the development of experimental methods required to apply the techniques of nuclear spectroscopy as an analytical tool for elemental and isotopic analysis and to expand the application of these techniques to non-nuclear energy problems.
RESULTS: Expected Results in FY 77: The major emphases of this program in FY 77 will be: operation of phase II remote controlled gamma-ray spectrometer system; fabrication and testing of a phase III remote gamma-ray spectrometer design of other remote environmental assessment systems; characterization of planar intrinsic Ge detector; acquisition of coaxial intrinsic Ge detector; continued improvement of basic computer programs for analysis of gamma-ray spectra from Ge(Li) detectors; and collection of additional spectra and preparation of text for the Ge(Li) Gamma-Ray Spectrum Catalogue. Expected Results in FY 78: The major emphases of this program will be the continued development of electronic systems for remote environmental assessment, the improvement of spectroscopy techniques and detector characterization. The phase III remote gamma-ray spectrometer will be operated to obtain experience related to determining an optimum design of the software. A possible commercial system will be designed. This technology will be applied to other areas of environmental assessment. Electronics systems will continue to be improved as needed for various uses. The effort to characterize the operation of state-of-the-art gamma-ray detectors will continue. Publish supplements to the Gamma-Ray Spectrum Catalog including additional spectra. Provide documentation of updated computer programs for the analysis of Ge(Li) gamma-ray spectra.
KEYWORDS: INSTRUMENTATION;GAMMA DETECTION;RADIATION DETECTORS;DESIGN;GAMMA SPECTROMETERS;RADIOISOTOPES;ENVIRONMENT;RADIONUCLIDE MIGRATION;GAMMA SOURCES;LOW DOSE IRRADIATION;RADIOACTIVE EFFLUENTS;EMISSION

<088007>
TITLE: Idaho National Engineering Laboratory Site Radioecology Program
PROJECT NUMBER: 001390
PRINCIPAL INVESTIGATOR: Markham, O.D.
ADDRESS: 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: Energy Research and Development Administration, Idaho Falls, Idaho (USA). Idaho Health Services Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, R. L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Grant No.-1390, c
77 FUNDING: Energy Research and Development Administration FY77:$102,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: COMBUSTION IN SITU (20%);STORAGE (20%);PROCESSING, CONVERSION (60%)
POLLUTANTS: PARTICULATES/Radionuclides (60%);RADIATION/Gamma (40%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Establish concentrations of radionuclides in biological materials onsite and downwind of the INEL Site; (2) Establish antelope migration routes so radionuclide tissue data significance can be established; (3) determine food habits and radionuclide concentrations in mourning doves; (4) determine secondary succession, wind erosion and radionuclide resuspension on a burned area; (5) determine distribution of Pu, Cm, and Am in the Test Reactor Area Radioactive Waste Ponds; (6) to determine gamma radionuclide concentrations and describe biomass of ecosystem components in a waste pond; (7) to determine external radiation exposure to small mammals near radiation areas; (8) to determine effects of radiation exposure to swallow young; (9) to determine repopulation of small mammals in a burned area; (10) to determine radionuclide buildup and retention by waterfowl using radioactive leaching pond; (11) to determine radionuclides near the INEL Radioactive Waste management Complex; (12) to determine I-127 and I-129 relations on and near the INEL Site.
RESULTS: It is expected that this program will accomplish the above objectives. The extent, effect and behavior of radionuclides in the INEL environment will be better understood.
KEYWORDS: RADIOISOTOPES;TRANSLOCATION;GAMMA RADIATION;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;RADIOECOLOGICAL CONCENTRATION;RADIOACTIVE EFFLUENTS;SOILS;RADIONUCLIDE MIGRATION;RADIATION MONITORING;PLUTONIUM;TISSUES;BIRDS;ANIMALS;CURIUM;AMERICIUM;RADIOACTIVE WASTE MANAGEMENT;IDAHO NATIONAL ENGINEERING LABORATORY;HEALTH HAZARDS;NUCLEAR ENERGY;TERRESTRIAL ECOSYSTEMS;IODINE 127;IODINE 129

<088011>
TITLE: ERDA Effluent Information System and On-Site Discharge Information System
PROJECT NUMBER: 600028
PRINCIPAL INVESTIGATOR: Dean, L.A.
ADDRESS: EG and G, Inc., Idaho Falls, ID
AFFILIATION: EG and G, Inc., Goleta, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environment and Safety
MONITOR: Elle, Donald R.
TELEPHONE: F233-5622
TYPE OF FUNDING: Contract No.-41-1375-I
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle

Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This is a continuing project for the collection, computerization, and distribution of effluent and on-site discharge data at ERDA sites. The information provides a management overview of ERDA environmental releases. Expansion of computer programs and output formats will provide more ready timely access to data and in a more usable form for both ERDA-HQ and field organizations.
APPROACH: The computer-based annual reporting systems consist of two management information systems. These two systems are identified as the U.S. ERDA Effluent Information System (EIS) and the U.S. ERDA On-site Discharge Information System (ODIS). The two management information systems consist of over 50 computer programs which maintain current nuclide data bases and narrative summary information for each effluent release point and on-site discharge point as reported by the ERDA-owned facilities throughout the United States. Computer printouts are generated to summarize the data into routine annual reports for validation of calendar year information. Systems analysis and programming maintenance service is provided for all operational programs. Changes and improvements are made as directed by ERDA-HDQ and as determined by operational experience to be pertinent and appropriate.
RESULTS: The ERDA EIS and ERDA ODIS Systems were designed to help accomplish the reporting requirements for radioactive effluents and radioactive on-site discharge as set forth in ERDA Manual Chapter 0513, Effluent and Environmental Monitoring and Reporting. These two management information systems have helped assemble a ''best available'' inventory of past on-site and off-site radioactivity releases for all retired and active ERDA facilities. Data bases from two systems provide a central source of information to provide routine and ''on call'' output reports and graphs for use by ERDA and ERDA contractors. Summary and alert reports are generated to serve as a management tool for maintaining an overview of the levels and trends in radioactive effluents and discharges. EIS and ODIS data collected from ERDA and ERDA contractors is processed each calendar year and all required and requested reports generated.
KEYWORDS: US ERDA;NUCLEAR FACILITIES;RADIOACTIVE EFFLUENTS;INFORMATION SYSTEMS;DATA PROCESSING;RADIATION MONITORING;COMPUTER CODES;AIR;RADIOISOTOPES;WATER

<0088016>
TITLE: Hoisting and Rigging Manual(s)
PROJECT NUMBER: 600054
PRINCIPAL INVESTIGATOR: Stickley, T.H.
ADDRESS: EG and G Idaho, Inc., P.O. Box 1625, Idaho Falls, ID 83401
AFFILIATION: SEE CODE- 9502158 EG and G Idaho, Inc., Idaho Falls (USA). Idaho National Engineering Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Skinner, Dennis E.
TELEPHONE: F233-5607
TYPE OF FUNDING: Contract No.-RK010502
77 FUNDING: Energy Research and Development Administration FY77:$23,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);NUCLEAR/Fusion (10%);HYDROELECTRIC (10%);GEOTHERMAL/General (10%);SOLAR/General (10%);CONSERVATION/General (10%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (5%);TRANSPORTATION (25%);STORAGE (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (10%);ELECTRICAL TRANSMISSION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOISE, VIBRATION (90%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: RESEARCH/General (25%);DEVELOPMENT (25%);FULL SCALE DEMONSTRATION (25%);PRODUCTION (25%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Develop data and publish manual(s) on the design and operation of lifting equipment, and provide consulting service to committees investigating accidents involving lifting equipment.
APPROACH: Conduct literature search of lifting equipment accidents, acquire data through national concensus committees, acquire design data from manufacturers, prepare outline of agency needs and refine data into manual(s).
RESULTS: Provide analysis of lifting equipment accidents; provide data to contractors which will increase safety performance and reduce lifting accidents; and compile agency lifting standards into manual.
PROJECT MILESTONES: (1) Complete literature search FY 1978. (2) Acquire accident data from concensus committees FY 1979. (3) Acquire design data from manufacturers FY 1978. (4) Initial sort of accident data FY 1979. (5) Outline of manual FY 1979. (6) Completed manual(s) FY 1979.
KEYWORDS: RIGGING;LIFTING;DATA ACQUISITION;MANUALS;SAFETY ENGINEERING;EQUIPMENT;HOISTS;MATERIALS HANDLING;DESIGN;ACCIDENTS;REVIEWS;INFORMATION NEEDS;STANDARDS;CRANES;OPERATION

<0088018>
TITLE: System Safety Management Program
PROJECT NUMBER: 600008
PRINCIPAL INVESTIGATOR: Nertney, R.J.
ADDRESS: P.O. Box 1625, Idaho Falls, ID 83401
AFFILIATION: SEE CODE- 9502158 EG and G Idaho, Inc., Idaho Falls (USA). Idaho National Engineering Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Hill, James R.
TELEPHONE: F233-5626
TYPE OF FUNDING: Contract No.-EY-76-C-07-1570
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: RESEARCH/General (25%);DEVELOPMENT (75%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objectives of this project are: (1) Improved evaluation and subsequent reduction of risks and hazards associated with ERDA work; (2) Improvement of communications and control relating to ERDA risks and hazards - internal and external to ERDA; (3) The establishing of standardization of method and comparability of hazard and risk assessment programs within ERDA; and (4) Improved allocation of resources to risk evaluation and hazard control. Total program scope is indicated on a planning tree.
APPROACH: The approach to be used is a continuing system safety process which: (1) Evaluates ERDA OES needs; (2) Searches the ES field for established and proven analytical methods; (3) Adapts existing methods or develops new programs to fill the needs; (4) Tests the methods in ERDA project context; (5) Designs risk evaluation and hazards control programs which are compatible with good general management practices; (6) Develops and implements software and training programs; and (7) Provides continuous consulting and

evaluation of the effectiveness of those methods implemented within ERDA. The activities indicated above are implemented through a contract based System Safety Development Center.
RESULTS: (1) The product expected is a series of OES guideline manuals and training programs related to implementation of the methods described in the manuals. (2) The results expected are: (a) Improved ERDA safety program based on cost-risk-benefit-communications criteria; (b) Improved comparability between the risks and hazards associated with the several ERDA energy programs; and (c) A reduction in the hazards and risks associated with ERDA programs.
KEYWORDS: SYSTEM SAFETY;SAFETY MANAGEMENT;SAFETY ANALYSIS;US ERDA;PERSONNEL;SAFETY;EDUCATION;COMPARATIVE EVALUATIONS;SYSTEMS ANALYSIS;HAZARDS;MANAGEMENT;PLANNING;COMPUTER CODES;QUALITY CONTROL;INJURIES;SAFETY ENGINEERING;IMPLEMENTATION

<088020>
TITLE: INEL Shutdown Reactors (Surveillance)
PROJECT NUMBER: 800005
PRINCIPAL INVESTIGATOR: Hickman, W.W.
ADDRESS: Aerojet Nuclear Company, Idaho Falls, ID 83401
AFFILIATION: Aerojet Nuclear Co., Idaho Falls, Idaho (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Glauberman, H.
TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-1375
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: There are several surplus radioactively contaminated facilities at the INEL, i.e., ARVFS, ARA IV, TAN-633, LPT-640, IET, Hallam reactor components and others. It is important that these closed facilities do not degrade the surrounding environment or impose a hazard to site personnel or the public.
APPROACH: Surveillance and maintenance.
RESULTS: Continuing surveillance, monitoring and security of INEL surplus radioactively contaminated properly.
PROJECT MILESTONES: Provide minimum surveillance and security for INEL surplus radioactively contaminated facilities to keep them in a safe condition.
KEYWORDS: NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;NUCLEAR FACILITIES;DECOMMISSIONING;INSPECTION;DECONTAMINATION;LAND RECLAMATION;MAINTENANCE;HEALTH HAZARDS;PUBLIC HEALTH;RADIOACTIVE WASTES;WASTE MANAGEMENT;SAFEGUARDS

Energy Research and Development Administration/Nevada Operations Office

<088501>
TITLE: Marshallese Natives at Rongelap, Radiological Studies of the
PROJECT NUMBER: 000472
ADDRESS: Los Angeles, CA
AFFILIATION: Holmes and Narver, Inc., Los Angeles, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma;RADIATION/Beta (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Marshall Islands
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Support for ship-time during medical visit by BNL.
KEYWORDS: MARSHALL ISLANDS;POPULATIONS;EPIDEMIOLOGY;GAMMA RADIATION;BETA PARTICLES;HEALTH HAZARDS;NUCLEAR ENERGY;PATHOLOGICAL CHANGES;GENETIC RADIATION EFFECTS;FALLOUT;DISEASES;MEDICINE;NEOPLASMS

<088504>
TITLE: Continued Management of the Mid-Pacific Marine Laboratory, Eniwetok Atoll, Marshall Islands
PROJECT NUMBER: 000661
PRINCIPAL INVESTIGATOR: Reese, E.
ADDRESS: Hawaii Institute of Marine Biology, University of Hawaii, P.O. Box 1346, Kaneohe, HI 96744
AFFILIATION: Hawaii Inst. of Marine Biology, Honolulu (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(26-1)-628;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$204,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;HYDROGRAPHIC AREAS/Other hydrographic areas Pacific
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project provides management support to marine research projects conducted in and about the Marshall Islands.
KEYWORDS: MARINE LABORATORY;ENIWETOK;MARSHALL ISLANDS;RADIATION MONITORING;SEDIMENTS;AQUATIC ECOSYSTEMS;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;RADIOECOLOGICAL CONCENTRATION;SAMPLING;AQUATIC ORGANISMS;SEAWATER;ENVIRONMENT;PACIFIC OCEAN

<088506>
TITLE: UCLA Support and Calibration Standards Maintenance
PROJECT NUMBER: 000760
PRINCIPAL INVESTIGATOR: Warner, B.P.;Borella, H.M.;Quam, W.M.
ADDRESS: EG and G, Inc., 130 Robin Hill Road, Goleta, CA 93017
AFFILIATION: EG and G, Inc., Goleta, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-AT(29-1)-1183;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: UCLA support under the present funding is planned in the following areas: (1) Maintenance of the NAD detector evaluation counting equipment. (2) An HPRR verification of the non-fissile system if scheduling is not appropriate for FY 75. Additional support work has been proposed in a separate 189 now under consideration.
APPROACH: The TLD and Ion Chamber calibrations are continuously updated by the maintenance of the Calibration Standards Program. This particular calibration program and associated dosimetry has been used in the past to support various UCLA field programs in the Nuclear Accident Dosimetry Program and other ERDA programs requiring dosimetric measurement calibration or verification.
KEYWORDS: THERMOLUMINESCENT DOSEMETERS;IONIZATION CHAMBERS;CALIBRATION;PERSONNEL DOSIMETRY;CALIBRATION STANDARDS

<088508>
TITLE: REECO Logistical Support
PROJECT NUMBER: 000805
PRINCIPAL INVESTIGATOR: Morrow, A.F.
ADDRESS: Reynolds Electrical and Engineering Co., Inc., P.O. Box 14400, Las Vegas, NV 89114
AFFILIATION: Reynolds Electrical and Engineering Co., Inc., Las Vegas, Nev. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$101,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Objectives are to provide a base of operations and administrative and logistical support to investigating organizations conducting funded and approved environmental research projects at the

Nuclear Test Site (NTS). Facilities and support services are used by principal investigators, permanently-assigned project technicians and lab helpers, seasonal personnel and participating visitors.
RESULTS: Objectives are accomplished by the coordination of project requirements with the support contractors' capabilities and resources to assist in the accomplishment of the scientific and technical objectives of the investigators.
YWORDS: LOGISTICS SUPPORT;ADMINISTRATIVE SUPPORT;NEVADA TEST SITE;ENVIRONMENT;MONITORING

<088509>
TITLE: Computer Support--CETO
PROJECT NUMBER: 000807
ADDRESS: Computer Science Corporation, P.O. Box 15390, Las Vegas, NV 89114
AFFILIATION: Computer Sciences Corp., Las Vegas, Nev. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$5,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide computer support at ERDA/Nevada Central Computer Facility to Civil Effects Test Operations (CETO).
KEYWORDS: COMPUTER CALCULATIONS;DATA PROCESSING;CIVIL DEFENSE;HUMAN POPULATIONS;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS

<088511>
TITLE: Research Vessel Operations (Support Operation of LCU)
PROJECT NUMBER: 001168
PRINCIPAL INVESTIGATOR: Holmes and Narver, Inc., Pacific Test Division
ADDRESS: P.O. Box 29939, Honolulu, HI 96820
AFFILIATION: Holmes and Narver, Inc., Honolulu, Hawaii (USA). Pacific Test Div.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-EY-76-C-08-0020
77 FUNDING: Energy Research and Development Administration FY77:$370,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Marshall Island
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Provide for the operation of an LCU (Landing Craft Utility) in the Marshall Islands for use by ERDA sponsored scientific investigators.
KEYWORDS: RESEARCH TRANSPORTATION;MARSHALL ISLANDS;RESEARCH PROGRAMS;PERSONNEL;TRANSPORT;SHIPS;AQUATIC ECOSYSTEMS;SAMPLING;COASTAL WATERS;OPERATION

<088512>
TITLE: Radiological Surveillance of South Pacific Islands
PROJECT NUMBER: 002941
PRINCIPAL INVESTIGATOR: undesignated
AFFILIATION: Energy Research and Development Administration, Las Vegas, Nev. (USA). Nevada Operations Office
MONITORING AGENCY: Energy Research and Development Administration, Las Vegas, Nev. (USA). Nevada Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLCGY: NUCLEAR/Fission (100%)

<088513>
TITLE: Bioenvironmental Transport of Transuranic Elements Metabolism of Curium and Neptunium in Ruminants
PROJECT NUMBER: 001325
PRINCIPAL INVESTIGATOR: Potter, G.D.
ADDRESS: P.O. Box 15027, Las Vegas, NV 89114
AFFILIATION: Environmental Protection Agency, Las Vegas, Nev. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Las Vegas, Nev. (USA). Nevada Operations Office
DIVISION: Nevada Operations Office
MONITOR: Watters, Robert L.
TELEPHCNE: F233-5329
TYPE OF FUNDING: Contract No.-E(26-1)-539
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Transuranics (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the biological uptake, physiological transport, tissue retention and rates of excretion for the transuranic nuclides in large animals.
APPROACH: Neptunium and Curium will be introduced to goats and cows with the transport mechanisms monitored to determine rates and effects.
ESULTS: To provide empirical data for understanding the bioenvironmental uptake and retention of transuranic elements in commercially significant ruminant species.
PROJECT MILESTONES: (1) Complete Neptunium studies in goats Sept. 1976. (2) Complete Curium studies in cows

Sept. 1976. (3) Complete Neptunium studies in cows Sept. 1977. (4) Decisions as to extending studies to other radionuclides and to similar studies in canivores or onmivores Sept. 1977.
KEYWORDS: NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;UPTAKE;BIOLOGICAL EFFECTS;PHYSIOLOGY;RADIONUCLIDE MIGRATION;RADIOACTIVE EFFLUENTS;RADIOISOTOPES;NEPTUNIUM ISOTOPES;CURIUM ISOTOPES;COWS;GOATS;METABOLISM;FOOD CHAINS;FOOD;INGESTION

<088514>
TITLE: Hydrogeochemistry of Eniwetok
PROJECT NUMBER: 001521
PRINCIPAL INVESTIGATOR: Buddemeir, R.W.
ADDRESS: P.O. Box 1346, Kaneole, HI 96744
AFFILIATION: Hawaii Inst. of Marine Biology, Honolulu (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-E(26-1)-641
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Marshall Islands; Pacific Ocean
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The description and quantitative understanding of the hydrology and groundwater geochemistry of Eniwetok Atoll and the use of these results to interpret groundwater radioactivity in terms of leaching, cycling, transport and residence time models, both for the groundwater, soil, vegetation system of specific locales and for the atoll system as a whole.
APPROACH: Perform measurements of tidal lag and efficiency on wells and surface pits, measure changes in water elevation in wells and pits, perform dye and chemical tracer experiments.
RESULTS: To complete objectives described in 93a
PROJECT MILESTONES: (1) Complete physical hydrology study June 1977. (2) Project review and redirection of project Sept. 1977.
KEYWORDS: ENIWETOK;HYDROLOGY;GEOCHEMICAL SURVEYS;GROUND WATER;RADIOACTIVITY;RADIONUCLIDE MIGRATION;SOILS;PLANTS;RADIONUCLIDE KINETICS;TERRESTRIAL ECOSYSTEMS;FOOD

<088515>
TITLE: Environmental Research Park Support
PROJECT NUMBER: 000991
AFFILIATION: Energy Research and Development Administration, Las Vegas, Nev. (USA). Nevada Operations Office
MONITORING AGENCY: Energy Research and Development Administration, Las Vegas, Nev. (USA). Nevada Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;FINANCIAL DATA

<088517>
TITLE: Circulation and Chemistry of the Eniwetok Atoll Lagoon
PROJECT NUMBER: 002571
PRINCIPAL INVESTIGATOR: Smith, S.V.;Stroup, E.D.
ADDRESS: University of Hawaii, Institute of Marine Biology, Kaneohe, HI 96744
AFFILIATION: Hawaii Univ., Kaneohe (USA). Inst. of Marine Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-EY-76-C-08-0703
77 FUNDING: Energy Research and Development Administration FY77:$58,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Eniwetok;COASTS/Other coasts Eniwetok;HYDROGRAPHIC AREAS/Other hydrographic areas Atoll lagoon
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the physical circulation of the Eniwetak Atoll lagoon and the flux of carbon, phosphorus and nitrate across the atoll's reef flats.
APPROACH: Conduct a field measurement program of physical properties using current meters and drogues and of selected nutrient chemical properties by sampling and analysis.
RESULTS: Models depicting the circulation system and residence times of water and certain of its nutrient properties.
KEYWORDS: ENIWETOK;COASTAL WATERS;SEAWATER;SAMPLING;CHEMICAL COMPOSITION;NUTRIENTS;CARBON;PHOSPHORUS;NITRATES;QUANTITATIVE CHEMICAL ANALYSIS;ENVIRONMENTAL TRANSPORT;AQUATIC ECOSYSTEMS;MATHEMATICAL MODELS

<088530>
TITLE: Surplus Facility Surveillance (Gnome)
PROJECT NUMBER: 800008
ADDRESS: Carlesbad, NM
AFFILIATION: Reynolds Electric Corp., Carlsbad, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: C(301) 353-3025
TYPE OF FUNDING: Contract No.-ru040100;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Surveillance and maintenance will be provided. EPA will provide environmental survey of the site and soil monitoring and together with USGS, periodic hydrologic samples will be analyzed. The FY 1978 funding will again permit repairs to the berm surrounding the salt muck pile and performance of periodic radiological inspections.
APPROACH: Continue surveillance including periodic hydrologic samples.
KEYWORDS: NUCLEAR ENERGY;INSPECTION;RADIOACTIVE WASTE MANAGEMENT;DECOMMISSIONING;SOILS;RADIATION MONITORING;TERRESTRIAL ECOSYSTEMS;RADIOACTIVE WASTE STORAGE;ENVIRONMENTAL EFFECTS;HYDROLOGY;NUCLEAR FACILITIES;RADIOACTIVE EFFLUENTS;RADIOISOTOPES;SAFETY

<088531>
TITLE: NRDS Fuel Packaging, Site Surveillance and Disposition
PROJECT NUMBER: 800026
PRINCIPAL INVESTIGATOR: Bond, A.
ADDRESS: Los Alamos Scientific Laboratory, Las Vegas, NV 89114
AFFILIATION: Reynolds Electrical and Engineering Co., Inc., Las Vegas, Nev. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Glauberman, H.
TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-A-8-1-01-NV;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$1,130,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: STORAGE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Task I: Rover and Tory Fuel. Approximately $25.5M worth of fuel remained at the NRDS after closeout of the Space Propulsion Project. This fuel is being processed and shipped to the INEL for further reprocessing.
APPROACH: Task II: Personal Property Processing and Excessing. Responsibility for disposing of the NRDS facility property was assigned to NV on closeout of the Space Nuclear Propulsion Project. An exception to the ERDA (AEC) Manual was granted which allowed the requester of the surplus property to be billed for property management service in the area. During mid-FY 1976 it became apparent that the movement of this property had reached a state where such requests were not covering the costs of managing the property. This task covers the remainder of the work expected to be required for disposing of the remaining uncontaminated personal property in the area.
RESULTS: Task III: NRDS Standby. On completion of the fuel processing and property disposal activities in FY 1977 the NRDS facilities currently in use will be placed in standby status. This task covers the guard costs and periodic maintenance required to protect these assets.
PROJECT MILESTONES: FY 1977. The Tory II C fuel will be processed and shipped to INEL. The facility will be decontaminated and placed on standby status. Property management activities will be completed in FY 1977.
KEYWORDS: NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;NUCLEAR FUELS;PACKAGING;TRANSPORT;INSPECTION;REACTOR DECOMMISSIONING;MANAGEMENT;ROVER REACTORS;SAFEGUARDS

<088532>
TITLE: Design for Medium-Scale LNG Spill Tests
PROJECT NUMBER: 800265
PRINCIPAL INVESTIGATOR: Iturralde, M.
ADDRESS: 50 Briar Hollow Lane, Houston, TX 77027
AFFILIATION: Holmes and Narver, Inc., Houston, Tex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Cece, John M.
TELEPHONE: C(301)353-5486
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$97,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (80%);STORAGE (20%)
POLLUTANTS: NOXIOUS GAS (5%);ORGANICS (5%);HEAT, THERMAL (85%);VISUAL AESTHETICS (5%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Develop conceptual design for medium-scale LNG spill tests to be conducted at either NWC, China Lake or NRDS at NTS. They will provide general plans, cost and time schedules.
APPROACH: Visit the two proposed test sites, evaluate availability of existing equipment, water, etc. Consider topography and meteorology aspects.
RESULTS: Site visits conducted. First draft of information reviewed.
PROJECT MILESTONES: (1) Complete conceptual design Oct. 77. (2) Begin final design Dec. 77.
KEYWORDS: LIQUEFIED NATURAL GAS;ACCIDENTS;HAZARDS;FIRES;TESTING;GAS SPILLS;TOPOGRAPHY;METEOROLOGY;RESEARCH PROGRAMS;SAFETY STANDARDS;PLUMES;ENVIRONMENTAL TRANSPORT

<088533>
TITLE: Gnome Site D/D
PROJECT NUMBER: 800268
PRINCIPAL INVESTIGATOR: Dicker, A.
ADDRESS: P.O. Box 14400, Las Vegas, NV 89114
AFFILIATION: Reynolds Electrical and Engineering Co., Inc., Las Vegas, Nev. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-EY-76-C-08-0410;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To develop plans for return of the Gnome site to BLM and public use. All potential hazards will be evaluated and rendered safe. The residual radioactivity will be established and reduced to acceptable levels. Based upon the site survey, a plan will be selected and carried out for site cleanup.
APPROACH: A radiologic survey will be made of the entire square mile site. A detailed clean-up plan will be developed based on alternative procedures. The clean-up will be completed.
RESULTS: During FY77, Phase I, radiologic survey and project planning will be initiated.
PROJECT MILESTONES: The preliminary target for completion of site clean-up is Oct. 1979.
KEYWORDS: GNOME EVENT;UNDERGROUND EXPLOSIONS;NUCLEAR EXPLOSIONS;LAND RECLAMATION;LAND POLLUTION ABATEMENT;RADIATION MONITORING;RADIOACTIVITY;ENVIRONMENT;WASTES;DECOMMISSIONING;DECONTAMINATION;RADIOISOTOPES

Energy Research and Development Administration/Oak Ridge Operations Office

<089001>
TITLE: Mammalian Genetics and Reproduction
PROJECT NUMBER: 000209
PRINCIPAL INVESTIGATOR: Erickson, B.H.
ADDRESS: 1299 Bethel Valley Road, Oak Ridge, TN 37830
AFFILIATION: UT-ERDA Comparative Animal Research Lab., Oak Ridge, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Lenhard, J.A.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-GEN-242
77 FUNDING: Energy Research and Development Administration FY77:$290,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: From an ontogenetic approach, our objective is to identify, describe, and determine the temporal limits of the various stages in the gametogenic pathway of cattle, swine, and rat and to determine the effect of stage and species within stage on the quantity and quality of germ cells subjected to toxicants emitted by the energy-producing industry.
APPROACH: Effects of toxicants, administered either chronically or acutely, on the germ cell of the female are assayed through counts of germ cells and follicles in serially sectioned ovaries and through observation of reproductive performance, i.e., number and quality of offspring produced during a limited portion of the lifespan. In the male, germ cells are quantified in cross sections of testes and

whole-mounts of seminiferous tubules. The quantity and quality of semen is also assessed.
RESULTS: Parameters, derived from our studies, describing the dose-response curves of the germ cells of cattle, swine, and rat will enable us to predict with reasonable accuracy how the germ cell of man will respond to a given energy-related toxicant at varying stages of development and senescence.
KWORDS: GENETICS;REPRODUCTION;CATTLE;SWINE;RATS;GERM CELLS;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;POLLUTION;TOXICITY;DOSE-RESPONSE RELATIONSHIPS;GAMMA RADIATION;HYDROCARBONS;GAMETOGENESIS;FETUSES

<089002>
TITLE: Late Somatic Effects of Energy Pollutants
PROJECT NUMBER: 000210
PRINCIPAL INVESTIGATOR: Noonan, T.R.
ADDRESS: 1299 Bethel Valley Road, Oak Ridge, TN 37830
AFFILIATION: UT-ERDA Comparative Animal Research Lab., Oak Ridge, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Carter, C.E.
TELEPHONE: C(301)353-3683
TYPE OF FUNDING: Contract No.-E-(40-1)-GEN-242
77 FUNDING: Energy Research and Development Administration FY77:$112,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To improve estimates of risk to humans from various forms of energy generation by studying in long-lived mammals the late somatic effects of ionizing radiation or pollutants associated with use of fossil fuels.
APPROACH: Burros exposed to gamma irradiation in 1951 or 1954 or to neutron-gamma (bomb) irradiation in 1957, together with unirradiated controls, are being maintained under observation. Causes of death of animals dying spontaneously are determined through postmortem examinations. Data on mortality from this and other experiments with long-lived animals will be evaluated using competing risk analysis. Preliminary experiments, designed to study carcinogenic effects of polycyclic aromatic hydrocarbons, are being started, with swine as the experimental animal. Compounds known to be carcinogenic in rodents will be fed or applied cutaneously and the biological effects studied by appropriate methods.
RESULTS: The experimental work with burros will provide data about the carcinogenic effect of ionizing radiation in a species which has a low rate of spontaneous neoplasia. This information will be helpful in understanding relative-versus-absolute risk in radiation carcinogenesis. The results of experiments with chemical carcinogens will enhance the value of extrapolation to man of data obtained from other mammals by increasing the number of species studied.
KEYWORDS: ENERGY SOURCES;POLLUTION;HEALTH HAZARDS;NEUTRONS;GAMMA RADIATION;BIOLOGICAL RADIATION EFFECTS;MORTALITY;BURROS;HYDROCARBONS;NEOPLASMS;RADIOINDUCTION;FOSSIL FUELS;BIOLOGICAL EFFECTS;AGING;ANIMALS;CARCINOGENS;GAMMA RADIATION

<089003>
TITLE: Cytogenetic Studies in Prenatal Mammals
PROJECT NUMBER: 000211
PRINCIPAL INVESTIGATOR: McFee, A.F.
ADDRESS: 1299 Bethel Valley Road, Oak Ridge, TN 37830
AFFILIATION: UT-ERDA Comparative Animal Research Lab., Oak Ridge, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Lenhard, J.A.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-GEN-242
77 FUNDING: Energy Research and Development Administration FY77:$88,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Through the application of in vitro culture techniques, chromosome analyses, and various measures of the in vitro behavior of cells, to investigate the effects of energy-related environmental pollutants on chromosome structure and cell function in representative mammalian systems.
APPROACH: Data from large animals can, in general, be more meaningfully extrapolated to man than that from laboratory species, and extrapolations are always stronger when interspecies comparisons can be made. Structural changes in chromosomes are taken as indicators of genetic rearrangement and thus indicative of mutagenic action by various agents. Aberrations found in the early embryonic stages can be measures of either damaging effects of the embryo or, more important, of damage which has been transmitted from the parent germ cell line.
RESULTS: The level of induction of chromosome aberrations by selected agents applied to preimplantation embryos will be quantitated and evaluated for its relationship to embryo survival. Methodology for obtaining adequate chromosome preparations will be refined in laboratory species and then applied to swine embryos. An ultimate relationship is sought between chromosomal sensitivity in somatic, germ, and embryonic cells within a species so that predictions of germ and embryonic cell sensitivity could be made for man on the basis of somatic cell evaluations.
KEYWORDS: CHROMOSOMES;HYDROCARBONS;MUTAGENESIS;GAMMA RADIATION;CYTOLOGY;CELL CULTURES;ENERGY SOURCES;POLLUTION;BIOLOGICAL EFFECTS;MAMMALS;CHROMOSOMAL ABERRATIONS;EMBRYOS;SWINE;GERM CELLS;SOMATIC CELLS

<089004>
TITLE: Plant Mutagenesis, Metabolism, and Morphogenesis
PROJECT NUMBER: 000215
PRINCIPAL INVESTIGATOR: Constantin, M.J.
ADDRESS: 1299 Bethel Valley Road, Oak Ridge, TN 37830
AFFILIATION: UT-ERDA Comparative Animal Research Lab., Oak Ridge, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITCR: Lenhard, J.A.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E-(40-1)-GEN-242
77 FUNDING: Energy Research and Development Administration FY77:$215,000; Department of Agriculture FY77:$89,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (20%);CONSERVATION/Improved conversion efficiency (50%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION OR END USE (80%);WASTE MANAGEMENT (10%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Objectives are threefold: (1) elucidate biology of regulation and synthesis of aspartate-derived amino acids; (2) determine mechanism of effects on intermediary metabolism induced by energy-related pollutants; and (3) mutagenesis for crop improvement.
APPROACH: The approach in 1 and 2 above are very similar; i.e., learn as much as possible concerning the system under investigation and then design research that utilizes the information. For example, nutrition studies using amino acids alone and in combination with and without analogs help to pinpoint mechanisms and regulatory sites in the pathway in both/barley and tobacco. The presence of and form(s) of key enzymes are determined. Information is then used to design screens to enhance the probability of isolating mutations involving key sites and/or processes that can be utilized for crop improvement.
RESULTS: Expected results include: (1) plant systems that can be utilized to monitor the environment for toxic and/or mutagenic pollutants; (2) improved crop varieties that maintain high productivity of quality products even under environmental stress; (3) barley plant types with increased lysine content; (4) demonstrate feasibility of using in vitro-cultured cells to induce and recover desirable mutants in tobacco, or model system; (5) development of rapid assay system for methionine in soybeans; and (6) biochemical and genetic characterization of mutants that can be utilized to better understand the genetics of amino acid synthesis and the nature of tolerance to pollutants, for example.
KEYWORDS: BARLEY;TOBACCO;ENZYMES;METABOLISM;ENERGY SOURCES;POLLUTION;BIOLOGICAL EFFECTS;MUTAGENESIS;PLANT BREEDING;SOYBEANS;GENETICS;AMINO ACIDS;BIOSYNTHESIS;FOOD;PLANT CELLS;PLANTS;MORPHOLOGICAL CHANGES

<089006>
TITLE: Plant Science
PROJECT NUMBER: 002531
PRINCIPAL INVESTIGATOR: Foard
AFFILIATION: UT-ERDA Comparative Animal Research Lab., Oak Ridge, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLCGY: FOSSIL FUEL/Biomass - pyrolysis (100%)
KEYWORDS: AGRICULTURE;RESEARCH PROGRAMS;CROPS;NUTRIENTS;PLANT GROWTH

<089007>
TITLE: Health and Mortality Study
PROJECT NUMBER: 000481
PRINCIPAL INVESTIGATOR: Mancuso, T.
ADDRESS: University of Pittsburgh, Pittsburgh, PA
AFFILIATION: Pittsburgh Univ., Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-AT-(30-1)-3394;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$190,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This is a retrospective epidemiological study of the health and mortality of workers in AEC/ERDA contractor facilities.
APPROACH: To attempt to establish correlation between deaths of personnel who have been employees at specific nuclear facilities, or deaths of siblings of these employees, and various methods of radiation exposures experienced by these employees.
RESULTS: Data collection on the Hanford workers is complete and initial analysis has been done.
PROJECT MILESTONES: (1) Further refine the data on the Hanford workers and conduct detailed analysis Sept. 30, 1977. (2) Continue data collection on the Oak Ridge workers and perform preliminary analysis Sept. 30, 1978.
KEYWORDS: NUCLEAR FACILITIES;PERSONNEL;BIOLOGICAL RADIATION EFFECTS;RADIATION DOSES;MORTALITY;EPIDEMIOLOGY;DOSE-RESPONSE RELATIONSHIPS;RADIATION INJURIES;HEALTH HAZARDS;DATA COMPILIATION;NEOPLASMS;IN VIVO;MEDICINE;PLUTONIUM

<089008>
TITLE: Atmospheric Turbulence and Diffusion Research
PROJECT NUMBER: 000532
PRINCIPAL INVESTIGATOR: Gifford, F.A.
ADDRESS: National Oceanic and Atmospheric Administration, Atmospheric Turbulence and Diffusion Laboratory, P.O. Box E, Oak Ridge, TN 37830
AFFILIATION: National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. (USA). Atmospheric Turbulence and Diffusion Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3600;C(301)353-3600
TYPE OF FUNDING: Contract No.;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$580,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);SOLAR/General (5%);GENERAL SCIENCE (45%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The purpose of the program is to conduct basic research studies of atmospheric turbulence and diffusion and to provide a continuing meteorological service to ERDA and its contractors in the Oak Ridge Operations area. Basic research includes atmospheric diffusion studies, planetary boundary layers studies, numerical studies of turbulent flows and turbulent heat flux, and momentum transfer studies. Meteorological instrument research is conducted as required to verify and improve the estimates made in connection with the above services and studies. Environmental transport, dispersion and diffusion of pollutants (including modeling and geochemical cycling); physical and chemical transformation of pollutants (e.g., photochemical reactions in atmosphere, adsorption of pollutants by soil particles); processes by which pollutants are removed from air, land and water; meteorological-climatic effects of heat, moisture, and pollutant releases; ecological processes and effects/baseline measurements and determination of ecological parameters; ecological impacts related to chemical disturbances - cycling of pollutants in the biosphere.
APPROACH: Physical and mathematical modeling, and boundary layer structure observations.
RESULTS: The results from this project are in the form of mathematical and physical models describing atmospheric transport and diffusion of energy wastes, the effects of waste heat on the atmosphere, and the structure of the atmospheric boundary layer. These results are directly applicable to environmental impact studies, to Federal regulations, to the design and siting of power plants, and to study of atmospheric effects of energy generation.
PROJECT MILESTONES: (1) 15 Nov. 1976 Wind tunnel operational. (2) 1 June 1977 2-D cooling tower plume model complete. (3) 1 June 1977 Potential flow model operational. (4) 1 Jan. 1978 Mesoscale boundary layer model completed.
KEYWORDS: EARTH ATMOSPHERE;TURBULENCE;DIFFUSION;CALIFORNIA;AIR POLLUTION;METEOROLOGY;MATHEMATICAL MODELS;BOUNDARY LAYERS;SMOG;ENERGY PARKS;HEAT TRANSFER;CLIMATES;PHOTOCHEMISTRY;POWER GENERATION;ENVIRONMENTAL EFFECTS;COOLING TOWERS;SITE SELECTION

<089009>
TITLE: Marine Pollution Studies
PROJECT NUMBER: 000615
PRINCIPAL INVESTIGATOR: Gonzales, J.
ADDRESS: Puerto Rico Nuclear Center, College Station, Mayaguez, PR 00708
AFFILIATION: Puerto Rico Nuclear Center, Mayaguez
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549;C(301)353-5549
TYPE OF FUNDING: Contract No.-E(40-1)-1833
77 FUNDING: Energy Research and Development Administration FY77:$390,000
TECHNOLOGY: FOSSIL FUEL/Coal (34%);FOSSIL FUEL/Oil and Gas (66%)
POLLUTANTS: METALS/Trace metals (46%);HEAT, THERMAL/Power plant effluents (54%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific Unspecified;COASTS/Other coasts Puerto Rico;HYDROGRAPHIC AREAS/Other hydrographic areas Island platform
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To investigate and evaluate the effects of stresses on a coastal marine ecosystem caused by the continuing development of the largest energy converting and petrochemical complex in Puerto Rico.
APPROACH: An integrated team approach will be used to investigate the interaction of physical, chemical and biological systems in the Guayanilla-Tallaboa area. The research will identify and characterize the pollutants in the area and attempt to describe their transport within and through the Bay ecosystem. The stresses on the biological systems caused by these pollutants will be measured and evaluated.
RESULTS: A set of management alternatives for the wise utilization of energy and marine resources.
PROJECT MILESTONES: 1st year, A comprehensive research plan will be developed to determine the programmatic research over the next five years. Specific projects and milestones will come from this plan.
KEYWORDS: SEAS;AQUATIC ECOSYSTEMS;COASTAL WATERS;PUERTO RICO;POLLUTION;ENVIRONMENTAL EFFECTS;ENERGY SOURCES;WASTE HEAT;CHEMICAL EFFLUENTS;HYDROCARBONS;METALS;TRACE AMOUNTS

<089010>
TITLE: Terrestrial Ecology Program
PROJECT NUMBER: 000616
PRINCIPAL INVESTIGATOR: Clements, R.G.
ADDRESS: Puerto Rico Nuclear Center, Caparra Heights Station, San Juan, PR 00935
AFFILIATION: Puerto Rico Nuclear Center, San Juan
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, Charles
TELEPHONE: F233-4208
TYPE OF FUNDING: Contract No.-E(40-1)-1833
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: GENERAL SCIENCE (100%)

CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Site specific Tropical;COASTS/Other coasts North Coast, Puerto Rico
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) To provide baseline ecological data for future environmental assessment studies at the local and regional levels. (2) To determine through an ecosystem approach, management alternatives for the wise utilization of energy, water and land resources.
APPROACH: The study will describe the interrelationships among climate, vegetation, soils, animals and man and their combined influence upon the hydrologic cycle of the drainage basin both at the local and regional level. Programmed research to be ordered by a five year comprehensive research plan.
RESULTS: To produce a data base and models where applicable, for environmental assessment and management.
PROJECT MILESTONES: (1) Completion of Five Year Master Research Plan September 1976. (2) Interim reports on Soil, Plant, Animal and Limnological Surveys, January 1977. (3) Publication of ''Succession and Regrowth follcwing Irradiation in a Tropical Forest''. (4) A ten year summary January 1977. (5) Initiation of the hydrology project of the Upper Espirito Santo Basin, 1978. (6) Establishment of rainage network throughout the drainage basin, 1977. (7) First approximation model of drainage basin, 1978.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;ECOLOGY;MANAGEMENT;ENERGY SOURCES;WATER RESOURCES;LAND USE;CLIMATES;PLANTS;SOILS;ANIMALS;DATA ACQUISITION;ENVIRONMENT;FORESTS

<089011>
TITLE: Comparative Study of Radiation, Chemical and Aging Effects on Viral Transformation
PROJECT NUMBER: 7593
PRINCIPAL INVESTIGATOR: Coggin, J.H.
ADDRESS: College of Medicine, Mobile, AL 36688
AFFILIATION: University of Southern Alabama, Mobile (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
TYPE OF FUNDING: Contract No.-E-(40-1)-3646
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to examine the antigenic and biochemical changes associated with the earliest stages of cell transformation induced by oncodnaviruses acting synergistically with x-irradiation (low-level) or radiomimetic chemicals.
APPROACH: A highly specific, cytotoxic antiserum has been prepared against fetal antigen (EA) present on 10 but no 14 day gestation hamster fetal or embryonic cells. The serum antibody responsible is also capable of destroying a wide variety of sarcomas which are known to carry EA. This serum is being used to detect (by cell cytotoxicity) the earliest appearance of EA on newly transformed sarcoma cells induced in vitro by the co-carcinogenic interaction of x-irradiation, chemicals and SV40. A new method for detecting the earliest transformed cells that appear in an SV40 infected normal cell population employs the culture of cells in polyacrylamide gels which permit only transformed, EA+ cells to attach and proliferate. The release of soluble EA from new transformant cells induced by co-carcinogenic action will be determined and temporally studied.
RESULTS: A highly cytotoxic, highly specific antiserum containing antibodies against EA has been developed which destroys mid-gestation EA+ fetal cells but not term EA- embryo cells. The serum also is highly cytotoxic for established EA+SV40 tumor cells. New, early transformant tumor cells which are induced by the co-carcinogenic action x-irradiation and SV40 were susceptible to anti-EA serum within one day post-infection with SV40 indicating the very early expression of EA.
KEYWORDS: VIRUSES;CHEMICAL RADIATION EFFECTS;AGE DEPENDENCE;BIOCHEMISTRY;X RADIATION;RADIOMIMETIC DRUGS;CARCINOGENS;ANTIGENS;NEOPLASMS;IN VITRO;COMPARATIVE EVALUATIONS

<089012>
TITLE: Water and Geothermal Assessment
PROJECT NUMBER: 7259
PRINCIPAL INVESTIGATOR: Montgomery
ADDRESS: Pasadena, CA 91109
AFFILIATION: California Inst. of Tech., Pasadena (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview/Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-New
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GEOTHERMAL/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
KEYWORDS: WATER RESOURCES;GEOTHERMAL RESOURCES;TECHNOLOGY ASSESSMENT

<089013>
TITLE: Public Policy Issues in Nuclear Waste Management
PROJECT NUMBER: 7404
PRINCIPAL INVESTIGATOR: Pucigua, J.
ADDRESS: 1800 G Street NW, Washington, DC 20550
AFFILIATION: National Science Foundation, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
77 FUNDING: Energy Research and Development Administration FY77:$49,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (80%);HEAT, THERMAL (20%)

CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide a public forum in which to identify and to discuss the legal, institutional, social, environmental, and other public policy issues relating to nuclear waste management.
RESULTS: Conference held 27 to 29 October 1976.
PROJECT MILESTONES: Proceedings published.
KEYWORDS: RADIOACTIVE WASTE MANAGEMENT;NUCLEAR ENERGY;NUCLEAR POWER PLANTS;GOVERNMENT POLICIES;ENVIRONMENTAL IMPACTS;MEETINGS;LEGAL ASPECTS;SOCIAL IMPACT;RADIATION PROTECTION;AIR POLLUTION;WATER POLLUTION;THERMAL POLLUTION;THERMAL EFFLUENTS;RADIOACTIVE EFFLUENTS

<089014>
TITLE: Portable XRF Survey Meter and Personal Sample Reader for Elemental Dosimetry of Industrial Atmospheres
PROJECT NUMBER: 7465
PRINCIPAL INVESTIGATOR: Rhodes, J.R.
ADDRESS: P.O. Box 9908, Austin, TX 78766
AFFILIATION: Columbia Scientific Industries, Austin, Tex. (USA). Applied Research Div.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Butenhoff, Robert L.
TELEPHONE: F233-5349
TYPE OF FUNDING: Contract No.-EE-77-C-05-5464
77 FUNDING: Energy Research and Development Administration FY77:$234,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (10%);GEOTHERMAL/General (10%);SOLAR/General (10%);CONSERVATION/General (20%);GENERAL SCIENCE (10%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (30%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (20%);WASTE MANAGEMENT (10%)
POLLUTANTS: METALS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH (15%);DEVELOPMENT (25%);FULL SCALE DEMONSTRATION (60%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: R and D on system parameters and source terms to be measured followed by design, development, fabrication and testing of prototype X-ray fluorescence (XRF) devices suitable for use in measurement and characterization of airborne particulates in and around industrial plants related to energy programs.
APPROACH: Four major task areas are detailed in the contract which might be summarized as follows: (1) theoretical and parametric studies required to develop detailed performance specifications, (2) design, fabricate and laboratory test two XRF survey meters, (3) evaluate XRF survey meters using a minimum of four selected plant environments and perform necessary source-term calibrations, and (4) prepare a final report and an operating and maintenance manual.
RESULTS: Monthly letter reports, interim technical reports, final report, operating and maintenance manual, and two operating, fully calibrated prototype instruments delivered to DOD upon completion of technical effort.
PROJECT MILESTONES: Completion of theoretical and parametric studies by early spring 1978; preparation of detailed performance specifications for review by early summer 1978; completion of prototype fabrication by late 1978; laboratory tests completed by spring 1979; completion of in-plant evaluations by mid-summer 1979; preparation and delivery of final report and manuals, together with prototype, by early fall 1978.
KEYWORDS: INDUSTRIAL PLANTS;AIR POLLUTION;MONITORING;CHEMICAL EFFLUENTS;AIR POLLUTION MONITORS;PERFORMANCE TESTING;AEROSOLS;X-RAY FLUORESCENCE ANALYSIS;QUANTITATIVE CHEMICAL ANALYSIS

<089015>
TITLE: Fate of Chlorine in Seawater
PROJECT NUMBER: 7616
PRINCIPAL INVESTIGATOR: Wong, G.T.F.
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$56,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts all
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The goal of this project is to identify the products and to estimate their rates of formation during the chlorination of seawater.
APPROACH: The effects of bromide ion concentrations, temperatures, and sunlight on the rate of ''chlorine'' consumption will be followed by three methods: an amperometric titration with phenyl arsene oxide at pH 4 for hypohalites; an iodometric titration with sodium thiosulfate at pH 1.4 for hypohalites and some halates; and UV spectroscopy.
RESULTS: The first two analytical methods will yield information on absolute concentrations while the third approach may give some clues to the identity of the products.
KEYWORDS: SEAWATER;CHLORINE;CHEMICAL EFFLUENTS;CHEMICAL REACTIONS;MARINE DISPOSAL

<089017>
TITLE: Marine Research Boat Operation
PROJECT NUMBER: 001326
PRINCIPAL INVESTIGATOR: Gonzales, J.G.
ADDRESS: Marine Ecology Division, Center for Environment Research, Mayaguez, PR 00708
AFFILIATION: Puerto Rico Univ., Mayaguez
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;COASTS/Other coasts Puerto Rico;HYDROGRAPHIC AREAS/Other hydrographic areas Puerto Rico

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The research boat ''Sultana'' was purchased during FY 76. This boat will serve as the primary field platform and base station for the work done by the Marine Ecology Division.
KEYWORDS: WATER QUALITY;MONITORING;ECOLOGY;AQUATIC ECOSYSTEMS;OCEANOGRAPHY;SHIPS;AVAILABILITY;EQUIPMENT

<089018>
TITLE: Developmental Research
PROJECT NUMBER: 002285
ADDRESS: Center for Environmental and Energy Research, Puerto Rico
AFFILIATION: Puerto Rico Univ., San Juan
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: SOLAR/General (100%)
KEYWORDS: ENVIRONMENT;RESEARCH PROGRAMS;PUERTO RICO

<089019>
TITLE: Environmental Research Park Support
PROJECT NUMBER: 001629
PRINCIPAL INVESTIGATOR: none
AFFILIATION: Center for Energy and Environment Research, Caparra Heights (Puerto Rico)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<089020>
TITLE: Global Effects of Increasing Levels of CO2
PROJECT NUMBER: 2932
PRINCIPAL INVESTIGATOR: Weinberg, A.
ADDRESS: Institute for Energy Analysis, Oak Ridge, TN 37830
AFFILIATION: Institute for Energy Analysis, Oak Ridge, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Carbon Dioxide Effects Research and Assessment
MONITOR: Slade, David H.
TELEPHONE: C(301)353-4208
TYPE OF FUNDING: Contract No.-304-2932
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Carbon dioxide (100%)
CHARACTER OF STUDY: DEVELOPMENT (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop, coordinate, and implement a national then international program of research and assessment to provide confident estimates of social, political, economic and environmental costs of increasing levels of atmospheric carbon dioxide from the combustion of fossil fuels.
APPROACH: (1) Determine future atmospheric concentrations of CO2. (2) Determine climate effects of increasing CO2. (3) Determine environmental impacts of climate change. (4) Determine social, political, economic costs of environmental changes. (5) Determine strategies/technological fixes to alleviate impacts.
RESULTS: Confident estimates of social, political and economic costs in an annual assessment report. Also research papers of conventional kind.
PROJECT MILESTONES: (1) FY 1977 Form institutional mechanisms. (2) FY 1978 Begin research and assessment program. (3) FY 1979 First assessment report.
KEYWORDS: GLOBAL;CARBON DIOXIDE;GLOBAL ASPECTS;ENVIRONMENTAL IMPACTS;CLIMATES;FOSSIL FUELS;COMBUSTION PRODUCTS;SOCIO-ECONOMIC FACTORS;ECONOMIC IMPACT;EARTH ATMOSPHERE;ECOLOGICAL CONCENTRATION;FORECASTING;AIR POLLUTION ABATEMENT;AIR POLLUTION CONTROL;PLANNING

<089021>
TITLE: Onset of Biochemical Abnormalities Induced by Energy-Related Toxicant: (1) Function and Structure of Biomembranes and (2) Surfactants and Lung Metabolism
PROJECT NUMBER: 001923
PRINCIPAL INVESTIGATOR: Snyder, F.L.
ADDRESS: Medical and Health Sciences Division, Oak Ridge Associated University, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: C(301)353-3683
TYPE OF FUNDING: Contract No.;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project is divided into two subprograms: (1) function and structure of biomembranes, and (2) surfactants and lung metabolism. The aim of the biomembrane subprogram is to determine the mechanism(s) by which environmental toxicants derived from diverse energy sources alter the biochemical properties of membranes and their constituents in liver and other mammalian tissues. The aim of the surfactant-lung subprogram is to determine how energy-related toxicants, such as NO/sub 2/, SO/sub 2/, ozone (peroxides), and aliphatic and aromatic hydrocarbons alter lung function at the molecular level.

APPROACH: The approach in the membrane experiments is to determine how the composition of biomembranes can be manipulated with analcgs of lipid precursors and to evaluate specific functional responses elicited by the membrane alteration. In the assessment of preneoplastic changes induced by chemical toxicants, the emphasis is on critical enzymatic indicators associated with the formation of membrane lipids. The approach in the lung-surfactant project deals with the effect of gaseous and hydrocarbon toxicants (derived from energy sources) on the metabolism, transport, and secretion of pulmonary surfactants, and related lipids and proteins. Type II cells and pulmonary secretions will receive the greatest emphasis; mosof the data will be obtained from tissues of mice, rats, and humans. Alveolar type II cell adenomas and type II cells from rat lung grown as monolayers or isolated by gradient centrifugation will primarily be used as test systems.
RESULTS: Results of the studies on membranes and surfactants will provide highly sensitive biochemical indicatcrs for identifying toxicants and carcinogens and their dose-response relations, in general, and the pulmonary ones in particular. We anticipate that the results from our investigation on the modification of cell membrane components can be useful in altering cell transformation and cell cycle changes induced by chemical toxicants. Ultimately, membrane modification techniques could be used in the prevention and treatment of cellular injury caused by exposure to hazardous environmental substances and radiations. Data obtained in the lung-surfactant subprogram are expected to provide: (1) early and sensitive detection of biochemical signs that identify and characterize toxicants in airway tissues; (2) biochemical indicators for the quantitative assessment of dose responses to toxicants in the lung and of subsequent repair processes; (3) underlying mechanisms of toxicant actions in respiratory tissues as a means of getting at the basis for prevention and a cure for the lesions they produce; and (4) suitable diagnostic tests with sputum and lavage fluids for the clinical assessment of the onset, severity, and recovery stages of respiratory diseases induced by energy-derived toxicants.
PROJECT MILESTONES: 1 Nov. 1976 Establish dose-response effects of NO/sub 2/ and pulmonary surfactant. 1 Jan. 1977 Complete membrane modification experiments with N-isopropylethanolamine. 1 Feb. 1977 Complete experiments on turnover of surfactant in acute and chronic NO/sub 2/-exposed rats. 1 July 1977 Establish enzymatic mechanisms of NO/sub 2/-enhancement of lung surfactant levels. 1 Sep. 1977 Complete solubilization and purification studies of three key enzymes responsible for metabolism of tumor-associated lipids (alkyl synthase, alkyl monooxygenase, alkyl desaturase). 1 Dec. 1977 Prepare antibodies for the purified enzymes for completion studies of their mechanism, turnover, regulatory controls, and for use in the development of inhibitors. 1 Jan. 1978 Establish mechanism of surfactant biosynthesis and secretion in alveolar type II cells. 1 Jun. 1978 Complete cell cycle and cell transformation experiments with N-isopropylethanolamine-modified membranes.
KEYWORDS: CELL MEMBRANES;BIOLOGICAL RADIATION EFFECTS;LIPIDS;METABOLISM;RATS;MICE;CARCINOGENS;TUMOR CELLS;ENZYMES;TISSUES;MAMMALS

<089022>
TITLE: Onset of Biochemical Abnormalities Induced by Energy-Related Toxicants, Surfactants and Lung Metabolism
PROJECT NUMBER: 001924
PRINCIPAL INVESTIGATOR: Snyder, P.L.
ADDRESS: Medical and Health Science Division, Oak Ridge Associated Universities, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA). Medical and Health Science Div.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: C(301)353-3683
TYPE OF FUNDING: Contract No.;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS/Polycyclic hydrocarbons (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This project is divided into two subprograms: (1) Function and structure of biomembranes, and (2) Surfactants and lung metabolism. The aim of the biomembrane subprogram is to determine the mechanism(s) by which environmental toxicants derived from diverse energy sources alter the biochemical properties of membranes and their constituents in liver and other mammalian tissues. The aim of the surfactant-lung subprogram is to determine how energy-related toxicants, such as NO/sub 2/, SO/sub 2/, ozone (peroxides), and aliphatic and aromatic hydrocarbons alter lung function at the molecular level.
APPROACH: The approach in the membrane experiments is to determine how the composition of biomembranes can be manipulated with analogs of lipid precursors and to evaluate specific functional responses elicited by the membrane alteration. In the assessment of preneoplastic changes induced by chemical toxicants, the emphasis is on critical enzymatic indicators associated with the formation of membrane lipids. The approach in the lung-surfactant project deals with the effect of gaseous and hydrocarbon toxicants (derived from energy sources) on the metabolism, transport, and secretion of pulmonary surfactants, and related lipids and proteins. Type II cells and pulmonary secretions will receive the greatest emphasis; most of the data will be obtained from tissues of mice, rats, and humans. Alveolar type II cell adenomas and type II cells from rat lung grown as monolayers or isolated by gradient centrifugation will primarily be used as test systems.
RESULTS: Results of the studies on membranes and surfactants will provide highly sensitive biochemical indicators for identifying toxicants and carcinogens and their dose-response relations, in general, and the pulmonary ones in particular. We anticipate that the results from our investigation on the modificatin of cell membrane components can be useful in altering cell transformation and cell cycle changes induced by chemical toxicants. Ultimately, membrane modification techniques could be used in the prevention and treatment of cellular injury caused by exposure to hazardous environmental substances and radiations. Data obtained in the lung-surfactant subprogram are expected to provide: (1) early and sensitive detection of biochemical signs that identify and characterize toxicants in airway tissues, (2) biochemical indicators for the quantitative assessment of dose responses to toxicants in the lung and of subsequent repair processes, (3) underlying mechanisms of toxicant actions in respiratory tissues as a means of getting at the basis for prevention and a cure for the lesions they produce, and (4) suitable diagnostic tests with sputum and lavage fluids for the clinical assessment of the onset, severity, and recovery stages of respiratory diseases induced by energy-derived toxicants.
PROJECT MILESTONES: (1) Establish dose-response effects of NO/sub 2/ and pulmonary surfactant Nov. 1, 1976. (2) Complete membrane modification experiments with N-isopropylethanolamine Jan. 1, 1977. (3) Complete experiments on turnover of surfactant in acute and chronic NO/sub 2/-exposed rats Feb. 1, 1977. (4) Establish enzymatic mechanisms of NO/sub 2/-enhancement of lung surfactant levels July 1, 1977. (5) Complete solubilization and purification studies of three key enzymes responsible for metabolism of tumor-associated lipids (alkyl synthase, alkyl monooxygenase, alkyl desaturase) Sept. 1, 1977. (6) Prepare antibodies for the purified enzymes (see Milestone No. 5) for completion studies of their mechanism, turnover, regulatory controls, and for use in the development of inhibitors Dec. 1, 1977. (7) Establish

mechanism of surfactant biosynthesis and secretion in alveolar type II cells Jan. 1, 1978. (8) Complete cell cycle and cell transformation experiments with N-isopropylethanolamine modified membranes June 1, 1978.
KEYWORDS: SURFACTANTS;METABOLISM;MEMBRANES;FOSSIL FUELS;NUCLEAR FUELS;HEALTH HAZARDS;LUNGS;BRONCHI;PATHOLOGICAL CHANGES;MAN;MICE;RATS;DOGS;LIPOPROTEINS;MEMBRANES;CHEMICAL EFFLUENTS;BIOLOGICAL REPAIR;POLYCYCLIC AROMATIC HYDROCARBONS;TOXICITY

<089025>
TITLE: Coal-Related Disease Detection
PROJECT NUMBER: 001928
PRINCIPAL INVESTIGATOR: Andrews, G.
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)

<089027>
TITLE: Effect of Irradiation and Environmental Hazards on Immune Systems
PROJECT NUMBER: 001930
PRINCIPAL INVESTIGATOR: Gengozian, N.
ADDRESS: Medical and Health Sciences Division, Oak Ridge Associated Universities, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA). Medical and Health Science Div.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$225,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: ORGANICS (10%);RADIATION (90%)
CHARACTER OF STUDY: RESEARCH/Laboratory (75%);ANALYTICAL (25%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To evaluate the physiologic stress imposed on the immune system by chronic and acute radiation and chemical toxicants of environmental importance. The potential immunosuppressive and carcinogenic qualities of chemicals derived from nonnuclear sources of energy are to be monitored on a background of low-level chronic radiation exposure which by itself may not appear to present a significant risk to the organism for survival in a foreign environment. Perturbations in the humoral and cellular immune systems of both adult and fetal animals will be examined from the viewpoint of a potential loss and/or alteration in the development of immunologic surveillance mechanisms controlling the appearance of aberrant cell types, i.e., malignant clones.
APPROACH: In vivo and in vitro test systems will be used to conduct studies at the organismal and cellular level. Exposure of adults and fetal mice to varying levels of chronic radiation will be made to assess their immediate and long-term effects on different components of the immune system. Animal models having two genetically different cell populations, the marmoset and the allogeneic radiation bone marrow chimera, will also be subjected to radiation stress and mesurements made on the cellular and humoral factors mediating tolerance. Perturbations detected in the fine balance between the two incompatible hemopoietic systems will provide a sensitive monitoring system for the potential carcinogenic activity of environmental pollutants such as those derived from the coal liquefaction process.
RESULTS: The following questions should be answered by this project: (1) Identify the interrelationships of the hemopoietic and lymphocytic systems in their recovery from damages inflicted by acute or chronic radiation. (2) Evaluate the immunologic and tumorigenic consequences of radiation in the adult animal when exposed during fetal life and the limits of exposure which may be deleterious to survival of the organism. (3) Determine the physiologic consequences of a loss in immunologic tolerance imposed by environmental insults which may be predictive of malignant cell transformations. (4) Determine whether a high rate of radiation induced chromosomal damage in somatic cells parallels a similarly large genetic hazard.
PROJECT MILESTONES: (1) 1 October 1978 Identify relative radiosensitivity of T and B lymphocytes after acute and chronic radiation. (2) 1 October 1978 Determine immune competence of adult mouse following radiation exposure during fetal life. (3) 1 October 1977 Determine alterations in T and B cells in marmosets exposed to low-level chronic radiation. (4) 1 October 1978 Evaluate effects of polynucleated aromatic amines on T and B cell function in normal mice and allogeneic radiation chimeras. (5) 1 October 1978 Obtain dose response data on induced chromosome aberrations in somatic and germ-line cells of the marmoset following low-level chronic radiation exposure.
KEYWORDS: CYTOGENIC;HEMOPOIETIC;IONIZING RADIATIONS;LOW DOSE IRRADIATION;CHRONIC IRRADIATION;BIOLOGICAL RADIATION EFFECTS;LYMPHATIC SYSTEM;CARCINOGENESIS;IMMUNE REACTIONS;BLOOD FORMATION;MICE;RADIOISOTOPES

<089028>
TITLE: Immunologic Surveillance Mechanisms in Natural and Laboratory-Induced Chimeric Models
PROJECT NUMBER: 001931
PRINCIPAL INVESTIGATOR: Gengozian, N.
ADDRESS: Medical and Health Sciences Division, Oak Ridge Associated University, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (75%);ANALYTICAL (25%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To evaluate the physiologic stress imposed on the immune system by chronic and acute radiation and chemical toxicants of environmental importance. The potential immunosuppressive and carcinogenic qualities of chemicals derived from a nonnuclear source of energy are to be monitored on a background of low-level chronic radiation exposure which by itself may not appear to present a significant risk to the organism for survival in a foreign environment. Perturbations in the humoral and cellular immune systems of both adult and fetal animals will be examined from the viewpoint of a potential loss and/or alteration in the development of immunologic surveillance mechanisms controlling the appearance of aberrant cell types, i.e., malignant clones.
APPROACH: In vivo and in vitro test systems will be used to conduct studies at the organismal and cellular level. Exposure of adults and fetal mice to varying levels of chronic radiation will be made to assess

their immediate and long-term effects on different components of the immune system. Animal models having two genetically different cell populations, the marmoset and the allogeneic radiation bone marrow chimera, will also be subjected to radiation stress and measurements made on the cellular and humoral factors mediating tolerance. Perturbations detected in the fine balance between the two incompatible hemopoietic systems will provide a sensitive monitoring system for the potential carcinogenic activity of environmental pollutants such as those derived from the coal liquefaction process.
RESULTS: The following questions should be answered by this project: (1) Identify the interrelationships of the hemopoietic and lymphocytic systems in their recovery from damages inflicted by acute or chronic radiation. (2) Evaluate the immunologic and tumorigenic consequences of radiation in the adult animal when exposed during fetal life and the limits of exposure which may be deleterious to survival of the organism. (3) Determine the physiologic consequences of a loss in immunologic tolerance imposed by environmental insults which may be predictive of malignant cell transformations. (4) Determine whether a high rate of radiation induced chromosomal damage in somatic cells parallels a similarly large genetic hazard.
PROJECT MILESTONES: (1) Identify relative radiosensitivity of T and B lymphocytes after acute and chronic radiation October 1, 1978. (2) Determine immune competence of adult mouse following radiation exposure during fetal life October 1, 1978. (3) Determine alterations in T and B cells in marmosets exposed to low-level chronic radiation October 1, 1977. (4) Evaluate effects of polynucleated aromatic amines on T and B cell function in normal mice and allogeneic radiation chimeras October 1, 1978. (5) Obtain dose response data on induced chromosome aberrations in somatic and germ-line cells of the marmoset following low-level chronic radiation exposure October 1, 1978.
KEYWORDS: ANIMALS;IMMUNE REACTIONS;GENETIC CONTROL;LYMPHOCYTES;MONKEYS;IMMUNOLOGY;RADIOSENSITIVITY;CHRONIC IRRADIATION

<089030>
TITLE: Health Impact of Hydroelectric Reservoirs in Tropics
PROJECT NUMBER: 001941
PRINCIPAL INVESTIGATOR: Jobin, W.R.
ADDRESS: Puerto Rico Nuclear Center, Caparra Heights Station, San Juan, PR 00935
AFFILIATION: Puerto Rico Nuclear Center, San Juan
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F353-5468;C(301)973-1000 ext. 5468
TYPE OF FUNDING: Contract No.-E(40-1)-1833
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: HYDROELECTRIC (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Tropics
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This study examines the ecology of existing hydroelectric reservoirs in Puerto Rico, in order to determine the factors which cause or prevent health problems related to the reservoirs. The major health problem investigated is schistosomiasis. Methods will be developed for prediction of the extent of disease transmission to be expected in new reservoirs being designed but not yet constructed. Alternate design of reservoirs and other preventive or control measures will be studied. In total this project attempts to assess environmental and health impact of proposed hydroelectric reservoirs, and to develop methods to minimize that impact.
APPROACH: Existing reservoirs in Puerto Rico are primarily for hydroelectric power and irrigation. The 25 major reservoirs will be studied for one year to select six which represent various ages, sizes and levels studied to determine water temperature, volume and quality, algal productivity, productivity of macroscopic vegetation, number and species of mollusks, insects and fish. Available computer models for predicting water temperature, algal productivity and mollusk populations will be calibrated with data from the first year of observation and then used to predict the second year. Available methods for control of bilharzia transmission will be studied for cost and benefits and the optimum measures will be specified to the Health Department.
RESULTS: Six of the 25 reservoirs will be selected for intensive study. Then a complete annual cycle of 4 intensive surveys on each of the six reservoirs will be completed. A computer model of snail populations will be developed for each reservoir and snail populations will be predicted for the next year (FY-1978). Subsequently a second annual cycle of 4 intensive surveys on the six reservoirs will be completed. The observed snail populations will be compared with the previous computer predictions in order to verify the reliability of the model. Methods for controlling snail populations in existing reservoirs will be evaluated and presented to the Power Authority for preliminary trials.
PROJECT MILESTONES: (1) Complete first 4 quarterly surveys on six reservoirs 7/1/77. (2) Complete computer predictions for reservoirs 7/1/77. (3) Complete second 4 quarterly surveys 7/1/78. (4) Recommend action to Power Authority 7/1/79. This study examines the ecology of existing hydroelectric reservoirs in Puerto Rico, in order to determine the factors which cause or prevent health problems related to the reservoirs. The major health problem investigated is schistosomiasis. Methods will be developed for prediction of the extent of disease transmission to be expected in new reservoirs being designed but not yet constructed. Alternate designs of reservoirs and other preventive or control measures will be studied. In total this project attempts to assess environmental and health impact of proposed hydroelectric reservoirs, and to develop methods to minimize that impact.
KEYWORDS: HYDROELECTRIC POWER PLANTS;WATER RESERVOIRS;ECOLOGY;DISEASES;ECOSYSTEMS;EPIDEMIOLOGY;INVERTEBRATES;MAN;PUERTO RICO;SCHISTOSOMIASIS;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS

<089031>
TITLE: MERC--WVU Coal Toxicology Program
PROJECT NUMBER: 2845
PRINCIPAL INVESTIGATOR: Thomas, J.A.
ADDRESS: West Virginia University School of Medicine, Morgantown, WV 26506
AFFILIATION: West Virginia Univ., Morgantown (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, M.
TELEPHONE: C(301)353-3683
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)

ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS (10%);METALS/Hg;METALS/Pb;METALS/Sr;METALS/Cd;METALS/Si;METALS/V (25%);PARTICULATES (40%);CRGANICS (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: ERDA-DBER and the Morgantown Energy Research Center are jointly managing a program at the West Virginia University School of Medicine which will develop and/or use bioassays to determine the pathogenic potential of possible fugitive emissions or effluents of pressurized low Btu coal gasification and combustion and of atmospheric pressure fluidized bed combustion processes and affiliated feed preparation and down-stream control and clean-up technologies.
APPROACH: The MERC in-house projects on Coal Gas/Combustion Effluents Assays and Toxic Coal Particle Identification will provide representative emission materials and supporting characterization research for the program. Bioassays include rabbit pulmonary macrophage morphology viability and activity tests, horomonal changes and teratogenic effects in mice or rats, assays and immune system effects in mice and rats, rat digestive tract and rabbit lung morphology studies, carcinogen and co-carcinogen metabolism and microsomal interactions, behavioral changes in the rat, lobster synapse tests, mollusk ciliary motion tests, and others. These studies will be coordinated with those of Lovelace ITRI and other participating ERDA-sponsored institutions.
RESULTS: Acquired information will direct the development and test the effectiveness of clean-up technologies to make the gasification and combustion processes environmentally acceptable.
KEYWORDS: COAL GASIFICATION;CHEMICAL EFFLUENTS;COAL GAS;LOW BTU GAS;COMBUSTION PRODUCTS;BIOASSAY;RABBITS;POLLUTION CONTROL;RATS;AQUATIC ORGANISMS;AIR POLLUTION;WATER POLLUTION;AEROSOLS;CARCINOGENS;SILVER;LEAD;STRONTIUM;CADMIUM;ALUMINIUM;SILICON;IRON;VANADIUM;GASEOUS WASTES;HYDROCARBONS;IMMUNOLOGY;METABOLISM

<089032>
TITLE: Transport Interactions of Environmental Pollutants with Essential Nutrients
PROJECT NUMBER: 002204
PRINCIPAL INVESTIGATOR: Chertok, R.J.
ADDRESS: 1299 Bethel Valley Road, Oak Ridge, TN 37830
AFFILIATION: UT-ERDA Comparative Animal Research Lab., Oak Ridge, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Carter, C.E.
TELEPHONE: C(301)353-3683
TYPE OF FUNDING: Contract No.-E-(40-1)-GEN-242
77 FUNDING: Energy Research and Development Administration FY77:$414,000; Environmental Protection Agency FY77:$97,500
TECHNOLOGY: FOSSIL FUEL/General (90%);NUCLEAR/Fission (10%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Cd;METALS/Hg (80%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To investigate the interactions of energy-related pollutants with essential nutrients under a variety of nutritional and physiological stresses at several levels of biological organization in an effort to understand these interactions and their mechanisms of contol.
APPROACH: Rats on various Ca:P diets for four weeks are being orally dosed with ''tracer,'' 5 mg or 50 mg of Cd, and serially sacrificed over a 5-day period to determine Cd uptake and distribution. Everted sacs from rats are being utilized to determine the kinetics of Cd movement across the intestine. Intestinal absorption of acute and chronic doses of iron, iron and Cd are being studied in rats, guinea pigs, and swine during iron-stress periods. Placental perfusion and/or fetal uptake studies are in progress using CH/sub 3/Hg, Cd and Ca, and Pu-239 (''tracer'' to high doses) in mice, guinea pigs, sheep, and swine. Isolated renal brush borders from the rat are being utilized to kinetically determine the effects of Cd on amino acid-binding sites. Methodologies are being developed to purify and solubilize intestinal brush borders without the loss of peripheral membrane proteins for the preparation of polyspecific antisera to study protein associations using crosslinking reagents and crossed immunoelectrophoresis.
RESULTS: The experiments are designed to determine the competitive effects of various nutrients and specific physiological stresses on the intestinal absorption of Cd, the subcellular distribution of Cd in the intestinal mucosa, and on the effects of Cd to fetal development, reproduction, and growth. Placental studies should clarify existing data on CH/sub 3/Hg movement, interaction of Ca and Cd movements, and the fetal uptake of Pu-239. Results will also determine the mechanism for Cd-induced aminoaciduria and elucidate the transport-related protein associations at the intestinal brush border.
KEYWORDS: ENERGY SOURCES;POLLUTION;NUTRIENTS;RATS;CALCIUM;PHOSPHORUS;DIET;CADMIUM;GUINEA PIGS;SWINE;INTESTINAL ABSORPTION;PLACENTA;FETUSES;SHEEP;PLUTONIUM 239;AMINO ACIDS;BIOLOGICAL EFFECTS;CARCINOGENS;INGESTION;METABOLISM;METALS

<089034>
TITLE: Production, Purification, and Assay of Thrombopoietin
PROJECT NUMBER: 006033
PRINCIPAL INVESTIGATOR: McDonald, T.P.
ADDRESS: University of Tennessee Memorial Research Center, 1924 Alcoa Highway, Knoxville, TN 37920
AFFILIATION: Tennessee Univ., Knoxville (USA). Memorial Research Center and Hospital
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations, P.O. Box E, Oak Ridge, Tennessee 37830
MONITOR: Frost, A.H. Jr.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-4465
77 FUNDING: Energy Research and Development Administration FY77:$37,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Much progress has been made in the last few years on research concerning thrombopoietin (TSP). The development of suitable assay procedures for thrombopoietin has made available a useful research tool whereby many questions can be answered. The objectives of this research are to establish the

existence of thrombopoietin (TSP), the site(s) of production, the chemical nature, and mechanisms of action of TSP.
APPROACH: The methods to be used include measurement of megakaryocytopoiesis in mice by TSP; measurement of the production of TSP by kidney cells in culture; investigation of erythropoietin and TSP interactions; continuation of the work on anti-TSP; continuation of work in purification of TSP; further development of a bioassay for TSP; testing for TSP in sera of various patients with platelet production disorders; and measuring the TSP levels and determining the platelet function in dogs with cycling thrombopoiesis. A variety of physical, chemical, and immunological techniques will be used.
RESULTS: Successful accomplishment of the objectives of this proposal will provide additional information for predicting the characteristics of TSP and provide new information concerning the thrombopoietic response in irradiated animals and in humans following irradiation accidents.
PROJECT MILESTONES: The overall goals of this research project are (1) to identify chemically the thrombopoietin (TSP) molecule, (2) to develop a sensitive, reproducible, and easily performed assay procedure for TSP, (3) to determine its site(s) of production, and (4) to determine the mechanisms that cause elaboration of the thrombopoietin molecule in response to thrombocytopenia.
KEYWORDS: THROMBOPOIESIS;HORMONES;BIOASSAY;BIOSYNTHESIS;MICE;BLOOD FORMATION;ERYTHROPOIETIN;PURIFICATION;BLOOD PLATELETS;DOGS;BIOLOGICAL RADIATION EFFECTS;KIDNEYS;ANIMAL CELLS;HORMONES

<089036>
TITLE: Mechanisms of Innate Immunity: Cytoplasmic Granules of Polymorphonuclear Neutrophilic Granulocytes, Antimicrobial Action, Translocation, Role and Fate in Antimicrobial Phagocytosis
PROJECT NUMBER: 006069
PRINCIPAL INVESTIGATOR: Spitznagel, J.K.
ADDRESS: 140 MacNider Hall, UNC School of Medicine, Chapel Hill, NC 27514
AFFILIATION: North Carolina Univ., Chapel Hill (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations Office
MONITOR: Frost, A.H.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-3628 UNC;Interagency agreement
77 FUNDING: Energy Research and Development Administration FY77:$24,000; National Institutes of Health FY77:$59,600
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (5%);PARTICULATES (5%);ORGANICS (5%);SPECIFIED OTHER POLLUTANTS/Influence on resistance to infection (85%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To establish immunochemical markers for the cytoplasmic granules of human polymorphonuclear neutrophil granulocytes. To investigate the contribution of constituents of the granules to antimicrobial action of polymorphs, to study the degranulation, translocation, function and fate of granule constituents in phagocytosis, to ascertain the influence of radiation and atmospheric pollutants such as might be generated by coal gasification on the integrity and function of these cells and their granule mechanisms.
APPROACH: To isolate granules, to dissect them with routine techniques for extraction of membrane bound structures, to resolve the extracted proteins, to identify the biological activity of the constituent proteins (i.e., antibacterial, peroxidatic, proteolytic, neurolytic, etc.) to raise antibodies to these proteins, to develop immunoassays and immunofluorescent conjugates that can be used to detect and measure proteins crucial to intraleukocytic killing of bacteria and to trace them both in bulk phase and at the cellular level, to ascertain their movements and effects during antibacterial phagocytosis and when the cells are exposed to pollutants.
RESULTS: To identify and dissect the normal functions of polymorphs and their granule-phagosomal system in phagocytosis and killing of bacteria. To evaluate the influence of particulate and gaseous air pollutants on these functions.
PROJECT MILESTONES: When we can with quantitative immunochemistry (single radial immunodiffusion, radioimmunoassay), and quantitative as well as qualitative immunofluorescence measure the above parameters in polymorphs from normal persons with or without the in vitro exposure of the polymorphs to atmospheric pollutants.
KEYWORDS: IMMUNITY;BIOCHEMICAL REACTION KINETICS;AIR POLLUTION;HEALTH HAZARDS;TOXICITY;LEUKOCYTES;BIOLOGICAL REPAIR;RADIATIONS;POLLUTION;CYTOLOGY;BACTERIA;PATHOGENESIS;BLOOD;ENZYMES;PATHOLOGICAL CHANGES

<089037>
TITLE: Study of the Influence of Hormones on the Transport of Cations into and out of Bone
PROJECT NUMBER: 006071
PRINCIPAL INVESTIGATOR: Talmage, R.V.
ADDRESS: Orthopaedic Research Labs., Rm. 241 Clinical Sciences Bldg., UNC School of Medicine, Chapel Hill, NC 27514
AFFILIATION: North Carolina Univ., Chapel Hill (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wachholz, Bruce W.
TELEPHONE: F233-3390
TYPE OF FUNDING: Contract No.-E-(40-1)-4106
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS/Laboratory chemicals (40%);RADIATION/Radioisotope tracers (30%);SPECIFIED OTHER POLLUTANTS/Animal wastes (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: This is a basic science project for determination of cation movement between blood and bone. Goals for this project are to understand the basic metabolism of bone leading to an increased knowledge of the incorporation of the method of cations into bone, and factors causing pathological conditions.
KEYWORDS: BONE TISSUES;METABOLISM;CATIONS;TISSUE DISTRIBUTION;ANIMALS;DISEASES;HORMONES

<089038>
TITLE: Developmental Approach to the Study of Immunologic Tolerance
PROJECT NUMBER: 006075
PRINCIPAL INVESTIGATOR: Hyde, R.M.
ADDRESS: Department of Microbiology and Immunology, College of Medicine, University of Oklahoma, Norman, OK
AFFILIATION: Oklahoma Univ., Norman (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(40-1)3792;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (20%);GENERAL SCIENCE (80%)
POLLUTANTS: RADIATION (20%);SPECIFIED OTHER POLLUTANTS/Drugs (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The research proposed will investigate the nature of the intracellular events which result in the loss of immunologic responsiveness to soluble human gamma globulin (sHGG) in mice. CBF1 mice will be placed on high dose regimens of various drugs, injected with sHGG and used as T cell donors 4 to 48 hours later in immunologic reconstitution experiments. Syngeneic irradiated recipients will be injected with normal bone marrow cells plus thymus cells from animals treated with metabolic modulators and sHGG. Thymus cells will be cultured for short periods of time in vitro and the metabolic events which occur during the development of immune tolerance will be monitored. Attempts will be made to reverse tolerance by trypsin treatment to remove bound antigen. Suppressor cells will be isolated and the mechanism of the immunosuppressive activity will be investigated by the use of metabolic inhibitors.
RESULTS: Puromycin aminonucleoside has been found to block the induction of immune tolerance in murine thyocytes in vivo. Thymus cells can be maintained in culture for 24 to 48 hours without loss of the ability to reconstitute thymus-dependent immune responses in irradiated recipients. Tolerant thymus cells do not spontaneously regain immunocompetence when similarly cultured.
KEYWORDS: IMMUNE REACTIONS;MICE;GLOBULINS-GAMMA;GENETIC CONTROL;BIOLOGICAL RADIATION EFFECTS;DRUGS;IMMUNOSUPPRESSION;MAN;IMMUNITY

<089039>
TITLE: Studies in Iodine Metabolism
PROJECT NUMBER: 006096
PRINCIPAL INVESTIGATOR: Van Middlesworth, L.
ADDRESS: University of Tennessee Center for the Health Sciences, 800 Madison Avenue, Memphis, TN 38163
AFFILIATION: Tennessee Univ., Memphis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-AT(40-1)-1643
77 FUNDING: Energy Research and Development Administration FY77:$53,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION/Radioiodine (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study iodine metabolism under different conditions, as it relates to the intake of radioactive iodine. To evaluate the determinants of iodine concentration in thyroid glands and methods to release radioiodine burdens from the thyroid gland. To evaluate natural radioactivity present in normal thyroids, in addition to artificial radioactivity which may be added. To evaluate the safety of methods to inhibit accumulation of radioiodine in thyroids and also to expedite the release of radioiodine in thyroids.
APPROACH: (1) Study iodine metabolism in stimulated glands (experimental animals fed low-iodine diet). (2) Study metabolism of thyroid hormones in human beings and rats. (3) Continuous observation of world-wide fallcut of I-131. (4) Radioaudographs of thyroids containing natural radium received from U.S.A., Columbia, South America, Nigeria, and other areas. (5) Investigate the effects of agents which hasten release of radioiodine from thyroids of adult rats, newborn rats, and embryonic rats. (6) Study undesirable side effects produced by agents which cause the release of iodine from thyroid glands.
RESULTS: (1) To determine, in retrospect, the exposure of animal populations to environmental I-131. (2) To minimize the hazards and reduce the retention of radioiodine in thyroid glands and to hasten the release of radioiodine with minimum undesirable complications. (3) Possibly aid in the world-wide survey for the presence of uranium deposits. (4) Improve the management and prevention of endemic goiter and endemic cretinism.
PROJECT MILESTONES: (1) Found commercial baby food to be very goitrogenic; corrected by manufacturer after our results published. (2) First developed in vivo method of isotope equilibrium; used to study iodine metabolism. (3) First observed worldwide fallout of I-131 in thyroid glands. (4) Measured radioiodine fallout from most atmospheric nuclear tests since 1954, in both hemispheres. (5) Found small pools of iodine in thyroid glands which turn over 20 times slower than major functional pool. (6) First observed radium in cattle thyroids, concentrated in nodules of barium sulfate. (7) First showed that goiter could be produced by fecal excretion of thyroid hormone. (8) First showed that goiter could be produced by interferring with effectiveness of thyroxin in the animal. (9) First to demonstrate liver scans from labelled thyroxin in human beings. (10) First to show that rats born to low-iodine diet had little or no triiodothyronine in thyroids (contrary to adults).
KEYWORDS: IODINE;METABOLISM;THYROID;IODINE 131;RATS;MAN;RADIUM;FALLOUT;BIOLOGICAL RADIATION EFFECTS;FOOD;HORMONES;IN VIVO;RADIOISOTOPES

<089041>
TITLE: Regulatory Mechanisms of Eosinopoiesis
PROJECT NUMBER: 006173
PRINCIPAL INVESTIGATOR: Bernheim, F.;Ottolenghi, A.
ADDRESS: Department of Physiology and Pharmacology, Medical Science, IA, Duke University Medical Center, Durham, NC 27701
AFFILIATION: Duke Univ., Durham, N.C. (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Frost, A.H.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-3329
77 FUNDING: Energy Research and Development Administration FY77:$17,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The proposed work will investigate the response of the major eosinophilic leukocyte compartments of the rat to exposure to x-irradiation of selected areas of the abdomen. The response of the eosinophils population to specific antisera and a number of bacterial endotoxins and their subfractions will also be tested.
APPROACH: Animals will be exposed to x-rays with partial body shielding involving alternatively the abdomen or the rest of the body to determine the reciprocal influence of these organs on eosinophil kinetics. The presence of eosinotactic material in normal and post-radiation intestine will be studied by comparison with extracts from the organs of animals exhibiting massive eosinophil infiltration (trichinella injected rats, dexamethasone treated rats). Such extracts will be fractionated by gel filtration prior to testing of their eosinotactic activity in vitro (millipore chambers) and in vivo (peritoneum, blood, subcutaneous tissue).
RESULTS: The general scope of the research is to identify the factors governing eosinophil production in the marrow and their distribution in peripheral tissues. The prevalent distribution of these cells outside the bloodstream and the availability of an enzymatic method (phospholipase B estimation) to determine their numbers provides a unique model for obtaining quantitative data in both normal and experimental conditions. The long-range impact of these studies can be projected into the fields of bone marrow kinetics (radiation injury and recovery, anti-cancer agents), immunology (asthma, allergies, etc.) and parasitology (Angiostrongylus, Schistosoma, Trichinella).
KEYWORDS: LEUKOPOIESIS;EOSINOPHILS;RATS;X RADIATION;BIOLOGICAL RADIATION EFFECTS;IMMUNE SERUMS;SHIELDING;BONE MARROW;ABUNDANCE;ANIMAL CELLS;ENZYMES

<089042>
TITLE: Radiation Biophysical Study of Biological Molecules
PROJECT NUMBER: 006174
PRINCIPAL INVESTIGATOR: Fluke, D.J.
ADDRESS: Department of Zoology, Duke University, Durham, NC 27706
AFFILIATION: Duke Univ., Durham, N.C. (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Mason, Earl M.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-3631
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective is to increase understanding of radiation effects in biological systems and their cellular and biochemical components. The radiation includes ionizing and photobiological components.
APPROACH: The temperature dependence of the direct action of radiation provides one approach to distinguishing mechanisms independent of solvent-mediated effects. Indirect action is also studied in relation to inactivation kinetics and scavenge processes. The overlap of ionization and excitation-induced processes is studied, together with independent follow-up of excitational photobiological consequences expected.
RESULTS: It is expected that wider varieties of radiation damage mechanisms will be established and that some of these will be understood at a more detailed chemical level than otherwise.
PROJECT MILESTONES: No sharp milestones are expected, but rather an increased understanding of processes already understood in some degree.
KEYWORDS: ANIMAL CELLS;PLANT CELLS;CELL CONSTITUENTS;MOLECULES;BIOLOGICAL RADIATION EFFECTS;TEMPERATURE DEPENDENCE;IONIZING RADIATIONS;PHOTOCHEMISTRY;X RADIATION;ULTRAVIOLET RADIATION

<089043>
TITLE: Mechanisms of Recombination and Function of DNA in Bacteria
PROJECT NUMBER: 006175
PRINCIPAL INVESTIGATOR: Guild, W.R.
ADDRESS: Department of Biochemistry, Duke University Medical Center, Durham, NC 27710
AFFILIATION: Duke Univ., Durham, N.C. (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Shepherd, George
TELEPHONE: F233-3681
TYPE OF FUNDING: Contract No.-E(40-1)-3941
FUNDING: Energy Research and Development Administration FY77:$43,000
CHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION/UV;RADIATION/X-ray (50%);SPECIFIED OTHER POLLUTANTS/Mutagens, carcinogens (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Total analysis of molecular mechanisms of gene transfer, genetic recombination, damage, repair, and function of DNA.

APPROACH: Analyze genetic processes in pneumococcus, including all stages of transformation by free DNA, and the behavior of phages and their DNA. Use recipient cells mutated in one or more functions affecting DNA metabolism. Cells, DNA, and/or phage are also treated with radiation and/or other agents to assess the nature of the damage and how it affects the overall genetic processes, continual comparison of results to those from other systems, for insight into applicability.
RESULTS: Better understanding of the molecular mechanisms operating on DNA in one particular system, which should help clarify other systems as well.
KEYWORDS: DNA;BACTERIA;GENE RECOMBINATION;BIOLOGICAL REPAIR;PNEUMOCOCCUS;BACTERIOPHAGES;RADIATIONS;BIOLOGICAL RADIATION EFFECTS;RADIATION INJURIES;MOLECULAR BIOLOGY;GENETICS;ULTRAVIOLET RADIATION;X RADIATION

<089044>
TITLE: Molecular Biology of Reovirus Multiplication
PROJECT NUMBER: 006176
PRINCIPAL INVESTIGATOR: Joklik, W.K.
ADDRESS: Department of Microbiology and Immunology, Duke University Medical Center, Durham, NC 27710
AFFILIATION: Duke Univ., Durham, N.C. (USA). Medical Center
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Frost, A.H., Jr.
TELEPHONE: F850-4105
TYPE OF FUNDING: Contract No.-E-(40-1)-3857
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to gain an understanding of the molecular and genetic events that occur during multiplication of an animal virus, reovirus. This virus is representative of a group of viruses that cause diseases in man such as Colorado tick fever and infantile gastroenteritis, as well as diseases in animals of economic importance such as Bluetongue and African horse sickness.
APPROACH: The approach is biochemical (for example, sequencing the 5'-terminal regions of reovirus messenger RNA molecules, the study of the interaction of reovirus-coded polypeptides with both single- and double-stranded RNA and studies of how reovirus induces the synthesis of the antiviral substance interferon), as well as genetic, in that use is made of a series of temperature-sensitive mutants of reovirus that were isolated in this laboratory some time ago.
RESULTS: The results of these studies should add to our understanding of genetic control and regulation. Such studies are much more conveniently studied for small genomes, such as that of reovirus, than for large cellular genomes; but it is expected that many of the insights obtained as a result of these studies will be directly applicable to the human cell and the human genome.
PROJECT MILESTONES: This project has been underway for several years. Among the milestones are the isolation and biochemical and genetic characterization of a series of temperature-sensitive mutants of reovirus (by far the largest series available anywhere; these mutants are now being used by several other laboratories), studies on the mode of induction of interferon by reovirus and its mutants, studies on reovirus-coded polypeptides, studies on the nature of the reactions responsible for virus-induced cytopathogenicity, and studies on the mode of action of interferon.
KEYWORDS: VIRUSES;REPRODUCTION;BIOCHEMICAL REACTION KINETICS;GENETIC CONTROL;MUTANTS;MOLECULAR BIOLOGY;RNA;MUTATIONS;ANIMAL CELLS

<089045>
TITLE: Research Program in Molecular Biophysics
PROJECT NUMBER: 006179
PRINCIPAL INVESTIGATOR: Kasha, M.
ADDRESS: Florida State University, Tallahassee, FL 32306
AFFILIATION: Florida State Univ., Tallahassee (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E-(40-1)-2690
77 FUNDING: Energy Research and Development Administration FY77:$375,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Molecular energy processes and energy transfer processes related to biophysical aspects of life processes. Model systems whose basic molecular mechanisms may reveal new practical energy conversion schemes and serve as the bases for understanding and dealing with environmental perturbations of living systems.
APPROACH: Fundamental techniques of physical chemistry and molecular biology.
RESULTS: Fundamental mechanisms in molecular biological and biophysical processes.
KEYWORDS: BIOPHYSICS;MOLECULAR BIOLOGY;HEALTH HAZARDS;ENERGY CONVERSION;CHEMICAL REACTION KINETICS;GENETICS;CHROMOSOMAL ABERRATIONS;FOSSIL FUELS;ANIMALS;DNA;RNA;ULTRAVIOLET RADIATION

<089047>
TITLE: Formation and Repair of Gamma-Ray Induced Nucleic Acid Base Damage in Bacteria and Mammalian Cells; (new) Formation and Repair of Physically and Chemically Induced DNA Damage in Human Cells
PROJECT NUMBER: 006183
PRINCIPAL INVESTIGATOR: Cerutti, P.A.
ADDRESS: University of Florida, J. Hillis Miller Health Center, J-245, Gainesville, FL 32610
AFFILIATION: Florida Univ., Gainesville (USA). J. Hillis Miller Health Center
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Frost, A.H., Jr.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-4155
77 FUNDING: Energy Research and Development Administration FY77:$63,000; National Institutes of Health FY77:$58,700
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS: ORGANICS (10%);RADIATION (90%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The repair of DNA damage induced by energy-related physical (e.g., ultraviolet light and ionizing radiation) and chemical agents (benz(a)pyrene) in human cells is of fundamental importance to basic molecular biology as well as the health sciences. The systematic study of formation and excision of products of the 5,6-dihydroxy-dihydrothymine type in DNA induced by ionizing radiation and ultraviolet light and of the guanine-benz(a)pyrene adduct is being undertaken in rodent and human cells under in vivo and in vitro conditions. In particular, excision repair of gamma-ray and benz(a)pyrene lesions will be studied in cells from patients with the hereditary diseases Xeroderma pigmentosum, Fanconi's Anemia, and Ataxia telangiectasia which are characterized by increased chromosomal abberration frequencies and cancer. These studies are expected to provide information about the mechanism(s) of processing of DNA lesions, and the relationship between DNA damage and physical and chemical carcinogenesis.
APPROACH: For in vivo studies, mammalian cells are labeled with thymidine-methyl(H-3), then irradiated with gamma-rays or ultraviolet light. Various cell types and incubation conditions are used and the excision of products of the 5,6-dihydroxy-dihydrothymine type from the acid-precipitable material is measured by an alkaline-acid degradation assay developed in our laboratory. The excision repair of benz(a)pyrene DNA adducts is studied in metabolizing cells in double label experiments using (CO-14)thymidine and (H-3)-benz(a)pyrene. For in vitro studies, radioactively labeled exogenous DNA, primarily from bacteriophage, is irradiated or treated with active benz(a)pyrene metabolites and incubated with extracts from rodent or human cells. Damage excision is measured by chromatographic procedures.
RESULTS: Damage introduced into DNA by various physical (e.g., ultraviolet light and ionizing radiation) or chemical agents, the spontaneous loss of a small number of DNA bases and mismatched base-pairs introduced by errors in repair or replication may impair the biological functions of DNA by similar mechanisms. Most cells have evolved elaborate mechanisms for the repair of DNA damage or more generally of defaults in the DNA structure. Prereplication excision repair is particularly efficient in human cells. If repair does not occur or remains incomplete, the cytopathological effects may range from cell death, induction of mutations to malignant transformation and possibly cell aging. The proposed studies are expected to supply information about the mechanisms of processing of DNA lesions in human cells and the relationship between different types of DNA damage and their biological effects. Emphasis will be placed on studies of prereplication excision repair of products of the 5,6-dihydroxy-dihydrothymine type and guanine-benz(a)pyrene adduct in normal and diseased human skin fibroblasts (Xeroderma pigmentosum, Fanconi's Anemia, Ataxia telangiectasia).
KEYWORDS: GAMMA RADIATION;NUCLEIC ACIDS;BACTERIA;DNA;ANIMAL CELLS;BIOLOGICAL REPAIR;ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;BENZOPYRENE;THYMIDINE;CARBON 14;TRITIUM;TRACER TECHNIQUES;SKIN;FIBROBLASTS;BIOLOGICAL EFFECTS;CARCINOGENS;MUTAGENESIS

<089048>
TITLE: Biohazards Risk Analysis
PROJECT NUMBER: 002555
PRINCIPAL INVESTIGATOR: Totter, J.
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$175,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ANIMALS;BIOLOGICAL EFFECTS;HAZARDOUS MATERIALS;PHYSIOLOGY;HEALTH HAZARDS

<089049>
TITLE: Enzymatic Synthesis of Eukaryotic Nucleic Acids
PROJECT NUMBER: 006185
PRINCIPAL INVESTIGATOR: Mans, R.J.
ADDRESS: 334 Nuclear Sciences Center, University of Florida, Gainesville, FL 32605
AFFILIATION: Florida Univ., Gainesville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental
MONITOR: Duda, George
TELEPHONE: F233-3681
TYPE OF FUNDING: Contract No.-AT-(40-1)3982
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: SOLAR/Biomass (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To construct a model system capable of the synthesis of gene products in a test tube: The model must. (1) Synthesize enough biopolymers to permit their chemical characterization, (2) Respond to the same internal or external stimuli that the cellular components exhibited in vivo, (3) Be tightly coupled so as to follow the flow of genetic information from DNA through transcription and processing through to translation of a specific protein.
APPROACH: (1) Molecular biology, enzymology and nucleic acid chemistry. (2) Isolate, purify and chemically characterize the cellular components (from corn) that synthesize RNA, process RNA, translate RNA. (3) Reassemble them under experimentally arranged conditions.
RESULTS: To be able to manipulate the use of timing of specific genetic information in agronomically important crops especially corn.
PROJECT MILESTONES: (1) Solubilization of RNA polymerase from a plant tissue (1962) purified in 1964. (2) Isolation of a cell-free protein synthesizer systems in corn (1960). (3) Isolation of the polyadenylylating system in plants (1970). (4) Demonstration of the mode of action of coodycepintic phosphate (1973). (5) Added poly A sequence to histone mRNAs and prepare reverse transcript probes.
KEYWORDS: DIFFERENTIATION;GENE REGULATION;NUCLEIC ACIDS;GENES;BIOSYNTHESIS;POLYMERS;MOLECULAR BIOLOGY;ENZYMES;RNA;PROTEINS;BIOCHEMISTRY;PLANTS;DNA

<089050>
TITLE: Role of RNA Dependent DNA Polymerase in Gene Expression of Neurospora crassa
PROJECT NUMBER: 006204
PRINCIPAL INVESTIGATOR: Dutta, S.K.
ADDRESS: P.O. Box 83, Adm. Building, Howard University, Washington, DC 20059
AFFILIATION: Howard Univ., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Shephard, G.
TELEPHONE: F233-3681
TYPE OF FUNDING: Contract No.-E(40-1)4182
77 FUNDING: Energy Research and Development Administration FY77:$18,000; Department of the Navy
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The enzyme reverse transcriptase is of considerable significance not only for oncogenic viruses but also for its role in normal cell development, differentiation and antibody formation. RNA-Dependent DNA Polymerase (RDDP) first observed by us in N. crassa, will be isolated, purified and characterized. The role of this enzyme in differentiation, gene amplification and RNA mediated transformation in the eukaryotic fungus N. crassa will be investigated.
APPROACH: The enzyme RDDP will be isolated and characterized as to its nature and immunological relationships and will be measured quantitatively in different cell types of N. crassa. Estimation of, and role of RDDP in rRNA gene amplification in cell types will be done using standard nucleic acid hybridyzation and enzymological procedures. RNA mediated transformation will be studied using auxotrophic mutants of N. crassa.
RESULTS: The new knowledge expected from the proposed experiment will be as follows: (1) Characterization of the nature, (including immunological relationships) of the RNA-dependent DNA polymerase in a lower eukaryotic organism. (2) Characterization of a unique RNA-bound reverse transcriptase in a lower eukaryotic cell. (3) Role of RNA-dependent DNA polymerase in rRNA gene repetition in differentiated cell types. (4) The nature (size and nucleotide composition) of RNA molecules which induce transformation in N. crassa, and (5) Understanding of the distinction between RNA and DNA-induced transformation in N. crassa by genetic (tetrad) analysis of the sexual progenies of the crosses between transformants (revertants) and their donor and/or recipient cells.
PROJECT MILESTONES: (1) The purification and characterization of a biomedically significant enzyme, RNA-Dependent DNA polymerase (RDDP) will be done. (2) Extensive investigation on the correlation of virus-like particles (VLP) with RDDP, associated with normal differentiation and development will be done. (3) Role, if any, of RDDP in gene amplification and cell transformation will be done.
KEYWORDS: RDDP;RNA;DNA;POLYMERASES;GENES;NEUROSPORA;ENZYMES;PURIFICATION;GENETICS;NUCLEIC ACIDS;HYBRIDIZATION;IMMUNE REACTIONS;BIOCHEMICAL REACTION KINETICS;MOLECULAR BIOLOGY;MUTATIONS;VIRUSES;NEOPLASMS

<089052>
TITLE: Mutagenic Effect of Radionuclides Incorporated into DNA of Drosophila melanogaster
PROJECT NUMBER: 006226
PRINCIPAL INVESTIGATOR: Lee, W.R.
ADDRESS: Department of Zoology and Physiology, Louisiana State University, Baton Rouge, LA 70803
AFFILIATION: Louisiana State Univ., Baton Rouge (USA). Dept. of Zoology and Physiology
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations Office
MONITOR: Frost, A.H., Jr.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(940-1)-3728
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: FOSSIL FUEL/General (15%);NUCLEAR/General (50%);GEOTHERMAL/General (15%);GENERAL SCIENCE (20%)
ENERGY CYCLE: STORAGE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (20%);SPECIFIED OTHER POLLUTANTS/Radionuclides (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To measure the genetic effect of tritium incorporated into specific sites in DNA or protein of Drosophila melanogaster spermatozoa. Previous experiments with prokaryotes have shown that transmutation of tritium in the 5-position of cytosine results in C yields T transitions. Work on this project with the eukaryote D. melanogaster has shown that when tritium is incorporated into the 5-position of cytosine there is an increase in the mutation frequency over that observed when the DNA precursor deoxycytidine is generally labeled. Additional data are needed to determine the genetic effect of tritium labeling in other positions within DNA and in a non-DNA molecule.
APPROACH: Tritium is incorporated into specific sites in DNA or nuclear protein by feeding male larvae of D. melanogaster precursors labeled with tritium as follows: 5-, 6- and (G)-labeled deoxycytidine, methyl- and 6-labeled deoxythymidine and 3-labeled arginine. The amount of tritium per cell will be determined by liquid scintillation methods used in our previous experiments to determine the genetic effects of transmutation of P-32, P-33, C-14 and now H-3. The genetic tests for the effect of tritium disintegrations will be for (1) loss of Y or X chromatin, and (2) sex-linked recessive lethals observed as completes in the F/sub 2/ and as mosaics in the F/sub 3/. Temperature-sensitive sex-linked recessive lethal mutations and mutations at the Adh locus will be detected.
RESULTS: In order to compare the relative mutagenic hazard produced by different sources of energy it is necessary to develop reliable means of measuring the dose of mutagen to genes and relating this measured dose to results of accompanying mutagenic tests. Measurement of dose of a mutagen to the genes is also necessary to permit valid comparisons among laboratory test systems, and this comparison will provide a basis for extrapolation to man when the dose to human germ cells has been determined. This project will couple the molecular dosimetry of the localized effects of tritium disintegration at specific sites within the DNA or protein of Drosophila melanogaster with genetic analyses in this eukaryote.
PROJECT MILESTONES: (1) Comparison of 5-labeled deosycytidine with (G)-labeled deoxycytidine completed. (2) Comparison of 5-labeled deoxycytidine with methyl-labeled deoxythymidine completed. (3) Distribution of label in thymine, cytosine and protein labeling to be done FY 77. (4) Comparison of protein with DNA label to be done FY 77. (5) Comparison of 6-labeled deoxycytidine with 5-labeled deoxycytidine to be done when

synthesis of 6-labeled deoxycytidine is completed approximately FY 77. (6) Development of Adh and temperature-sensitive mutation detection techniques FY 77.
WORDS: TRITIUM;BIOLOGICAL RADIATION EFFECTS;DROSOPHILA;INTERNAL IRRADIATION;DNA;PROTEINS;MUTATIONS;MOLECULAR BIOLOGY;CHEMICAL RADIATION EFFECTS;GENETIC RADIATION EFFECTS;MUTAGENESIS;RADIOISOTOPES;IN VIVO

<089053>
TITLE: Physico-Chemical Study of Some Areas of Fundamental Significance to Biophysics
PROJECT NUMBER: 006227
PRINCIPAL INVESTIGATOR: McGlynn, S.P.
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$115,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<089054>
TITLE: Repetitious Nature of Repaired DNA in Mammalian Cells
PROJECT NUMBER: 006255
PRINCIPAL INVESTIGATOR: Meltz, M.L.
ADDRESS: Southwest Foundation for Research and Education, P.O. Box 28147, 8848 West Commerce, San Antonio, TX 78284
AFFILIATION: Texas Univ., San Antonio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Shepherd, George R.
TELEPHONE: F233-5037
TYPE OF FUNDING: Contract No.-E-(40-1)-4761
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (35%);GENERAL SCIENCE (65%)
POLLUTANTS: ORGANICS/B(a)P;ORGANICS/4-NQO;ORGANICS/Etc. (30%);RADIATION/U.V. (40%);SPECIFIED OTHER POLLUTANTS/Misc. mutagens (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our Objective, Approach, and Product/Results Expected: Reexamination of the kinetic reassociation of repair replicated DNA obtained from WIL/sub 2/-A3 cells upon methyl methanesulfonate treatment over the entire C/sub o/t range. Examination of the kinetic reassociation of DNA of WI-38 cells undergoing repair replication at different times after UV or MMS treatment. Comparison of the extent of repair replication occurring in skin fibroblast cells from individuals of different ages grown in vitro and treated at equal passage numbers with UV or MMS, and if significant differences are observed, investigation of the kinetic reassociation of the isolated DNA to determine the distribution of repair replication radioactivity in DNA of different sequence frequencies. Comparison of the extent of repair occurring in human WIL/sub 2/-A3 lymphoblastoid cells and human WI-38 lung cells of embryonic origin, after UV exposure, to confirm the normality of the former. In addition, determination of the extent of repair upon treatment with a second chemical agent, 4-nitroquinoline-1-oxide. Induction of AHH in WI-38 cells in vitro, and attempt to detect whether a greater amount of repair occurs during benz(a)anthracene on DNA synthesized after treatment of WI-38 cells, measuring both incorporation and repetitive distribution of label. The broader investigation which will be initiated is an attempt to correlate the extent of repair replication with mutational events in mouse L5178Y cells.
PROJECT MILESTONES: Completion of each of the objectives.
KEYWORDS: REASSOCIATION;DNA;ANIMAL CELLS;BIOLOGICAL REPAIR;METHANE;SULFONIC ACID ESTERS;ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;QUINOLINES;BENZANTHRACENE;BIOLOGICAL EFFECTS;MICE;CARCINOGENS;MUTAGENESIS

<089056>
TITLE: A Study of the Biochemical Effects of Ionizing and Nonoionizing Radiation of Plant Metabolism During Development
PROJECT NUMBER: 006283
PRINCIPAL INVESTIGATOR: Klein, W.H.
AFFILIATION: Smithsonian Institution, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$67,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (100%)

<089057>
TITLE: Radiation and Chemical Effects on Viral Transformation and Tumor Antigen Expression
PROJECT NUMBER: 006294
PRINCIPAL INVESTIGATOR: Coggin, J.H.
ADDRESS: The University of Tennessee, Dept. Microbiology, Knoxville, TN 37916
AFFILIATION: Tennessee Univ., Knoxville (USA). Dept. of Microbiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(40-1)3646
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: NUCLEAR/General (100%)
LUTANTS: RADIATION/X-ray (100%)
RACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
IONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of the work is to develop antigenic markers for early cancer detection using embryonic determinants which appear universally on radiation stimulated cancer cells. The properties of these cancer markers are being studied to learn how to distinguish them from other cellular antigens and from viral antigens.

APPROACH: Immune reagents are being developed to test animals for the expression of the earliest signs of embrycnic antigen as an indicator of a radiation stimulated cancer. Test systems are also being developed to detect the first raciation stimulated transformed cells which appear in an exposed normal cell population.
RESULTS: We have developed the necessary screening sera to carry out the work. A unique method has been developed to detect the earliest transformants that appear in a population of sublethally irradiated cells carrying sub oncogenic viruses which are rendered oncogenic by the radiation exposure.
PROJECT MILESTONES: The discovery that tumors of many types carry reexpressed embryonic product which are auto-antigenic to the host. The discovery that these embryonic components can be used to prevent cancer induction and can, under other circumstances be responsible for cancer cell proliferation.
KEYWORDS: ANTIGENS;NEOPLASMS;TUMOR CELLS;VIRUSES;BIOLOGICAL RADIATION EFFECTS;EMBRYOS;CELL PROLIFERATION;AGE DEPENDENCE;CARCINOGENS;TERATOGENESIS;IMMUNOLOGY

<089059>
TITLE: Effect of Radiation-Sensitive Mutations and Radiation on Recombination in Partially Diploid Derivatives of Escherichia coli
PROJECT NUMBER: 006297
PRINCIPAL INVESTIGATOR: Matney, T.S.
ADDRESS: The University of Texas Health Science Center at Houston, Graduate School of Biomedical Sciences, Houston, TX 77025
AFFILIATION: Texas Univ., Houston (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Frost, A.H.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-4024
77 FUNDING: Energy Research and Development Administration FY77:$26,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives are to understand the role of cellular repair processes in mutagenesis induced by chemical carcinogens and radiation.
APPROACH: To determine the kinds of mutation induced by carcinogens in microorganisms having various defective repair processes, the Ames Salmonella test system will be employed and its specific his mutations transferred into Escherichia coli. The carcinogens for preliminary experiments include polycyclic hydrocarbons such as acetylaminofluorene, benz(a)pyrene, and nitrosoguanidine.
RESULTS: The research will result in the development of more sensitive tester strains and strains which will permit an assessment of cellular repair and minimum thresholds.
PROJECT MILESTONES: (1) Construction of deep rough mutants of E. coli which are permeable to the polycyclichydrocarbon type of carcinogen. (2) Introduction of the his mutations involved in the Ames system into E. coli via an F-merogenote. (3) Construction of derivatives with various combinations of recombination and excision repair deficiencies. (4) Development of strains that measure specific base pair changes. (5) Identification of specific genetic loci with unusual sensitivities to mutagenesis.
KEYWORDS: ESCHERICHIA COLI;MUTATIONS;CARCINOGENS;HYDROCARBONS;BIOLOGICAL REPAIR;RADIOINDUCTION;BIOLOGICAL EFFECTS;DNA;GENETICS;MOLECULAR BIOLOGY;MUTAGENESIS;POLYCYCLIC AROMATIC HYDROCARBONS;BENZOPYRENE;ORGANIC NITROGEN COMPOUNDS;ULTRAVIOLET RADIATION;ORGANIC FLUORINE COMPOUNDS

<089060>
TITLE: Physico-Chemical Studies of Radiation Effects in Cells
PROJECT NUMBER: 006298
PRINCIPAL INVESTIGATOR: Powers, E.L.
ADDRESS: Department of Zoology, Laboratory of Radiation Biology, Univ. of Texas at Austin, Austin, TX 78712
AFFILIATION: Texas Univ., Austin (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(40-1)-3408
77 FUNDING: Energy Research and Development Administration FY77:$56,000; National Institutes of Health FY77:$60,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To characterize the events leading from the absorption of radiation energy to the expression of damage at the cellular level.
APPROACH: DNA and intact bacterial cells will be irradiated with x-rays in the presence and absence of selected chemical agents to determine how these additives affect radiation sensitivity. B. megaterium spores will be used in uptake studies with some of these agents and in studies on radiation-induced chemical events leading to cell death; DNA (isolated from B. subtilis will be used to study the effects these additives have on radiation-induced, in vitro loss of transforming ability; B. subtilis spores and vegetative cells will be used to examine rates of mutation induction under different conditions of irradiation.
RESULTS: With the two in vivo systems, we expect a characterization and comparison of the radiation-induced processes leading to cell death and mutation. With the in vitro DNA system, we compare the chemical processes that damage this specific molecule with those that affect the intact cell.
PROJECT MILESTONES: August 1975 evaluate results and submit progress report. August 1976 evaluate results and submit progress report. August 1977 evaluate progress, submit progress report and renewal requests.
KEYWORDS: DNA;BACTERIA;X RADIATION;BIOLOGICAL RADIATION EFFECTS;BACILLUS SUBTILIS;BACILLUS MEGATERIUM;MUTATIONS;SPORES;CELL KILLING;RADIOINDUCTION;CARCINOGENS;MUTAGENESIS;ULTRAVIOLET RADIATION

<089061>
TITLE: Radiation and Biophysical Studies on Cells and Viruses
[ECT NUMBER: 006299
[CIPAL INVESTIGATOR: Cole, A.
[DDRESS: Department of Physics, University of Texas System Cancer Center, M.D. Anderson Hospital and Tumor Institute, 6723 Bertner Avenue, Houston, TX 77025
AFFILIATION: Texas Univ., Houston (USA). Dept. of Physics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(40-1)-2832;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$56,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Ionizing (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: DNA, nucleoprotein, chromosomes, cells and other systems are used to study radiation damage and repair of damage by cells. Studies using electron microscopy, centrifugation and electron and alpha-particle beam irradiations imply that the mammalian chromosome is arranged as a quasi-parallel array of 64-DNA molecules of 2 . 10/sup 9/ daltons, each has one primary and many secondary radiosensitive sites (constituting several percent of the total) closely associated with the nuclear membrane. Some 5 to 10% of the nuclear surface area may be in these sites. When cells are lysed in detergent (sarkosyl), most of the DNA sediments anomalously as an apparent aggregate with other cellular material, however DNA of 10/sup 9/ daltons sediments out of the aggregation when cells are exposed to ionizing radiation before lysis. Salt, disulfide, and peptide bonds are not critically involved in the formation of this aggregate, although a single DNA region may be involved. Such DNA regions may represent primary radiation sites in the cell. Incubation of cells after irradiation leads to the repair of single and double strand DNA breaks and to the reformation of the aggregate. Preheating (hyperthermia) of cells to 43 degrees for 45 minutes between irradiation inhibits cell repair both of sub-lethal damage and of single and double strand DNA breaks. If preheating is done in buffer rather than nutrient medium,
KEYWORDS: ANIMAL CELLS;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL REPAIR;BIOLOGICAL RECOVERY;DNA;CHROMOSOMES;NUCLEOPROTEINS;GENETIC RADIATION EFFECTS;ALPHA PARTICLES;ELECTRONS;IONIZING RADIATIONS;VIRUSES;BIOCHEMICAL REACTION KINETICS

<089062>
TITLE: Mechanism of Photorepair of UV-Damage by Photolyase
PROJECT NUMBER: 006300
PRINCIPAL INVESTIGATOR: Werbin, H.
ADDRESS: University of Texas at Dallas, Programs in Biology, Box 688, Richardson, TX 75080
AFFILIATION: Texas Univ., Dallas (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations
MONITOR: Frost, A.H., Jr.
TELEPHONE: C(615)483-8611
TYPE OF FUNDING: Contract No.-E(40-1)-3630
77 FUNDING: Energy Research and Development Administration FY77:$13,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The possibility that emissions from SST's and the fluorocarbons in aerosols may be factors in reducing the stratospheric ozone layer has focussed attention on the potentially harmful effects to cells of increased UV radiation on the earth's surface. UV damages genetic material and induces mutation. There is a ubiquitous enzyme found in many types of plants and animal cells, DNA photolyase, that can repair with light this genetic damage. Our objective is to learn how this enzyme functions.
APPROACH: We have purified the enzyme by a combination of chromatographic techniques and have found it to have a molecular weight of 130,000. Using SDS acrylamide electrophoresis, the enzyme was found to consist of two subunits with molecular weights of 85,000 and 60,000. We expect to separate these subunits by chromatographic methods and or sucrose density sedimentation. We expect to reconstitute the active enzyme from the subunits and to learn the contribution of each to enzyme function. We have isolated a fluorescent substance (activator) from yeast that may be necessary for enzyme action and we will determine its structure.
RESULTS: Our findings will clarify how photolyase uses near UV and visible light to repair UV damage to informational molecules in cells and will tell us whether such repair can help cells survive sunlight irradiation.
PROJECT MILESTONES: We expect to identify the fluorescent substance in Baker's yeast that enhances photolyase activity and that is a necessary component for the enzyme's functioning.
KEYWORDS: LYASES;PURIFICATION;ELECTROPHORESIS;CHROMATOGRAPHY;SEDIMENTATION;YEASTS;PHOTOLYSIS;ULTRAVIOLET RADIATION;GENETIC EFFECTS;PLANT CELLS;ANIMAL CELLS;RADIATION INJURIES;BIOLOGICAL REPAIR;BIOCHEMISTRY;DNA;MOLECULAR BIOLOGY;IN VITRO

<089064>
TITLE: Ecological Behavior and Effects of Energy Related Pollutants
PROJECT NUMBER: 006351
PRINCIPAL INVESTIGATOR: Platt, R.B.
ADDRESS: Dept. of Biology, Emory Univ., Atlanta, GA 30322
AFFILIATION: Emory Univ., Atlanta, Ga. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: F233-3664
[OF FUNDING: Contract No.-E(40-1) 2412
FUNDING: Energy Research and Development Administration FY77:$79,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);NUCLEAR/Fission (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (50%);RADIATION/Environmental;RADIATION/Ecological (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To determine how plant communities respond to sustained periods of exposure to sulfur dioxide.
APPROACH: Tree, grass, shrub, and weed species native to the Copper Basin will be surveyed at different distances from the pollution source. Plants will be exposed to varying concentrations of sulfur dioxide in chambers and classified according to susceptibility.
RESULTS: Results will answer the following questions: does the species composition of plant communities change with exposure to SO2; do plants evolve populations tolerant to SO2; which species replace those lost because of their SO2 susceptibility; are the current ambient air quality standards for SO2 sufficient to prevent changes in plant communities.
PROJECT MILESTONES: (1) Completion of radiocesium studies. (2) Initiation of study of long-term adaptation of plants to SO/sub 2/ stress in the Copper Basin.
KEYWORDS: ENERGY SOURCES;POLLUTION;CESIUM 137;FORESTS;CONTAMINATION;TERRESTRIAL ECOSYSTEMS;SULFUR DIOXIDE;PLANTS;COMMUNITIES;ENVIRONMENTAL EFFECTS;SAVANNAH RIVER PLANT;RADIONUCLIDE MIGRATION

<089065>
TITLE: Nuclear Power and the Environment
PROJECT NUMBER: 6627
PRINCIPAL INVESTIGATOR: Glasstone, S.
ADDRESS: 103 Wiltshire Drive, Oak Ridge, TN 37830
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-EY-76-C-05-4248
77 FUNDING: Energy Research and Development Administration FY77:$8,000
RESULTS: Publish handbook.
KEYWORDS: NUCLEAR POWER PLANTS;ENVIRONMENTAL IMPACTS;DATA COMPILATION;MANUALS;ENVIRONMENT

<089066>
TITLE: Ecology of South Florida Estuarine Systems
PROJECT NUMBER: 006371
PRINCIPAL INVESTIGATOR: Carpenter, J.H.
ADDRESS: 4600 Rickenbacker Causeway (University of Miami), Miami, FL 33149
AFFILIATION: Miami Univ., Fla. (USA). Rosenstiel School of Marine and Atmospheric Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H. Jr.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-E-(40-1)-3801
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (30%);HEAT, THERMAL (30%);VISUAL AESTHETICS (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives of this research are to understand part of the environmental effects of energy production in subtropical environments. The program has three elements: The first is directed toward understanding the food chains in the estuarine and coastal systems of Southeast Florida; the second is directed toward a quantitative description of the importance of mangrove leaf detritus in such ecosystems; the third has the goal of understanding the physical and chemical states of copper and chlorine that are released to these environments from energy-related activities.
APPROACH: The food chain research is a field and laboratory program in which the abundance and distribution of the animals in a representative ecosystem is being measured. The food preferences and breakdown of plant and detrital substrates is measured in a laboratory. The mangrove detritus system is being characterized by using quantitative studies of laboratory systems that closely approximate the natural systems. The copper and chlorine studies are predicated on adding these substances to natural waters and observing the products of the reactions.
RESULTS: The expected results are a quantitative description of the functioning of the mangrove detritus and food web systems and the response of these systems to environmental variables, such as waste heat and chemical substances from energy-related activities.
KEYWORDS: FLORIDA;ESTUARIES;FOOD CHAINS;COPPER;CHLORINE;AQUATIC ECOSYSTEMS;ECOLOGY;THERMAL EFFLUENTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;FISHES;TOXINS

<089069>
TITLE: Dynamics of the Recovery of Damaged Tundra Vegetation
PROJECT NUMBER: 006402
PRINCIPAL INVESTIGATOR: Amundsen, C.C.
ADDRESS: Ecology, University of Tennessee, Knoxville, TN 37916
AFFILIATION: Tennessee Univ., Knoxville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
TYPE OF FUNDING: Contract No.-E-(40-1)-4180
77 FUNDING: Energy Research and Development Administration FY77:$23,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (25%);PROCESSING, CONVERSION (25%)
POLLUTANTS: ORGANICS (75%);HEAT, THERMAL (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECT
PROJECT DESCRIPTION: Document environmental factors affecting recovery of damaged tundra landscapes. Develop measurement technology to allow rapid aquisition of data amenable to analyses of pattern and process of landscape recovery. Document response of native plant species indicative of various pollutants resulting from man's activities on tundra landscapes, or recovery following insults. Train ecologists to collect,

analyze and evaluate such data.
APPROACH: Classify disturbances as to age, type, cause, subsequent history. Classify disturbances topographically, edaphically and by vegetation type. Field sample across disturbances to obtain data for analyses in the laboratory.
RESULTS: Prediction of natural recovery rates, patterns and processes on various sites given various tundra communities in several tundra environments. Recommendations for intensity of reclamation management required and consequences of unwise reclamation management.
PROJECT MILESTONES: Substantial reduction of costs of reclamation on maritime tundra. Elimination of futile efforts for vegetative establishment on tundra landscapes. Demonstration of the absence of secondary plant succession on tundra, in the presence of vigorous vegetative recovery under certain conditions.
KEYWORDS: TUNDRA;LAND RECLAMATION;PLANTS;ECOLOGY;ECOSYSTEMS;BIOMASS;SOILS;CONSTRUCTION

<089070>
TITLE: Geochemistry of Uranium and Thorium Series Nuclides and of plutonium in the Gulf of Mexico
PROJECT NUMBER: 006403
PRINCIPAL INVESTIGATOR: Scott, M.R.
ADDRESS: Dept. of Oceanography, Texas A and M Univ., College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA). Dept. of Oceanography and Meteorology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-E(40-1)-3852
77 FUNDING: Energy Research and Development Administration FY77:$53,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/U;METALS/Th;METALS/Pu (50%);RADIATION/U;RADIATION/Th;RADIATION/Pu (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Site specific Gulf of Mexico;COASTS/Gulf;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine the distribution and chemical behavior of uranium, thorium, and plutonium isotopes in the Gulf of Mexico.
APPROACH: Box core samples of Gulf sediments and suspended sediments from streams contributing to the Gulf will be analysed for Pu isotopes; core samples will be dated by /sup 228/Th//sup 232/Th ratios and /sup 210/Pb concntrations. Ligand concentration effects on the adsorption of Th and Ra on clays will be measured on core samples as well as tested experimentally under lab conditions.
RESULTS: Models depicting the secular and spatial distribution of plutonium and thorium isotopes in the Gulf of Mexico.
KEYWORDS: PLUTONIUM;DISTRIBUTION;SEDIMENTS;GULF OF MEXICO;URANIUM;THORIUM;RADIUM 226;RADIUM 228;RADIATION MONITORING;RADIONUCLIDE MIGRATION;RADIOACTIVITY;OCEANOGRAPHY

<089071>
TITLE: Studies of Drosophila Dispersal and Species Packing
PROJECT NUMBER: 006404
PRINCIPAL INVESTIGATOR: Richardson, R.H.
ADDRESS: Department of Zoology, University of Texas at Austin, Austin, TX 78712
AFFILIATION: Texas Univ., Austin (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-AT(40-1)-4023
77 FUNDING: Energy Research and Development Administration FY77:$33,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (85%);DEVELOPMENT/Laboratory scale (15%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Hawaii
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Investigate population structure in rapidly evolving and/or ecologically disrupted population. (2) Determine if isolated sub-populations within a single area are representing incipient or actual species. (3) Relate evolving isolated sub-populations to ''species packing'', to community complexity, and to community stability. (4) Relate behavioral processer and responses to formation of population structure.
APPROACH: New statistical analyses allow the use of molecular variation in enzymatic systems to identify the units of a structured population (i.e., a population with partially isolated sub-units). Samples of Drosophila species evolving in areas of active geological change (Kilanea and) Mauna Loa Volcanoes, Hawaii) and biogeographic shifts (deserts of North America) are taken to determine the population structure present. The behavior of the insects with respect to environmental cues (wind humidity, temperature, chemical constituents in the air) is investigated. The responses are related to the ability to make adaptive changes to become reproductively isolated, or to become ecologically specialized.
RESULTS: Determining if populations are comprised of several partially isolated units or cryptic species in a given area is the major result expected. Secondarily, determining behavioral cues and mechanisms of sensing and responding to environmental variation is necessary to evaluate significance of results in one group of species to expectation of application to other species. In the process of the study, new measurements will be obtained of population and community complexity, and relationships among community stability, buffering to ecological shifts, and adaptation to ecological shifts will be attempted.
PROJECT MILESTONES: (1) Obtaining adequate data to determine community and intra-specific complexity. (2) Analysis of the data from several locations and years, including comparisons among populations. (3) Determining responses to environmental cues and roles of the responses to community properties.
KEYWORDS: DROSOPHILA;POPULATION DYNAMICS;TERRESTRIAL ECOSYSTEMS;GENETIC VARIABILITY;GEOGRAPHY;ENVIRONMENT;ENVIRONMENTAL EFFECTS;MUTATIONS;MUTAGENESIS;COMPUTER CODES;ENZYMES

<089073>
TITLE: Investigation of the Unusual Behavior of Cesium-137 and Other Radionuclides in the Florida Environment
PROJECT NUMBER: 006438
PRINCIPAL INVESTIGATOR: Gamble, J.F.
ADDRESS: Botany Dept., 2177 McCarty Hall, University of Florida, Gainesville, FL 32611
AFFILIATION: Florida Univ., Gainesville (USA). Inst. of Food and Agricultural Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(40-1)-4066
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Cesium-137 (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Site specific Sandy soils;COASTS/Southeast;COASTS/Gulf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To establish fallout cesium-137 levels in compartments of selected managed and natural ecosystems in Florida. Emphasis is on dairy and beef-forage and mesic hardwood forest; determine the mechanism(s) responsible for the concentration of Cs-137 and develop an analog model for the cycling of Cs-137 in Florida.
APPROACH: Major compartments of selected ecosystems were sampled and Cs-137 activity levels determined using low-level radioassay techniques in combination with Cs specific, ion exchange resins for concentrating Cs-137. Low level (1 microCi)radiotracer Cs-134 is used in field and greenhouse experiments.
RESULTS: Cs-137 is concentrated in the A/sub o/ horizon of forest soils and surface 5 cm of agronomic soils. High levels of Cs-137 activity in grazing animals of Florida forests is accounted for by Cs-137 activity found in mycorrhizal mushrooms (40,000 pCi/kg) that constitute a major part of their diet during periods of the year. Pangola hay from southeastern Florida averaged 3,000 pCi/kg and, using 7% transfer rate, accounts for 90% of the 90 pCi/liter, Cs-137 activity found in the milk of the area. Levels in unimproved pasture are 2 to 3 times that of pangola pasture. Range cattle beef have 5 times the activity as beef from dairy cattle from same area, 740 pCi/kg and 140 pCi/kg, respectively.
PROJECT MILESTONES: A differential uptake of radiocesium as a function of endomycorrhizal presence on pangola rooting system and ectomycorrhizal association on tree roots is expected to be demonstrated during the coming contracting period. Controlled experiments include inoculation with mycorrhizal species and selective control of mycorrhizal development in untreated soil.
KEYWORDS: FALLOUT;CESIUM 137;RADIATION MONITORING;TERRESTRIAL ECOSYSTEMS;FLORIDA;RADIOECOLOGICAL CONCENTRATION;ANIMALS;PLANTS;SOILS

<089074>
TITLE: Atmospheric Tritium
PROJECT NUMBER: 006446
PRINCIPAL INVESTIGATOR: Ostlund, H.G.
ADDRESS: Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, FL 33149
AFFILIATION: Miami Univ., Fla. (USA). Rosenstiel School of Marine and Atmospheric Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-AT-(40-1)-3944
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Tritium escapes to the atmosphere from nuclear industry and research. The HTO originates from atmospheric nuclear testing; the HT from reprocessing of nuclear fuel elements and accidental releases; tritiated hydrocarbons, possibly from the underground gas stimulation experiments of several years ago. We are regularly monitoring HT and HTO in Miami, Alaska, Hawaii, and New Zealand; tritiated hydrocarbons (primarily methane) in Miami. We also do synoptic sampling on a global scale by ship, and sample the stratosphere by aircraft. The distribution pattern of these tritium compounds yields data on the interhemispheric mixing time scale of the troposphere (HT), the residence time in the lower stratosphere of water vapor (HTO), and the chemical lifetime of hydrogen gas (HT) and, perhaps, methane. We are able to detect large new tritium injections into the atmosphere and the distribution by space and time of these perturbations. Studies of the infiltration into the groundwater of Biscayne Aquifer of water from the cooling canals of the Turkey Point nuclear power plant will be undertaken. In addition to the intrinsic scientific value according to reasoning above, the distribution patterns, as they emerge, will make it possible to project the fate of future releases, accidental or not, of tritium into the environment on global or local scales.
RESULTS: We have found one major source of HT in the atmosphere to be venting from underground thermonuclear events; thus, the northern hemispheric inventory of about 550 g of tritium as hydrogen gas, appeared to receive an injection of about 80 g of tritium from two large underground events in 1973 October-November. The global distribution of HT is also telling us that the chemical lifetime of hydrogen gas in the atmosphere is more than five years. The downward transfer of water vapor from the lower stratosphere to the troposphere occurs on a time scale of about three years.
KEYWORDS: THERMONUCLEAR REACTIONS;ENVIRONMENTAL EFFECTS;TRITIUM;HYDROCARBONS;TRITIUM COMPOUNDS;RADIONUCLIDE MIGRATION;RADIOACTIVITY;MONITORING;GROUND WATER;AIR POLLUTION;WATER POLLUTION;METEOROLOGY;EARTH ATMOSPHERE;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;RADIONUCLIDE KINETICS

<089075>
TITLE: Charged Particle Deposition Studies
JECT NUMBER: 006461
NCIPAL INVESTIGATOR: Green, A.E.S.
AFFILIATION: Florida Univ., Gainesville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<089076>
TITLE: Electronic Properties of Liquids
PROJECT NUMBER: 006484
PRINCIPAL INVESTIGATOR: Painter, L.R.
ADDRESS: Physics Department, The University of Tennessee, Knoxville, TN 37916
AFFILIATION: Tennessee Univ., Knoxville (USA). Dept. of Physics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Contract No.-E-(40-1)-3861
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (10%);ORGANICS (30%);RADIATION (60%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDRCGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Techniques have been developed for measuring the electronic structure of condensed materials. These studies consist of measuring the reflectance and transmittance of liquids in the vacuum ultraviolet spectral region as a function of angle of incidence and wavelength. Such measurements are usually analyzed to yield the optical and dielectric functions of the liquid as functions of wavelength. These in turn may be interpreted in terms of the electronic structure of each liquid as it is excited by the passage of a charged particle. Studies have been initiated on chloroform, solutions of lecithin and cholesterol in chloroform, aqueous solutions of fucose, sucrose and galactose. Isotopic effects between H/sub 2/O and D/sub 2/O are being investigated.
APPROACH: Several techniques are being used in the study on optical properties of liquids. Transmission measurements made on liquid films of approximately 1000A thickness in a transparent, closed cell yield values of absorption coefficient to 1250A. Another method involves measuring the reflectance of liquid in equilibrium with its vapor. The optical functions are obtained from a Kramers-Kronig analyses of the reflectance measured at nearly normal incidence. In an alternate method, the reflectance as a function of incidence angle was measured at the interface of water and a transparent, flat window which forms one side of a semicylinder. A new approach currently being developed is an ionization method for making precision reflectance measurements (and hence optical and dielectric parameters). The ratio of ionization of the vapor by the beam just before and after reflectance is measured using a ratio meter of our own design.
RESULTS: Optical parameters of the monosaccharides galactose, glucose and fructose in agueous solution are being extended to 10 eV. The vacuum UV properties will be compared for differences arising from structural change. Spectra of the solid solutes will be studied for purposes of comparison with the solvent and solution parameters. Studies are being completed on the sugars fucose and galactose, on the phospholipid lecithin, and cholesterol, and on the solvent chloroform. The primary goal of this effort is the identification of substances giving rise to a repulsive force between cells such as constitute metastasis. The newly-designed photoionization technique will be used to examine previously studied (optically) low vapor pressure liquids (e.g., glycerol, DC-704, DC-705, tetramethyltetraphenyltrisiloxane and trimethylpentaphenyltrisiloxane, respectively, and C/sub 14/H/sub 30/ and C/sub 14/H/sub 36/, normal tetradecane and normal heptadecane, respectively) for evidence of photoemission.
PROJECT MILESTONES: (1) 1/1/77 Completion of data and analysis of optical properties of sugar fucose in aqueous solution; of chloroform and of solutions of lecithin and cholesterol in chloroform. Determination of isotopic effects on electronic properties of H/sub 2/O and D/sub 2/O. Ionization chamber in routine use for precision measurements of reflectance from low major pressure liquids. (2) 7/1/77 Completion of optical and photoemission survey of four low vapor pressure organic solvents, formamide, triethylphosphate, dimethylacetamide and hexamethylphosphorotriamide. (3) 1/1/78 Data and analysis of solid films, of oriented lecithin in the vacuum UV and soft x-ray region. Introduction of solutions into photoionization chamber for comparison with solvents. (4) 7/1/78 Develop interpretation of solution data.
KEYWORDS: LIQUIDS;ELECTRONIC STRUCTURE;HYDROGEN;DEUTERIUM;ISOTOPE EFFECTS;OPTICAL PROPERTIES;DIELECTRIC PROPERTIES

<089077>
TITLE: The Interaction of Heavy Kev Ions with Gases
PROJECT NUMBER: 006487
PRINCIPAL INVESTIGATOR: Boring, T.J.
AFFILIATION: Virginia Univ., Charlottesville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$12,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<089078>
TITLE: Assistance in the Further Development of Diving and Hyperbaric Research Center
PROJECT NUMBER: 7150
PRINCIPAL INVESTIGATOR: Shilling, C.W.
ADDRESS: 9650 Rockville Pike, Bethesda, MD 20014
AFFILIATION: Undersea Medical Society, Inc., Bethesda, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Interagency agreement-NOAA
77 FUNDING: Energy Research and Development Administration FY77:$3,000; National Oceanic and Atmospheric Administration FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Hyperbaric conditions (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;COASTS/Gulf;COASTS/Far West;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Reduce the high mortality rate of divers involved in offshore petroleum exploration.
APPROACH: Assess the medical problems and medical services associated with diving personnel in offshore operations. Establish a program for training of paramedical personnel for diving operations.
RESULTS: A medical surveillance program for divers in offshore operations was established. A training program for diver paramedics was established.
PROJECT MILESTONES: Continue training personnel for paramedic teams.
KEYWORDS: HYPERBARIC;DIVING OPERATIONS;HEALTH HAZARDS;MORTALITY;OFFSHORE OPERATIONS;INDUSTRIAL MEDICINE;PERSONNEL;EDUCATION;MONITORING;SAFETY;HUMAN POPULATIONS;MEDIUM PRESSURE

<089080>
TITLE: Energy Circuit Model of the United States
PROJECT NUMBER: 006608
PRINCIPAL INVESTIGATOR: Odum, H.T.
ADDRESS: Department of Environmental Engineering Sciences, University of Florida, Gainesville, FL 32611
AFFILIATION: Florida Univ., Gainesville (USA). Dept. of Environmental Engineering
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations Office, and Analysis and Assessment Program, Division of Biomedical and Environmental Research in Washington
MONITOR: Gerhardt, Paul;Frost, A.H. Jr.
TELEPHONE: C(301)353-4536;C(615)483-8611, ext. 4105
TYPE OF FUNDING: Contract No.-E(40-1)-4398
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (30%);GEOTHERMAL/General (5%);SOLAR/General (15%)
ENERGY CYCLE: EXTRACTION (11%);COMBUSTION IN SITU (11%);TRANSPORTATION (11%);STORAGE (11%);PROCESSING, CONVERSION (11%);COMBUSTION OR END USE (11%);ELECTRICITY GENERATION (11%);ELECTRICAL TRANSMISSION (11%);WASTE MANAGEMENT (12%)
POLLUTANTS: HEAT, THERMAL (20%);VISUAL AESTHETICS (10%);SPECIFIED OTHER POLLUTANTS/Nutrients (70%)
CHARACTER OF STUDY: RESEARCH/Theoretical (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The project will perform energy analysis by developing energy sources and primary interactions with other externals including environment and international exchange. Evaluations of the models is followed by calculations of net energy of primary sources, calculations of investment ratios of secondary sources and environmental interactions, and simulations of further aggregated models for alternatives of energy policy and external possibilities. Tables of energy quality transformation factors are developed from evaluated energy models of selected typical subsystems.
APPROACH: Principles of the design of energy systems are used to scan the main types of energy flow supporting the U.S. economy and its environment, including sources, interactions, feedbacks, economic flows, and pattern of energy chains using the stocks and flows and process functions from the diagrams. Tables are prepared that document with data from many sources the energy flows. Where needed new subsystems are studied to get new energy quality factors. Field trips are made to sites and centers of energy transformation study and operation to assemble reports and other information found to be critical and otherwise not available.
RESULTS: (1) Simulation graphs of indices of U.S. economy, inflation, international exchange, energy use and environmental load for various alternatives possible or projected. (2) Tables of net energy for alternative energy sources based on case histories. (3) Tables of economic viability as measured by matching energy of environment for alternative projects and proposed developments of national consequence especially of environmental nature. (4) Tables of energy quality factors for principal components of U.S. model. (5) Suggestions for public policy to prepare for expected trends.
PROJECT MILESTONES: (1) Showing the net energy method for evaluating energy sources 1972. (2) Developing the energy quality measurement scale for evaluating work potentials 1974. (3) Showing the low net energy of nuclear and solar energy compared to coal and oil and the fallacy in project independence. (4) As a result of the project a book of principles was written for the public and for schools (Energy Base of Man and Nature, H. T. Odum and E. C. Odum) 1975. Controversial presentations at NSF conference on net energy 1975. (5) Presentation and publication of results in Congressional hearing 1976. Future Milestones: Completion of analysis of primary sources 1977. Completion of environmental energy evaluation cases 1978.
KEYWORDS: ENERGY MODELS;ENVIRONMENT;ENERGY POLICY;ENERGY YIELD;USA;SOCIO-ECONOMIC FACTORS;ECOLOGY;ECONOMICS;SIMULATION;TERRESTRIAL ECOSYSTEMS

<089082>
TITLE: Biodegradation of Organo Sulfur Compounds in High Sulfur Crude Oil
PROJECT NUMBER: 2649
PRINCIPAL INVESTIGATOR: Rigau, J.
ADDRESS: Center for Energy and Environment Research, San Juan, PR 00935
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$57,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)

ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
IONS OF INTEREST: GEOGRAPHIC AREAS/Global
EARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
...JECT DESCRIPTION: Optimize microbial degradation of organo sulfur compounds in high sulfur crude oil.
APPROACH: (1) Select microorganisms; (2) determine optimal growth conditions for mass culture; (3) define optimal reaction conditions; (4) perform lab-scale demonstration.
RESULTS: Demonstrate biological feasibility of large scale clean up of high sulfur crude oil.
KEYWORDS: ORGANIC SULFUR COMPOUNDS;BIODEGRADATION;PETROLEUM;BACTERIA;HYDROCARBONS;METABOLISM;PREFERRED SPECIES;CULTIVATION TECHNIQUES;SULFUR COMPOUNDS;DESULFURIZATION

<089083>
TITLE: Effect of Cyclic Temperature on Larvae of Marine Invertebrates
PROJECT NUMBER: 006637
PRINCIPAL INVESTIGATOR: Costlow, J.D.
ADDRESS: Duke University Marine Laboratory, Beaufort, NC 28516
AFFILIATION: Duke Univ., Beaufort, N.C. (USA). Marine Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Programs, Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: C(301)353-5324
TYPE OF FUNDING: Contract No.-E-(40-1)-4377
77 FUNDING: Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: HEAT, THERMAL/Effluents (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the effects of cyclic temperatures, as opposed to constant temperatures, on larval development of estuarine and continental shelf species of marine invertebrates. The research entails: (1) a more detailed consideration of the relative roles of temperature cycle constituents; (2) an extension of the use of cyclic temperatures to cover a wider range; (3) an examination of the response of larval stages to cyclic temperatures at the metabolic and biochemical level; (4) effort to determine the possible synergistic to cut effects between cyclic temperatures, other natural environmental factors, and ''artificial'' factors such as pollutants.
APPROACH: Larval stages of estuarine and continental shelf invertebrates, including crustacea, mulluscs, and polychaetes are cultured from hatching to the juvenile stages in the cyclic temperature regimes as opposed to constant temperatures. Temperature cycles, 5 degrees C-24 hr., have been designed which incorporate equal rates of increase or decrease combined with equal periods of maximum and minimum temperatures, unequal rates of increase and decrease combined with equal periods of maximum and minimum temperatures, and unequal rates of increase and decrease combined with unequal periods of maximum and minimum temperatures. Data on survival, rates of development, and incidents of abnormalities should provide an insight into which elements of a temperature cycle are most important in regulating developmental patterns of marine invertebrates.
RESULTS: Results should provide the basis from which to develop a concept relative to how cyclic temperatures, far more natural than constant temperatures within the estuarine and coastal environments, affect an element of marine invertebrates. This should provide for application to the effect of thermal effluent on planktonic organisms within the relatively closed system of an estuary and, within limits, the relatively open system of the continental shelf waters. The unifying concept, ''the integrated thermal experience'' is being developed to provide a more informative and efficient means of comparing development within and between species at various combinations of environmental factors normally found within an estuarine or continental shelf area.
PROJECT MILESTONES: The significant increase in survival has been described for larvae of one particular estuarine species of crab when cultured in a cycle of 30 to 35 degrees C as opposed to either a constant temperature of 30 or 35 degrees C. Although an explanation for this phenomenon is not presently available, further biochemical and physiological studies are planned which will hopefully elucidate the mechanisms responsible for the increased survival.
KEYWORDS: INVERTEBRATES;SURVIVAL TIME;THERMAL EFFLUENTS;ESTUARIES;CONTINENTAL SHELF;COASTAL WATERS;BIOLOGICAL MODELS;AQUATIC ECOSYSTEMS;BIOLOGICAL EFFECTS;LARVAE;AMBIENT TEMPERATURE

<089084>
TITLE: Seagrass Community Processes in Coastal Zones of the Semitropics and Tropics
PROJECT NUMBER: 006700
PRINCIPAL INVESTIGATOR: Thorhaug, A.
ADDRESS: School of Medicine, Dept. Microbiology, University of Miami, Miami, FL 33149
AFFILIATION: Miami Univ., Fla. (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Div. of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-E-40-1-4493
77 FUNDING: Energy Research and Development Administration FY77:$47,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (50%);GENERAL SCIENCE (25%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (20%);HEAT, THERMAL (70%);SPECIFIED OTHER POLLUTANTS/Dredge and silt (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (80%);DEVELOPMENT/Laboratory scale (20%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Site specific Subtropical, tropical;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
JECT DESCRIPTION: To assess the energy related pollutant's impact on nearshore semitropical seagrass communities. Specifically, the effects of heat, high salinity, heavy metals and radionuclides (Zn, Cf, Pd, Co, etc.) on the survival and productivity of the plant community and elements of the animal community. To find alternatives, such as restoring plant communities, to the pollution effects.
APPROACH: Combined laboratory and field studies on the major plants in the ecosystem; seagrasses, especially the dominant Thalassia testudinum, macroalgae, microalgae (epiphytes), and phytoplankton. Field

measurements include effect of heat, salinity, silt, heavy metals and radionuclides on standing crop and productivity. Laboratory measurements include defining lethal limits and effects of temperature, high salinity, light, heavy metals and radionuclides.
RESULTS: Results are to aid decision makers in siting and solutions for existing energy related industry in subtropics and tropics by having extensive data base of effects on which to base decision.
PROJECT MILESTONES: (1) First time the productivity and dynamics of subtropical seagrass community has been delineated (a series of publications). (2) The upper lethal limit for the seagrass community in subtropics has been defined (several publications and incorporated into siting of Florida power plants and Florida State Department of Pollution Control Standards). (3) The interrelationship between subtropical and tropical seagrass community plants and animals is outlined for the first time (several publications). (4) The first large-scale restoration (transplantation) of seagrasses by seed. The first large-scale restoration of tropical seagrasses. (Publs.) (5) The understanding of ion uptake in subtropical and tropical seagrasses for the first time (publications).
KEYWORDS: GRASS;COASTAL WATERS;COMMUNITIES;SALINITY;METALS;RADIOISOTOPES;POLLUTION;AQUATIC ECOSYSTEMS;ALGAE;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;TROPICAL REGIONS;CHEMICAL EFFLUENTS

<089085>
TITLE: Repair and Cell Cycle Response in Cells Exposed to Environmental Biohazards
PROJECT NUMBER: 006711
PRINCIPAL INVESTIGATOR: Billen, D.
ADDRESS: University of Tennessee, Oak Ridge Grad. School Biomed. Science, Oak Ridge, TN 37830
AFFILIATION: Tennessee Univ., Oak Ridge (USA). Graduate School of Biomedical Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(40-1)-4568
77 FUNDING: Energy Research and Development Administration FY77:$74,000
TECHNOLOGY: NUCLEAR/General (75%);GENERAL SCIENCE (25%)
POLLUTANTS: ORGANICS/Carcinogenic chemicals (50%);RADIATION/Ionizing;RADIATION/Solar (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We plan to determine the roles of various substrates, cofactors and enzymes of DNA metabclism in DNA synthesis after irradiation or chemical damage, using bacteria and cultured mammalian cells made permeable to nucleoside triphosphates and other small molecules.
APPROACH: A wide variety of environmental agents are known which induce damage in DNA leading to an inhibition of DNA synthesis or faulty DNA replication. The extent to which DNA repair processes restore the original fidelity of the DNA will ultimately determine the fate of the damaged cell. We are using both bacteria and mammalian cells to assess the roles of several known DNA polymerases and other DNA metabolic enzymes and factors in DNA repair, replication and recombination. DNA mutants of E. coli and B. subtilis provide a genetic approach to defining the roles of individual components of the DNA repair and replicative systems. The information obtained with prokaryotes should provide leads to assess the details of DNA repair and replication in mammalian systems including man.
RESULTS: Our program should provide additional insight into the cellular systems for repairing chromosomal damage. The similarities and differences between ionizing radiation and certain chemicals in regard to the repair response elicited will be further clarified.
KEYWORDS: CHEMICAL EFFLUENTS;IRRADIATION;BIOLOGICAL EFFECTS;BIOLOGICAL RADIATION EFFECTS;BACTERIA;ANIMAL CELLS;CELL CULTURES;DNA;BIOSYNTHESIS;DNA REPLICATION;ENVIRONMENT;BIOLOGICAL REPAIR;CELL CYCLE;POLLUTION;ENVIRONMENT;CARCINOGENS;X RADIATION

<089088>
TITLE: Adsorption and Diffusion of Plutonium in Soils
PROJECT NUMBER: 006830
PRINCIPAL INVESTIGATOR: Brown, D.A.
ADDRESS: Agronomy Department, University of Arkansas, Fayetteville, AR 72701
AFFILIATION: Arkansas Univ., Fayetteville (USA). Dept. of Agronomy
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Franklin, Ralph E.
TELEPHONE: F233-4904
TYPE OF FUNDING: Contract No.-AT(40-1)-4700
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Isotopes of plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The research proposed under this project includes the (a) physical, chemical and mineralogical characterization of selected surface and subsurface soils; (b) measurement of the rate and amount of plutonium movement by ion diffusion and convective flow under transient flow conditions/ (c) determination of the soil properties responsible for adsorption, and desorption of plutonium in the exchangeable form under a range of soil physical and chemical conditions; (d) using the data obtained under the objectives (a), (b), and (c) to develop mathematical models and equations to predict the transport of plutonium in soils.
APPROACH: Refine techniques for the adsorption, diffusion, and radioassay of plutonium in soils and in aqueous salt solutions; expand the adsorption and diffusion work from three soils studied in 1975 to include four new ones plus three standard clay minerals; compare the adsorption and diffusion of Pu-237, Pu-238, and Pu-239 isotopes in the nitrate chemical form and in the complexed (EDTA and DTPA) form; initiate an in-depth study of the effect and particle size of Pu-238 microspheres upon the dissolution and diffusion rates of Pu-238 in soils in cooperation with Dr. Jack Corey (S.R.L., Aiken, SC) in that he would provide the microspheres and some laboratory facilities for analytical work, particularly for experiments requiring more alpha activity than our laboratory will handle.
RESULTS: The adsorption and diffusion data will enable the development of a prediction equation for estimating the transport rate of plutonium in soil and water systems and the rate of accumulation in the soil systems over time. Data now available for 3 soils shows over 95% of Pu adsorbed in as little as 6 minutes; diffusion rates vary from 1 x 10/sup -8/ for sandy soils to 1 x 10/sup -11/ cm/sup 2//sec for clay loam-high organic matter soils. Plutonium in the nitrate form is adsorbed more and diffuses slower

than in the EDTA or DTPA chemical form. Dissolution rate of Pu-239 from microspheres in soil systems is also under study.
PROJECT MILESTONES: By the end of this year, the project is expected to provide significant data permitting he prediction of the rate of accumulation, transport, and Pu flux in the soil solution phase of the soil. he effect of chemical form, pH, and soil property will be related to the concentration of Pu transported nd moving in the soil profile.
KEYWORDS: FATE;INSTRUMENTATION;LAND;SOILS;PLUTONIUM 237;DIFFUSION;ADSORPTION;DESORPTION;MATHEMATICAL MODELS;EQUATIONS;RADIOASSAY;PLUTONIUM 238;PLUTONIUM 239;RADIONUCLIDE MIGRATION;CONTAMINATION;WATER;TRANSPORT;RADIOACTIVE WASTES

<089089>
TITLE: Interaction of Slow Electrons with High-Pressure Gases (Quasi-Liquids) Synthesis of Our Knowledge on Slow-Electron Interactions
PROJECT NUMBER: 006842
PRINCIPAL INVESTIGATOR: Christophoroj, L.G.
AFFILIATION: Tennessee Univ., Knoxville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$49,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<089091>
TITLE: Environmental Aspects of Coal Production in the Applachian Region
PROJECT NUMBER: 007010
PRINCIPAL INVESTIGATOR: Minear, R.A.
ADDRESS: Department of Civil Engineering, The University of Tennessee, Knoxville, TN 37916
AFFILIATION: Tennessee Univ., Knoxville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: C(301)353-5078
TYPE OF FUNDING: Contract No.-E-(40-1)-4946
77 FUNDING: Energy Research and Development Administration FY77:$168,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (50%);PARTICULATES (25%);SPECIFIED OTHER POLLUTANTS/Sulfates and other inorganics (25%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The project is comprised of 4 sub tasks (hydrologic, contaminant mobilization within spoil banks, heavy metals distribution in sediment, and biological impacts on small watersheds). The overall project objective is to quantitate environmental effects resulting from contour coal strip mining, focusing on the small, primary watershed. Each sub task objective is to achieve this goal for its specific focus, while simultaneously providing necessary data for each of the other sub tasks. Jointly, full characterization of the mining impact is sought to allow economic and technological judgements to be made.
APPROACH: Continuous rainfall and streamflow data are being collected to allow assessment and modelling of the mining process on small watershed hydrology. Hydrologic and chemical (water and overburden) data are being taken directly from the spoil bank interior to assess the quantitative aspects of the spoil bank role for more general basin modelling purposes. Sediment studies focus on direct sediment load measurements during rainfall events and physical/chemical characterizations of suspended and bed load sediment. The latter involves determining heavy metal content as a function of particle size and nature of binding in the particle. Biological studies include comparison of disturbed and undisturbed watersheds for species diversity. Metal content of individual species is being assessed to compare with separate water quality studies conducted on the streams. Effects of streamload and suspended solids on biota is being determined.
RESULTS: Results have been obtained for hydrologic, water quality, sediment and biological baseline data and changes associated with mining activity in the New River Basin of Tennessee. The outstanding feature of this study is the comparative analysis between impacted and virgin watersheds. Significant and quantified differences have been documented for a number of parameters of the different watersheds. For example, the results leave no doubt that contour mining for coal as practiced in the New River drainage basin profoundly affects population size, species richness and species equitability of the different groups of organisms. Yet, for insects, streams can return to a healthy, if not normal, condition over a period slightly in excess of 20 years. Such results describe baseline rehabilitation of reclamation standards of the millions of acres required by the new Surface Mine Control Law.
PROJECT MILESTONES: (1) June 1977 Estimate recovery of aquatic biota for non-treated ecosystems. (2) June 1977 Complete development of hydrologic model. (3) Oct. 1977 Provide data for implementing strip-mine enforcement law. (4) Oct. 1977 Complete 3-year water quality program. (5) Dec. 1977 Test hydrologic transport model with independent water quality data. (7) March 1978 Correlate biotic responses with water quality parameters.
KEYWORDS: FATE;COAL MINING;ENVIRONMENTAL EFFECTS;HYDROLOGY;METEOROLOGY;SPOIL BANKS;METALS;PARTICLE SIZE;WATER QUALITY;REGIONAL ANALYSIS;COST BENEFIT ANALYSIS;SURFACE MINING;CHEMICAL EFFLUENTS;ECOSYSTEMS;TOXINS;WATER;SEDIMENTS

<089093>
TITLE: Development and Coordination of a Program of Energy-Related Oceanographic Research on the Continental Shelves of the Gulf of Mexico
PROJECT NUMBER: 007075
PRINCIPAL INVESTIGATOR: Treadwell, T.K.
ADDRESS: Texas A and M University, College Station, TX 77843
FFILIATION: Texas A and M Univ., College Station (USA). Dept. of Oceanography and Meteorology
TORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
IVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen
TELEPHONE: C(301)353-5549
TYPE OF FUNDING: Contract No.-E(40-1)-5017
77 FUNDING: Energy Research and Development Administration FY77:$26,000

TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (60%);TRANSPORTATION (20%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (5%);WASTE MANAGEMENT (5%)
POLLUTANTS: METALS (10%);PARTICULATES (20%);ORGANICS (60%);RADIATION (5%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop and monitor the execution of an energy-related oceanographic research program in the Gulf of Mexico. This program will be structured as an inter-disciplinary and inter-institutional effort. It will emphasize the processes in the marine environment, and build on the base of data gathered in studies such as those sponsored by BLM and USGS. The geographical areas of concern will be the estuarine and continental shelves of the Gulf. Primary orientation will be toward understanding the environmental processes, and development of a predictive capability.
APPROACH: To evaluate the present and potential energy-related activities of the Gulf of Mexico; to identify those processes of the environment which may affect, or be affected by, energy activities; to highlight research work which will aid in understanding these processes; to identify researchers and institutions which are capable and available to carry out the work; and to prepare recommendations to ERDA concerning the research program and the means for implementing it.
RESULTS: The submission to ERDA of the proposed research program outlined above. In follow-on years, the monitoring of the execution of the program if approved by ERDA, and continued planning of a program to take advantage of results achieved in the research.
PROJECT MILESTONES: A management structure (steering committee) and advisory structure (scientific advisory committee) have been formed. A workshop brought together experts on the problem, and the workshop proceedings were published as a general scientific framework for program development. Potential PI's have been brought together in working groups and encouraged to develop interdisciplinary and interinstitutional proposals. An annual meeting with PI's, the steering and advisory committees will provide the opportunity for interchange of ideas and planning for future operations.
KEYWORDS: GULF OF MEXICO;CONTINENTAL SHELF;OCEANOGRAPHY;ESTUARIES;BIOMASS;AQUATIC ECOSYSTEMS;CHEMICAL EFFLUENTS;OIL SPILLS;WATER

<089095>
TITLE: DPTA Chelation Therapy
PROJECT NUMBER: 2496
PRINCIPAL INVESTIGATOR: Lushbaugh, C.C.
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Weyzen, W.W.
TYPE OF FUNDING: Contract No.-E-76-C-05-0033;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To provide impetus to the development of DTPA for safe chemical usage in decorporation of occupationally acquired transuranic contaminants.
APPROACH: Provide the best chelator drug available for Pu decorporation to U.S. physicians responsible for occupational medicine in ERDA plants and contractor facilities and annual surveillance of their clinical experience with the drug Pentamel (CaNa3DTPA) for review by FDA.
RESULTS: The working files on national DTPA usage, IND (Investigation of New Drug) information and DTPA users were received and summarized. A report was prepared on the frequency of DTPA usage, reactions, modes of therapy and results.
PROJECT MILESTONES: (1) The study of the efficacy of ZnDTPA therapy will be completed Sept. 30, 1978. (2) Attempt to obtain New Drug status for DTPA (both as Ca or Zn salt) from FDA, Sept. 30, 1979.
KEYWORDS: PERSONNEL;CONTAMINATION;TRANSURANIUM ELEMENTS;RADIOACTIVE AEROSOLS;RADIOISOTOPES;TISSUE DISTRIBUTION;EXCRETION;DTPA;BIOLOGICAL EFFECTS;TOXICITY;PHARMACOLOGY;DECONTAMINATION;CALCIUM COMPOUNDS;ZINC COMPOUNDS;PLUTONIUM;MEDICINE;EPIDEMIOLOGY

<089099>
TITLE: Benthic Community Metabolism on the Continental Shelf of the Northern Gulf
PROJECT NUMBER: 007103
PRINCIPAL INVESTIGATOR: Pamatomat, M.M.
ADDRESS: Agriculture Experiment Station, Auburn Univ., Auburn, AL 36830
AFFILIATION: Auburn Univ., Ala. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: C(301)353-5549
TYPE OF FUNDING: Contract No.-06-70-91(24)
77 FUNDING: Energy Research and Development Administration FY77:$67,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Oil and Gas (50%)
ENERGY CYCLE: EXTRACTION (60%);TRANSPORTATION (20%);STORAGE (20%)
POLLUTANTS: HEAT, THERMAL (10%);SPECIFIED OTHER POLLUTANTS/Oil spills (90%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To provide background to assess the impacts of oil-gas activities in the Gulf of Mexico
APPROACH: (1) Conduct seasonal studies of benthic community metabolism along transects on the continental shelf of Florida, Alabama, Mississippi and Louisiana. Measurements would include total O2 uptake, uptake after formaldehyde poisoning (to measure chemical oxidation), assay of dehydrogenase activity and ATP levels (anaerobic metabolism), estimation of respiratory quotient and analyses of sediment for pH, Eh, reduced substances, organic carbon and nitrogen, plant pigments and their degradation products, silt and clay content. (2) Do the same measurements around an existing oil rig in the Gulf. (3) Apply direct calorimetry in order to make a comparative study of metabolic heat release, dehydrogenase activity and ATP

concentrations
KEYWORDS: GULF OF MEXICO;CONTINENTAL SHELF;COASTAL WATERS;AQUATIC ECOSYSTEMS;SEASONAL VARIATIONS;AQUATIC ORGANISMS;BENTHOS;BIOMASS;RESPIRATION;OXIDATION;METABOLISM;SEDIMENTS;ANAEROBIC CONDITIONS;ENZYMES;BIOCHEMICAL REACTION KINETICS;OIL WELLS;OFFSHORE DRILLING;OCEANOGRAPHY;ENVIRONMENTAL EFFECTS

<089100>
TITLE: Disposal of Contaminated Metal
PROJECT NUMBER: 800013
PRINCIPAL INVESTIGATOR: Cavendish, J.H.
ADDRESS: National Lead Company of Ohio, Fernald, OH
AFFILIATION: National Lead Co. of Ohio, Fernald (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Glauberman, Harold
TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-EY-76-C-05-1156;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$185,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS;INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: To provide means for the recycle of metallic scrap slightly contaminated with Special Nuclear Material (SNM) back into commercial use. Present Federal regulations (10CFR70) prohibits possession, use or sale of SNM except by holders of an NRC license. The first objective is to have current regulations amended to permit unlicensed possession of de minimis quantities of SNM. The second objective is to provide means to decontaminate scrap metals to the de minimis levels.
APPROACH: To work with the Nuclear Regulatory Commission to revise existing regulations, and develop scrap metal smelters capable of recovering and decontaminating metals to the de minimis levels established.
RESULTS: During FY 77 evaluation of alternative smelter processes will be continued. Conceptual designs of a portable smelter will be considered. A Draft Environmental Impact Statement is being prepared. As a basis of NRC consideration in revising the existing regulations.
PROJECT MILESTONES: (1) Review EIA with NRC, start revisions as required. (2) Start reassessment of radiological impact. (3) Initiate review of general nuclear industry scrap metal problem areas.
KEYWORDS: METALS;CONTAMINATION;ENRICHED URANIUM;RECOVERY;DECONTAMINATION;SMELTING;RADIOACTIVE WASTES;RADIOISOTOPES;DECOMMISSIONING

<089101>
TITLE: Weldon Spring Raffinate Pits Stabilization
PROJECT NUMBER: 800027
PRINCIPAL INVESTIGATOR: Pennak, A.F.
ADDRESS: National Lead Company of Ohio, Fernald, OH
AFFILIATION: National Lead Co. of Ohio, Fernald (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-4214
TYPE OF FUNDING: Contract No.-E(30-1)-1156
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Weldon Spring
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: ERDA, successor to AEC, has retained possession of 52 acres containing the four raffinate pits as a radioactive disposal area subject to perpetual control. The construction of the pits utilizing ten feet of impermeable clay on all sides, effectively eliminates liquid seepages to surface or underground waters.
APPROACH: Removal of the supernatant liquors from all pits will be completed and the raffinate pits area will be regraded for decommissioning and sale.
RESULTS: After removal of the radioactive sludges by others, it is proposed to decommission the ERDA-Weldon Spring site (approximately 52 acres). Predicted upon the receipt of a NPDES Discharge permit, the supernatant liquors in the pits would be discharged to the Missouri River utilizing the same discharge route as was used during the operation of the Weldon Spring Production Center. Thereafter, the earthen pit dikes would be destroyed, with the earth used to grade the entire area to an esthetically pleasing contour. The disturbed area would be seeded to prevent erosion and silt carryover offsite.
PROJECT MILESTONES: (1) Monitoring and caretaking actively. (2) Removal of radioactive residues by others. (3) Application for and receipt of discharge permit. (4) Raffinate pits decommissioning. (5) Reduction of quarry discharge.
KEYWORDS: RAFFINATE;PITS;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;RADIOACTIVE WASTE DISPOSAL;URANIUM;RADIOACTIVE WASTES;UNDERGROUND DISPOSAL;RADIOACTIVE WASTE FACILITIES;DECOMMISSIONING;RADIATION MONITORING;LAND RECLAMATION;DECONTAMINATION;STABILIZATION

<089102>
TITLE: Epidemiological Models for Predicting Health Impact of Energy Related Facilities
PROJECT NUMBER: 002511
PRINCIPAL INVESTIGATOR: Jobin, W.R.
ADDRESS: Puerto Rico Nuclear Center, Caparra Heights Station, San Juan, PR 00935
AFFILIATION: Puerto Rico Nuclear Center, San Juan
ITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Contract No.-E-(40-1)-1833
77 FUNDING: Energy Research and Development Administration FY77:$21,000

TECHNOLCGY: HYDROELECTRIC (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Tropics
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: In the development of new energy production facilities and in programs to reduce the pollution from existing facilities, planners need tools for predicting the environmental and health impact of these changes. Special concern is given to tropical diseases related to hydroelectric impoundments. More subtle diseases caused by air pollution from oil-fired steam plants also occur in tropical areas, and these merit attention. The purpose of this project is to develop epidemiological models which can be used by planners to predict the changes in disease prevalence and incidence related to the power facilities in Puerto Rico and other tropical areas.
APPROACH: This project will be concerned with laboratory and field investigations necessary for formulation, calibration, and verification of models related to specific diseases. In addition, the completed models will be used to examine alternate strategies for reducing the related diseases in Puerto Rico and other tropical areas. The models will be developed sequentially starting with schistosomiasis and within two years moving onto the next disease which will depend on availability of data from other projects such as the air pollution study. The following scheme relates specifically to the next two years and the epidemiological modelling of schistosomiasis.
RESULTS: The specific objectives are to develop a model of schistosomiasis transmission based on hydroelectric reservoirs as the epidemiological unit. The reservoirs in Puerto Rico to be modelled will include Lago Loiza and Rio Blanco. In addition, a model will be developed for Volta reservoir in Ghana, for Taveras and Bao reservoirs in the Dominican Republic and for some of the larger power reservoirs on the Sao Francisco River in Brazil. The models will be verified with the field data and used to predict effects of various designs, operational schedules and control programs for these reservoirs.
PROJECT MILESTONES: (1) Complete analysis of 1976 skin-test survey for schistosomiasis 1/10/76. (2) Complete laboratory studies of pathogens 1/1/77. (3)Complete epidemiological studies in rural communities 1/1/77. (4) Complete computer modelling 30/9/77.
KEYWORDS: HYDROELECTRIC POWER PLANTS;WATER RESERVOIRS;ENVIRONMENTAL EFFECTS;TROPICAL REGIONS;FOSSIL-FUEL POWER PLANTS;AIR POLLUTION;EPIDEMIOLOGY;SCHISTOSOMIASIS;ECOSYSTEMS;MAN;SOCIOLOGY

<089103>
TITLE: Effect of Fossil Fuel Pollutants on Human Health and Biota in the Tropics
PROJECT NUMBER: 002512
PRINCIPAL INVESTIGATOR: Jobin, W.R.
ADDRESS: Puerto Rico Nuclear Center, Caparra Heights Station, San Juan, PR 00935
AFFILIATION: Puerto Rico Nuclear Center, San Juan
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, Walter
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(40-1)-1833
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (10%);ELECTRICITY GENERATION (90%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Site specific Tropics
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The project will put emphasis on the effect of pollution from the utilization of oil for energy and related enterprises in the tropics especially in Puerto Rico. We will utilize several approaches to correlate the levels of pollution with human and animal health. In the first, we will study the epidemiology trying to put the problem in prospective and to find some links between morbidity and mortality in populations with high and low risk. Analytical studies of the contaminants in human and domestic animals will be made to correlate contaminants with incidence of symptoms and disease. Functional tests of environmental aggression will be made in humans on lung, and liver function, chromosomal patterns, etc. The biological half life of the main pollutants from oil will be determined in human and domestic animals. Tissue culture studies of human cell lines will be made trying to extrapolate effects of contaminants on human health.
APPROACH: Given the difficulties and complexities of this project, the proposal calls for a gradual development as follows: Localize and define the problem, Epidemiological studies from available data, Locate specific populations in which it will be possible to correlate analytical data on pollutants in humans and biota, with specific effects. Technical Results FY-1976 The Project has been funded at a minimal level during the current fiscal year. Because of the limited funding it was necessary to set up very limited research objectives and to make use of students to implement this research.
RESULTS: Biological test systems are being developed in the laboratory for detecting substances in the atmosphere which have the potentiality of damaging DNA. In one the growth of an E. coli mutant deficient in DNA polymerase is inhibited by mutagens because the deficient polymerase is not capable of repairing the damage to the DNA. The response of the mutant to benzopyrene and hydroxyurethane will be quantitated. In another method the uptake of labeled thymidine by cells exposed to pollutants will be monitored. Having established laboratory methods of detecting substances which damage cellular DNA these methods will be used to detect potentially damaging substances emitted by the power plants of Puerto Rico.
PROJECT MILESTONES: (1) Quantitate response of E. coli mutant to pollutants 1/1/77. (2) Detect potentially toxic substances from power plants 1/6/77. (3) Complete report 30/9/77.
KEYWORDS: FOSSIL FUELS;POLLUTION;OILS;ENERGY SOURCES;PUERTO RICO;TROPICAL REGIONS;HEALTH HAZARDS;EPIDEMIOLOGY;ENVIRONMENTAL EFFECTS;LUNGS;LIVER;BIOLOGICAL EFFECTS;ESCHERICHIA COLI;DNA;POLYMERASES;AIR;CARCINOGENS;ANIMAL CELLS;CHEMICAL EFFLUENTS;MAN

<089105>
TITLE: Transporting Radioactive Cargoes-Exhibit (Operations)
PROJECT NUMBER: 800052
PRINCIPAL INVESTIGATOR: English, G.
ADDRESS: Oak Ridge Associated Universities, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology, Transportion Branch
MONITOR: Dunckel, Thomas L.
TELEPHONE: F233-5361
TYPE OF FUNDING: Contract No.-EY-76-C-05-0033
77 FUNDING: Energy Research and Development Administration FY77:$42,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: RADIATION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This activity is an extension of the public education programs described under Activity UH 01 02 01, Traveling Presentations. The exhibit ''Transporting Radioactive Cargoes'' is designed to be used primarily at convention sites. Its purpose is increased public awareness and understanding of the present and potential requirements for the transport of radioactive materials. It emphasizes ERDA's continuing concern for the safety of every citizen and the protection of our environment.
APPROACH: Show a specially designed exhibit, ''Atoms on the Move,'' manned by an ORAU teacher-demonstrator at large conferences of the Transportation Industry and related groups to emphasize ERDA's continuing concern for the safety of every citizen and protection of our environment in the transport of radioactive materials.
RESULTS: Increased public awareness by showing the exhibit at 5 to 7 large conferences per year.
KEYWORDS: RADICACTIVE MATERIALS;TRANSPORT;EDUCATION;SAFETY;RADIATION PROTECTION;RADIOACTIVE WASTES

<089107>
TITLE: National Spill Control School
PROJECT NUMBER: 800064
PRINCIPAL INVESTIGATOR: Gilchrist, R.
ADDRESS: 6300 Ocean Drive, P.O. Box 8263, Corpus Christi, TX 78412
AFFILIATION: Texas A and I Univ., Corpus Christi (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Mott, W.
TELEPHONE: F233-5227
TYPE OF FUNDING: Contract No.-E-05-07-0438.00
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (50%)
POLLUTANTS: ORGANICS/Oil (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Southeast;COASTS/Gulf;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The overall objective of the project is to organize, test the curriculum developed during Phase I, begin classes of instruction in order to reach ERDA's objective of providing a trained manpower base to respond to the needs of the nation in controlling the problems created by oil spills.
APPROACH: The curriculum developed during Phase I emphasizes the current ''state of the art'' of oil spill control as practiced throughout the nation and for the contingency planning necessary to improve the nation's readiness to react to oil spills.
RESULTS: The training program provided will furnish a manpower base to local communities to respond to emergencies caused by oil spills and to develop contingency plans for dealing with problems of oil spills.
PROJECT MILESTONES: The proposed schedule for the academic year 1977-78 will consist of five practice sessions with selected students to test the curriculum plus fourteen, five-day class sessions.
KEYWORDS: OIL SPILLS;ENVIRONMENTAL EFFECTS;EDUCATION;CLEANING;PLANNING;PERSONNEL

<089108>
TITLE: Puerto Rico Energy Model: An Aid for the Decision Process in Region Energy Policy Formulation
PROJECT NUMBER: 2647
PRINCIPAL INVESTIGATOR: Davila, J.A.
ADDRESS: Puerto Rico Energy Office, P.O. Box 41089, Santurce, PR 00940
AFFILIATION: Puerto Rico Energy Office, Santurce
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Office
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-EY-76-C-05-1833;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$71,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);SOLAR/General (25%);CONSERVATION/General (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Site specific Puerto Rico;COASTS/Other coasts Puerto Rico;HYDRCGRAPHIC AREAS/Other hydrographic areas Puerto Rico
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop quantitative tools leading to improvement of our understanding of the energy system and to improve energy policy analysis for decision making related to the selection of strategies and goals.
ROACH: (1) Develop and evaluate the ''Econometric Growth Model'' of Puerto Rico. (2) Document and assess the demographic submodel. (3) Assess demand submodels for each sector. (4) Related environmental impact (particularly in relation to the air contaminants and associated epidemiological incidence).
RESULTS: (1) Assessment of the predictive capacity of the Econometric Growth Model. (2) Use the atmospheric dispersion model for the industrial areas of Guayanilla and Catano. (3) Complete primary sources data bank. (4) Complete alternate energy source profiles.
PROJECT MILESTONES: (1) Completed a synopsis of the energy situation of Puerto Rico-1976, done April 1977.

(2) Complete evaluation of economic models and application, Sept. 1975. (3) Complete the development of energy model, Jan. 1976. (4) Full implementation of system for energy, Sept. 1976. (5) Complete implementation of petro model, Aug. 1977.
KEYWORDS: PUERTO RICO;ENERGY MODELS;DECISION MAKING;REGIONAL ANALYSIS;ENERGY POLICY;ECONOMETRICS;POPULATION DYNAMICS;HUMAN POPULATIONS;AIR POLLUTION;ENVIRONMENTAL TRANSPORT;SOCIOLOGY

<089110>
TITLE: Decontamination of ERDA Niagara Falls Site
PROJECT NUMBER: 800125
PRINCIPAL INVESTIGATOR: Pennak, A.F.
ADDRESS: National Lead Company of Ohio, Lewiston, NY 14092
AFFILIATION: National Lead Co. of Ohio, Cincinnati (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-EY-76-C-05-1156;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To improve the quality and reliability of data in the ERDA site ground water monitoring program. Site supervision would be continued. Removal of residues from the site by others is being considered.
APPROACH: Nine new wells will be installed to replace existing deficient wells on the site. A new sample collection system will be provided and employed.
RESULTS: The installation of the improved groundwater sampling system would be completed.
KEYWORDS: DISMANTLE;US ERDA;NUCLEAR FACILITIES;RADIOACTIVE WASTE MANAGEMENT;RADIATION MONITORING;GROUND WATER;SAMPLING;WELL DRILLING;PLANNING;SAMPLERS;RADIONUCLIDE MIGRATION;SOILS;DECONTAMINATION

<089111>
TITLE: Decontamination of PRNC Reactor Facility
PROJECT NUMBER: 800090
PRINCIPAL INVESTIGATOR: Brown, R.
ADDRESS: Puerto Rico Nuclear Center, Mayaguez, PR
AFFILIATION: Puerto Rico Nuclear Center, Mayaguez
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-E(40-1)-1833;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;COASTS/Gulf
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of the project is to decontaminate the PRNC reactor facility after termination of reactor operations. The PRNC TRIGA reactor will be decommissioned and transferred to Argonne National Laboratory-West after termination of operations in September 1976.
APPROACH: Following removal of the reactor fuel the reactor facility will be cleaned of all contaminated equipment, materials, and debris and decontaminated of all radioactivity. All unserviceable radioactive material will be packaged and shipped for burial in the continental U.S.
RESULTS: During FY-77 a complete assessment will be made of all contaminated systems, equipment, materials and debris in the facility. This will include all reactor equipment and components in the pool, irradiation facilities, water purification system, hot liquid waste system, normal and emergency ventilation system, and air and area monitoring systems. Decontamination levels to required limits will be set for each area. Plans and procedures for the dismantling and disassembly of systems and components, shielding, packing, monitoring, labeling and shipment of all radioactive materials will be prepared, reviewed and submitted for approval.
KEYWORDS: REACTOR DISMANTLING;PRPR REACTOR;DECONTAMINATION;REACTOR DECOMMISSIONING;RADIOACTIVE WASTE DISPOSAL;ACTIVITY LEVELS;TRANSPORT

<089112>
TITLE: Health and Mortality Study
PROJECT NUMBER: 2493
PRINCIPAL INVESTIGATOR: Tompkins, E.
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Weyzen, W.W.
TYPE OF FUNDING: Contract No.-EY-76-C-05-0033;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Hanford and Oak Ridge coal conv. sites
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Use modern epidemiological technology as the means for monitoring large populations of workers in industries related to fuel and energy production to detect any harmful effects of these occupations as soon as possible so that health protection can be constantly improved.
APPROACH: The disability and mortality experience of persons with a history of employment in selected installations associated with the nuclear industry and the coal conversion industry will be studied. Employment histories and medical records are used as primary inputs. Where lacking, plans for medical

surveillance of workers are being designed to provide early detection of health effects. In the coal conversion area, plans for industrial hygiene programs are being designed to minimize exposure of workers to carcinogens.
ULTS: The professional staff of epidemiologists and statisticians needed to conduct the study have been recruited and become familiar with the existing data banks. A study of the mortality experience of the workers exposed to metallic nickel at the Oak Ridge Gaseous Diffusion Plant has been implemented, and a study of the mortality experience cf workers at the Savannah River Plant has been completed.
PROJECT MILESTONES: (1) The study of mortality of workers exposed to metallic nickel will be completed and submitted for publication, Sept. 30, 1978. (2) The design of forms for collection of data on clinical findings and medical, occupational, and family histories fcr coal-conversion workers will be completed, Sept. 30, 1978. (3) The first analyses of mortality of workers in Oak Ridge employed before 1950 will be completed, Sept. 30, 1979. (4) The forms and protocols designed for collection of health data on coal-conversion workers will be field tested and redesigned, if indicated, Sept. 30, 1979.
KEYWORDS: PERSONNEL;HEALTH HAZARDS;EPIDEMIOLOGY;AIR POLLUTION;NUCLEAR INDUSTRY;COAL INDUSTRY;COAL GASIFICATION;COAL LIQUEFACTION;NICKEL;TOXICITY;CARCINOGENS;NEOPLASMS;HYDROCARBONS;RADIOISOTOPES;RADIONUCLIDE KINETICS;COMPARATIVE EVALUATIONS;MORTALITY

<089113>
TITLE: Physical and Chemical Properties of a Geothermal Submarine Spring
PROJECT NUMBER: 007367
PRINCIPAL INVESTIGATOR: Pyle, T.E.
ADDRESS: Department of Marine Sciences, University of South Florida, St. Petersburg, FL 33701
AFFILIATION: University of South Florida, St. Petersburg (USA). Dept. of Marine Science
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen
TELEPHONE: C(301)353-5549
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (10%);NUCLEAR/General (30%);GEOTHERMAL/Hydrothermal (60%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (30%);PARTICULATES (30%);HEAT, THERMAL (30%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This study will test the feasibility of using an existing natural phenomenon (warm, saline discharge of a major submarine spring in the eastern Gulf of Mexico) to determine the long-term effects upon shelf biota of thermal discharge from offshore power plants.
APPROACH: The study will assess the regional setting, magnitude variability and properties of the Mud Hole Submarine Spring by means of geophysical, geological, chemical, hydrographic and limited biological sampling. Reconnaissance and quarterly shipboard surveys will be supplemented by continuous in situ monitoring of flow rate and temperature and by periodic aerial mapping of sea surface temperature patterns. Mathematical modeling of the spring's flow regime and its interaction with ambient shelf waters will help determine the near-field and far field significance of discharge plume in comparison with nutrient, trace metal, dissolved oxygen and primary productivity anomalies.
RESULTS: Advances in understanding the distribution of continental shelf fracture patterns, the potential flow paths of waste injected in deep wells, the nature of geothermal processes in non-volcanic areas and the dynamics of water-sediment-organism interactions.
PROJECT MILESTONES: Initial reconnaissance 1977; establishment of film-recording thermograph and flowmeter for continuous, unattended monitoring of the spring 1977.
KEYWORDS: THERMAL SPRINGS;PHYSICAL PROPERTIES;CHEMICAL PROPERTIES;UNDERWATER;SEAS;FEASIBILITY STUDIES;GULF OF MEXICO;MONITORING;FLOW RATE;TEMPERATURE MEASUREMENT;ENVIRONMENTAL EFFECTS;CONTINENTAL SHELF;FRACTURES;AQUATIC ECOSYSTEMS;TEMPERATURE EFFECTS;GEOPHYSICAL SURVEYS;GEOCHEMICAL SURVEYS

<089115>
TITLE: Toxic Coal Particle Identification
PROJECT NUMBER: 002494
PRINCIPAL INVESTIGATOR: Wallace, W.E.
ADDRESS: Morgantown Energy Research Center, Morgantown, WV
AFFILIATION: Energy Research and Development Administration, Morgantown, W.Va. (USA). Morgantown Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: C(301)353-5468;F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS (20%);PARTICULATES (50%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To characterize effluents, process streams, and wastes from fluidized bed combustion and low-Btu gasification for toxic agents present; (2) to define the pathogenic chemicals in these processes by in vitro screening, and (3) to understand the biochemical mechanism(s) involved in the effect.
APPROACH: (1) Sample and chemically analyze process streams and effluents. (2) Analyze chemical reactions that lead to contaminant release. (3) Conduct cellular and biochemical screening bioassay lung macrophages, membranes and model lipid membranes.
SULTS: In conjunction with investigators at Inhalation Toxicology Research Institute, an integrated chemical and biological analysis program will define the major effluents and emissions from both advanced coal combustion and gasification processes. Information from the in vitro bioassays will be used to establish priorities among chemical agents to be used in animal experiments in the joint ITRI-MERC program.
PROJECT MILESTONES: (1) Obtain samples and chemically characterize 1-6-77. (2) Prepare samples for in vitro bioassay 1-9-77. (3) Preliminary bioassay lung macrophages 1-1-78. (4) Data on PAH activating enzymes

1-6-78.
KEYWORDS: COAL GASIFICATION;COAL LIQUEFACTION;ENVIRONMENTAL EFFECTS;GASEOUS WASTES;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;BIOLOGICAL EFFECTS;BIOASSAY;HYDROCARBONS;CARCINOGENS;ENZYMES;RESPIRATORY TRACT CELLS;MOLECULAR BIOLOGY;BIOCHEMICAL REACTION KINETICS;PATHOLOGICAL CHANGES;LUNGS;AIR POLLUTION;PARTICLES;TOXICITY

<089116>
TITLE: Management of the Red-Cockaded Woodpecker, an Endangered Species
PROJECT NUMBER: 007241
PRINCIPAL INVESTIGATOR: Jackson, J.A.
ADDRESS: Department of Zoology, Mississippi State University, State College, MS 39762
AFFILIATION: Mississippi State Univ., State College (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: SOLAR/Biomass (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to determine the habitat requirements and preferences of the Red-Cockaded Woodpecker.
APPROACH: The habitat and food supply differences between active and abandoned bird colonies will be measured and habitats of selected active colonies will be altered.
RESULTS: The results of this study will lead to a change in forest management practices so that this bird species will not become extinct.
KEYWORDS: BIRDS;MANAGEMENT;ENDANGERED SPECIES;FOOD;FORESTS;WILD ANIMALS;POPULATIONS

<089118>
TITLE: Environmental Effects of Carbon Dioxide
PROJECT NUMBER: 002561
PRINCIPAL INVESTIGATOR: Rotty, R.
ADDRESS: Oak Ridge Associated Universities, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Slade, David N.
TELEPHONE: C(301)353-4374
TYPE OF FUNDING: Contract No.-EY-76-C-05-0033
77 FUNDING: Energy Research and Development Administration FY77:$95,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Carbon dioxide (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide support for ERDA's special study group on global environmental effects of carbon dioxide which, in turn, assists ERDA in formulating a research program in this subject area.
APPROACH: Assist ERDA in staffing study group, arrange meetings and workshops on the subject and collect information on world energy growth and environmental issues related to increasing levels of atmospheric CO2.
RESULTS: A comprehensive research plan addressing all relevant issues but integrated into the global research effort to avoid unnecessary duplication of effort.
PROJECT MILESTONES: (1) March 7--11, 1977 Workshop on environmental effects of global CO2 increases held in Miami Beach. (2) September 1977 Proceedings of workshop delivered to ERDA.
KEYWORDS: CARBON DIOXIDE;ENVIRONMENTAL EFFECTS;US ERDA;AIR POLLUTION;RESEARCH PROGRAMS;CLIMATES

<089119>
TITLE: Development of Transport Models for Environmental Pollutants
PROJECT NUMBER: 002287
PRINCIPAL INVESTIGATOR: Spalding, G.E.
ADDRESS: University of Tennessee, Comparative Animal Research Lab., Oak Ridge, TN 37830
AFFILIATION: UT-ERDA Comparative Animal Research Lab., Oak Ridge, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468;C(301)353-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$356,000
TECHNOLOGY: FOSSIL FUEL/Coal (80%);NUCLEAR/General (20%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (90%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To mathematically model whole-body transport and deposition of ingested or injected Cd and Nb in comparative animal species in order to supply the tissue and organ dose. The dose component of dose-effect studies will be used to improve human risk estimates from experimentally derived data.
APPROACH: We will study neonatal and weanling and adult rodents, swine and sheep using intravenous and oral routes of administration to derive experimental transport coefficients among animals and across species and associated error terms to avoid confounding data variations due to experimental variation as opposed to real variations in transfer coefficients for various species.

RESULTS: We expect to find some transfer coefficients are species independent and therefore directly applicable tc man. Others will be shown to be species dependent and the anatomical, physiological and metabolic basis will be defined. Where actual human data exist, these will be incorporated into the model.
KEYWORDS: CADMIUM;NIOBIUM;TOXIC MATERIALS;TISSUE DISTRIBUTION;ANIMALS;COMPARATIVE EVALUATIONS;ORAL ADMINISTRATION;INTRAVENOUS INJECTION;RODENTS;SWINE;SHEEP;AGE DEPENDENCE;NEONATES;INFANTS;ADULTS;BIOLOGICAL VARIABILITY;BIOLOGICAL MODELS;METABOLISM;MATHEMATICAL MODELS;DOSE-RESPONSE RELATIONSHIPS;ENVIRONMENT;PHYSIOLOGY;RADIONUCLIDE KINETICS

<089120>
TITLE: Seasonal Interactions Among Estuarine Primary Producers and Herbivores
PROJECT NUMBER: 006851
PRINCIPAL INVESTIGATOR: Heinle, D.R.
ADDRESS: Center for Environmental and Estuarine Studies, Cheasapeake Biological Laboratory, Solomons, MD 20688
AFFILIATION: Maryland Univ., Solomons (USA). Chesapeake Biological Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549;C(301)353-5549
TYPE OF FUNDING: Contract No.-E(40-1)-4848
77 FUNDING: Energy Research and Development Administration FY77:$44,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To determine the potential effect of grazers (including nauplii) on phytoplankton succession in coastal temperate waters by assessing their selection of different sized species and grazing rates on different species of comparable sizes. (2) To determine the trophic status of the seasonally dominant species of zooplankton in mid-Chesapeake Bay. (3) To determine the extent to which phytoplankton size composition limits production of zooplankton in coastal temperate waters. (4) To determine the potential effect of phytoplankton succession of zooplankton grazer interaction by assessing the mechanistic response of particular grazers to particular feeding conditions.
APPROACH: Wild or laboratory-cultured species of zooplankton are presented with natural or contrived distributions of particulate matter. Particles removed from suspension by the grazing zooplankton are determined with an automatic particle counter.
RESULTS: Selection by the grazers for certain sizes or classes of particles will be interpreted in light of observed selective mortalities of phytoplankton that are pumped through power plants. Subtle effects of large power plants on estuarine ecosystems may thus be evaluated.
PROJECT MILESTONES: May 1977 Complete full year's study of selection of experimentally contrived particle distributions. (Testing of hypotheses formulated during first year's work).
KEYWORDS: SEASONAL VARIATIONS;ESTUARIES;PLANKTON;PARTICLE SIZE;HERBS;FOOD;BIOLOGICAL MODELS;ALGAE;FISHES

<089121>
TITLE: In-House Energy Management Plan
PROJECT NUMBER: 002560
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ENERGY SOURCES;RESEARCH PROGRAMS

<089122>
TITLE: Cytological Study of Radiation Induced Alterations in Cytoplasmic Factors Controlling Male-Sterility in Corn
PROJECT NUMBER: 006184
PRINCIPAL INVESTIGATOR: Edwardson, J.R.
AFFILIATION: Florida Univ., Gainesville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$9,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: PLANTS;MAIZE;BIOLOGICAL RADIATION EFFECTS;SEEDS;CYTOLOGY;CYTOPLASM;GENETIC EFFECTS;STERILITY;SEX DEPENDENCE;MORPHOLOGICAL CHANGES;PLANT BREEDING;IRRADIATION;MUTATIONS;RADIOINDUCTION

<089123>
TITLE: Ecological Effects of Nuclear Steam Electric Station Operations on Estuarine Systems
PROJECT NUMBER: 006368
PRINCIPAL INVESTIGATOR: Mihursky, J.A.
AFFILIATION: Maryland Univ., College Park (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: THERMAL POWER PLANTS;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;BIOLOGICAL EFFECTS;COASTAL REGIONS;ESTUARIES;AQUATIC ORGANISMS;POPULATION DYNAMICS;BIOMASS;THERMAL EFFLUENTS

<089124>
TITLE: Nuclear Power Generation and the Environment
PROJECT NUMBER: 006720
PRINCIPAL INVESTIGATOR: Ohanian, M.J.
AFFILIATION: Florida Univ., Gainesville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$13,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: NUCLEAR POWER;POWER GENERATION;ENVIRONMENTAL IMPACTS;NUCLEAR INDUSTRY;ENVIRONMENT

<089125>
TITLE: Electrical Power Generation--Comparative Risks and Benefits
PROJECT NUMBER: 006726
PRINCIPAL INVESTIGATOR: Kohl, J.
AFFILIATION: North Carolina State Univ., Raleigh (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$11,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ELECTRIC POWER;POWER GENERATION;ENVIRONMENTAL IMPACTS;COST BENEFIT ANALYSIS

<089126>
TITLE: Gulf Geothermal Ecology
PROJECT NUMBER: 007225
PRINCIPAL INVESTIGATOR: Day
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$84,000
TECHNOLOGY: GEOTHERMAL/General (100%)
KEYWORDS: GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS;LOUISIANA;GULF OF MEXICO;TERRESTRIAL ECOSYSTEMS;BASELINE ECOLOGY

<089127>
TITLE: Gulf Geothermal Water Quality
PROJECT NUMBER: 007226
PRINCIPAL INVESTIGATOR: Martinez
AFFILIATION: Louisiana State Univ., Baton Rouge (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: GEOTHERMAL/General (100%)
KEYWORDS: GULF OF MEXICO;LOUISIANA;WATER QUALITY;BASELINE ECOLOGY;GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS

<089128>
TITLE: Energy Resources
PROJECT NUMBER: 007417
PRINCIPAL INVESTIGATOR: Loebbaka, D.
AFFILIATION: Tennessee Univ., Knoxville (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$6,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: ENERGY SOURCES;TENNESSEE

<089129>
TITLE: Special Energy Training Courses
PROJECT NUMBER: 001148
PRINCIPAL INVESTIGATOR: Cloutier, R.
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<089130>
TITLE: Radiation Emergency Assistance Center
PROJECT NUMBER: 001404
PRINCIPAL INVESTIGATOR: Lushbaugh, C.
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$666,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<089131>
TITLE: Training in Radiation Accident Management in Reacts
PROJECT NUMBER: 001922
PRINCIPAL INVESTIGATOR: Cloutier, R.
AFFILIATION: Oak Ridge Associated Universities, Inc., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<089132>
TITLE: Training
PROJECT NUMBER: 002495
PRINCIPAL INVESTIGATOR: none
AFFILIATION: Center for Energy and Environment Research, Caparra Heights (Puerto Rico)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$95,000
TECHNOLCGY: SOLAR/General (100%)

Energy Research and Development Administration/Richlands Operations Office

<089501>
TITLE: ERDA Health Study (Lifetime Health and Mortality Experience of ERDA Contractor Employees with Occ. Radiation Exposure)
PROJECT NUMBER: 000408
PRINCIPAL INVESTIGATOR: Kirklin, C.W.
ADDRESS: 840 Swift Blvd., Richland, WA 99352
AFFILIATION: Hanford Environmental Health Foundation, Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: Richland Operations Office
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E-(45-1)-1837
77 FUNDING: Energy Research and Development Administration FY77:$135,000
TECHNOICGY: NUCLEAR/Fission (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific Hanford;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project is being carried forward to develop and maintain criteria to determine the long range effect of low level chronic radiation exposure to man, including the incidence of leukemia or cancer in general, and to study the effect on the mortality rate and differential causes of death between those exposed occupationally to ionizing radiation and their appropriate controls not so exposed.
APPROACH: The ERDA-RL Contractors' employees health, radiation exposure, and job assignment records have been searched dating from 1944. This, with other data, will be studied to determine any relationships between radiation exposure and mortality. The study design utilizes multiple control groups. One of the control groups is, employees in the same installations who were less exposed to ionizing radiation. One of the controls is the siblings of exposed employees. The mortality experience of each control group is being compared with the mortality experience of the exposed groups graded according to their exposure to ionizing radiation received in the course of employment in an ERDA installation.
RESULTS: The main purpose of this study is to ascertain whether or not any detectable life-shortening or increase in mortality has occurred among atomic energy workers, especially those exposed to occupational radiation compared to non-exposed employees selected from appropriate control populations.
KEYWORDS: IONIZING RADIATIONS;LOW DOSE IRRADIATION;CHRONIC IRRADIATION;PERSONNEL;US ERDA;BIOLOGICAL RADIATION EFFECTS;LEUKEMIA;NEOPLASMS;LIFE SPAN;MORTALITY;EPIDEMIOLOGY;GAMMA RADIATION;MAN;HUMAN POPULATIONS;PLUTONIUM

<089502>
TITLE: U.S. Transuranium Registry of ERDA, ERDA Contractor and Licensee Employees
PROJECT NUMBER: 000409
PRINCIPAL INVESTIGATOR: Breitenstein, B.D.
ADDRESS: 840 Swift Boulevard, Richland, WA 99352
AFFILIATION: Hanford Environmental Health Foundation, Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISICN: Richland Operations Office
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-E(45-1)-1837
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (20%);ANALYTICAL (80%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific USA
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of the U.S. Transuranium Registry is to determine any observable effects of work exposures on health, longevity and cause of death of transuranium workers in major ERDA contractor and licensee installations.
APPROACH: This continuing program provides for the centralized accumulation and evaluation of the uptake, distribution, retention, elimination and biological effects of transuranium nuclides in occupationally exposed workers. There is in progress a rapid evaluation of present health, mortality and cause of death of plutonium workers who have known depositions as compared with control groups with no such depositions.
RESULTS: Some nine thousand transuranium workers who have been at risk have been identified and continuing search of past records is expected to add two or three thousand more. Eight hundred forty-five authorities

for autopsy have been obtained and 58 autopsies obtained as of May 1, 1976. No serious adverse health effects, related to work exposures, have been found to date and results have been published in reports to ERDA and in the professional journals. A study of 452 Hanford employees with depositions of Pu has shown no statistically significant difference in present health, mortality and cause of death in those with higher depositions of Pu (2 nCi to 400 nCi) as compared to those with lower depositions (2 nCi). A Registry study of present health and longevity and cause of death of presently employed Hanford Pu workers with that of Hanford workers not so exposed as well as with other controls is expected to be completed during fiscal year 1977. Continued progress is expected in the accumulation of sufficient data to develop an improved model of the metabolism of Pu in man.
KEYWORDS: TRANSURANIUM ELEMENTS;HEALTH HAZARDS;NUCLEAR ENERGY;PERSONNEL;OCCUPATIONAL DISEASES;US ERDA;PERSONNEL MONITORING;EPIDEMIOLOGY;BIOLOGICAL EFFECTS;PLUTONIUM;MORTALITY;METABOLISM;RADIONUCLIDE KINETICS;DEATH;NUCLEAR FACILITIES;LIFE SPAN;DATA ACQUISITION SYSTEMS;NEOPLASMS

<089508>
TITLE: Solute Drag and Membrane Transport Task Agreement No. 2
PROJECT NUMBER: 006263
PRINCIPAL INVESTIGATOR: Van Bruggen, J.T.
ADDRESS: 3181 S W Sam Jackson Park Road, Portland, OR 97201
AFFILIATION: Oregon Univ., Portland (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: Richland Operations Office
MONITOR: Parker, Margi W.
TELEPHONE: C(509)942-7263
TYPE OF FUNDING: Contract No.-AT(45-1)-2226 Master No. E(45-1)-2226
77 FUNDING: Energy Research and Development Administration FY77:$23,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This laboratory discovered a new physical phenomena associated with the interaction (collision) of molecules in solution. When molecules collide in free solution the diffusion coefficients of one each of the pair are influenced. In general, free solution interaction reduces the diffusion coefficient and there is no ''useful'' effect of such collisions. When a membrane separates two solutions and the processes of transmembrane diffusion is being studied, molecular (solute) interaction can lead to a large unidirectional effect. The large asymmetric flux of a second solute caused by the presence of a hyperosmotic agent (first solute) on one side of the membrane has been given the descriptive name ''solute drag.'' The present studies are directed to defining the specifics of molecular structure, molecular size, etc. of the solute drag. We are attempting the quantitate the phenomena and to describe conditions under which solute drag may be put to practical use.
APPROACH: Details of the approach have been described in a series of publications from this laboratory, the latest of which was entitled ''Solute Flux Coupling in a Homopore Membrane.'' This appeared in the J. Gen Physicl. 83, 639-656, 1974. The usual experiment involves following the flux of a radioactive tracer as it moves from one chamber to another across a selected membrane. Solutes other than the tracer are added to the solutions in appropriate amounts to elicit solute-solute interaction and solute drag.
RESULTS: It is expected that the work will firmly establish solute-solute interaction as a basic process of both biological and non-biological systems. Its recognition in biological systems may lead to a better understanding of mechanisms of transmembrane movement of solutes into and out of cellular and organ systems. Its recognition as a basic process in non-biological systems may lead to its application in industry to energy-related mechanisms of application.
PROJECT MILESTONES: It is possible that the application of the concept of solute drag to specific biological systems will reveal that the present ''cloudy'' explanations of biological transport do in fact have a component of solute drag within the process. It is possible that the application of the principle of solute drag may permit the useful modification of the rate of transmembrane separation processes so as to accomplish separation with a ''force'' not yet utilized. It may also help to explain the limitations of current transmembrane separations in which the presence of solute drag had not been appreciated.
KEYWORDS: SEPARATIONS;AQUEOUS SOLUTIONS;MEMBRANES;MOLECULES;MEMBRANE TRANSPORT;DIFFUSION;IN VITRO;TRACER TECHNIQUES;MOLECULAR BIOLOGY;METABOLISM

<089509>
TITLE: Nature and Mechanism of Induction of Mutations
PROJECT NUMBER: 006306
PRINCIPAL INVESTIGATOR: Nilan, R.A.;Kleinhofs, A.
ADDRESS: Department of Agronomy and Soils, Washington State University, Pullman, WA 99163
AFFILIATION: Washington State Univ., Pullman (USA). Dept. of Agronomy and Soils
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: Richland Operations Office
MONITOR: Parker, Margi W.
TELEPHONE: C(509)942-7263
TYPE OF FUNDING: Contract No.-E(45-1)-2221
77 FUNDING: Energy Research and Development Administration FY77:$38,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Ammonia (40%);RADIATION/Gamma-rays (20%);SPECIFIED OTHER POLLUTANTS/Environmental Mutagens (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) Elucidate the mechanism of azide mutagenesis. (2) Elucidate the nature of azide-induced mutations.
APPROACH: Previous work indicates that azide is a potent and specific mutagen. In bacteria only base substitution mutations are induced and possibly only transversion-type base substitutions. The mechanism of azide mutagenesis is not understood. Work on this contract during the past year has provided preliminary evidence that azide is converted in vivo to the actual mutagen. Research proposed on this contract will concentrate on elucidating the in vivo reaction that results in the actual mutagen. The nature of this unknown in vivo mutagenic product as well as the role of DNA replication in azide

mutagenesis will be investigated. The waxy pollen locus system is being developed to study the molecular nature of the induced mutants.
RESULTS: Elucidation of the mechanism of action of a very unusual and potent environmental mutagen, sodium azide. Development of systems for the characterization of the nature of eukaryotic mutations.
PROJECT MILESTONES: (1) Discovery of sodium azide as a mutagen. (2) Realization of the unique mode of action of azide as a mutagen. (3) Determination that azide induces only point mutations in bacteria and possibly in eukaryotes.
KEYWORDS: MUTATIONS;GAMMA RADIATION;AZIDES;MUTAGENS;MUTAGENESIS;CHEMICAL REACTION KINETICS;IN VIVO;DNA;SODIUM COMPOUNDS;GENETICS;AMMONIA;AIR POLLUTION;HEALTH HAZARDS;BACTERIA;PLANTS

<089510>
TITLE: Control of Plant
PROJECT NUMBER: 006307
PRINCIPAL INVESTIGATOR: Cleland, R.E.
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$27,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (100%)

<089511>
TITLE: Theoretical Studies of Gene Substitution, Geographic Variation, and Speciation
PROJECT NUMBER: 006308
PRINCIPAL INVESTIGATOR: Felsenstein, J.
ADDRESS: Department of Genetics, SK-50, University of Washington, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Dept. of Genetics
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: Contracts and Procurement Division
MONITOR: Cole, Donald W.
TELEPHONE: C(509)942-7263
TYPE OF FUNDING: Contract No.-AT(45-1)2225 TA 5
77 FUNDING: Energy Research and Development Administration FY77:$19,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To carry out a variety of theoretical studies of evolutionary genetics of natural populations.
APPROACH: Theoretical mathematical studies; computer simulation.
RESULTS: Increased understanding of the mechanisms of evolution in natural populations. Maintenance and updating of a computerized bibliography of theoretical population genetics.
KEYWORDS: ECOSYSTEMS;POPULATION DYNAMICS;GENETIC CONTROL;MATHEMATICAL MODELS;COMPUTER GRAPHICS;COMPUTER CODES;GENETICS;MUTATIONS

<089512>
TITLE: The Physiology and Photochemistry of Ribonucleic Acids
PROJECT NUMBER: 006309
PRINCIPAL INVESTIGATOR: Gordon, M.P.
ADDRESS: Department of Biochemistry, SJ-70, University of Washington, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: Richland Operations Office
MONITOR: Bennett, Oscar J.
TELEPHONE: C(509)942-7271
TYPE OF FUNDING: Contract No.-E(45-1)2225, TA No. 15
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To obtain understanding of the chemical alterations introduced into self-replicating molecules of ribonucleic acids by exposure to ultraviolet light and other radiation. The process whereby various proteins, especially viral capsomer proteins, can protect genetic material from the damaging effects of ultraviolet light and other electromagnetic radiation will be ascertained. The ability of various plants to repair damage to genetic material will be studied using plant viruses.
APPROACH: The small ribonucleic acids of precisely determined sequence will be used to determine the effects of ultraviolet radiation on the replication of ribonucleic acids. Various plant viruses containing different types of capsomer proteins will be used as means of determining the protective effects of capsomer proteins on genetic material. Plants which are hosts for these viruses will be used to study environmental effects on the ability of plants to repair nucleic acids.
RESULTS: Expected results will be a determination of the types of lesions introduced into nucleic acids and their effects on the ability of these nucleic acids to replicate. The protective effects of proteins will be determined by a study of the molecular nature of the dissipation of the radiant energy in plant viruses. The protective nature of plants in repairing damage will be indicated by the ability to rescue infectivity of virus particles inactivated by ultraviolet radiation.
PROJECT MILESTONES: In the case of small self-replicating molecules, a milestone will certainly represent a determination of the chemical nature of lesions introduced into the self-replicating molecule by ribonucleic acid and the exact determination of the site of these lesions in molecules whose space sequence is ascertained.
KEYWORDS: RNA;CHEMICAL RADIATION EFFECTS;MOLECULAR BIOLOGY;IRRADIATION;PLANTS;VIRUSES;BIOLOGICAL REPAIR;BIOLOGICAL RADIATION EFFECTS;PHOTOCHEMISTRY;IRRADIATION;ULTRAVIOLET RADIATION;DNA;MUTAGENESIS

<089513>
TITLE: Trace Metal Associations in Sub-Arctic Fjord Environments
PROJECT NUMBER: 006324
PRINCIPAL INVESTIGATOR: Burrell, D.C.
ADDRESS: University of Alaska, Fairbanks, AK 99701
AFFILIATION: Alaska Univ., College (USA). Inst. of Marine Science
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: C(301)353-3035
TYPE OF FUNDING: Contract No.-AT(45-1)-2229 TA 1
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (80%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Identification and characterization of physical and chemical processes responsible for transporting, immobilizing, remobilizing and transfering between constituent phases, heavy metals in Alaskan ecosystems, particularly fjord estuaries.
APPROACH: A multi-faceted basic research program currently emphasizing the role of copper. Approach includes: (1) laboratory studies on chemical speciation in saline solutions, (2) exchange between natural solid inorganic phases and estuarine waters, (3) remobilization and migration at and from the sediment-water interface, (4) transport processes (advection and diffusion within fjords, and (5) development of the analytical methods required for the previous objectives.
RESULTS: Knowledge of the processes controlling the transport rates and routes and the major sinks for selected heavy metals in estuarine systems with specific reference to Alaskan fjords.
PROJECT MILESTONES: Project milestones through calendar year 1976 include: (1) inter-agency selection of intensive study, Alaskan estuarine sites July, (2) preliminary data on copper and lead speciation published September, and (3) comprehensive reports on chemical characteristics and water circulation in one Alaskan fjord September and November.
KEYWORDS: FATE;SPECIATION;PETROLEUM INDUSTRY;NATURAL GAS INDUSTRY;ENVIRONMENTAL EFFECTS;WATER POLLUTION;DIFFUSION;ALASKA;ECOSYSTEMS;METALS;CHEMICAL EFFLUENTS;COPPER;LEAD;ECOLOGICAL CONCENTRATION;ESTUARIES;RESOURCE CONSERVATION;WATER

<089514>
TITLE: Industrial Development in Alaska and its Effects on the Nutritional and Physiological Status of Arctic Animals
PROJECT NUMBER: 006325
PRINCIPAL INVESTIGATOR: Luick, J.R.
ADDRESS: Institute of Arctic Biology, University of Alaska, Fairbanks, AK 99701
AFFILIATION: Alaska Univ., College (USA). Inst. of Arctic Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, J.R.
TELEPHONE: C(301)353-4905
TYPE OF FUNDING: Contract No.-E(45-1)-2229, No. 3
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (80%);NUCLEAR/Fission (20%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (80%)
POLLUTANTS: ORGANICS (80%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The overall goal of this project is to study the effects of industrial development in Alaska on the physiological status and performance of arctic animals, especially caribou and reindeer. Additional studies with moose, fox, wolf, hare, lemming and ptarmigan will be undertaken in collaboration with other investigators. Environmental contaminants and pollutants resulting from energy extraction, mineral exploitation and from recreational use of the arctic wilderness as well as the exotic plants that are introduced for revegetation of transportation corridors are included among the environmental stresses of concern to this project. Studies will be directed at determining the effects on various parameters on indices of performance, i.e., on grazing behavior, animal productivity, milk production, body composition, physiological and nutritional status, and the passage of fallout radionuclides through food chains. In addition and in order to study the performance of herbivores grazing revegetated transportation corridors in alpine tundra/taiga areas, special grazing paddocks are being prepared at the Cantwell Reindeer Research Station. This new development affords considerable opportunity for agronomic, plant ecology and plant physiology/nutrition research and therefore we are listing appropriate long-term research in this area as a new contract objective. Studies will be directed at seed
APPROACH: Various arctic mammals, especially reindeer, Rangifer tarandus, are fed or allowed to graze atypical and/or petroleum-contaminated vegetation under controlled circumstances that simulate existing or anticipated conditions along transportation and/or petroleum pipeline corridors. The consequences of ingesting these atypical and/or polluted foodstuffs are monitored via a number of physiological and biomedical parameters. Additional studies are conducted simultaneously to determine levels of voluntary food intake, palatability and preferences for the various plant species used in revegetating tundra rangelands.
RESULTS: The results from these studies will provide information on the toxicity of orally ingested crude oil to arctic mammals, will establish the syndrome of such toxicity and provide guidelines for preventing the syndrome or treating animals that have accidentally ingested crude oil. The study will also establish the suitability of plant species used to revegetate disturbed land toward meeting the nutritional requirements of arctic animals grazing especially in alpine tundra rangelands.
PROJECT MILESTONES: (1) 1977, Perfection of in vivo techniques for determining physiological status of large arctic ungulates. (2) 1977, Initiation of studies on the nutritional and ecological significance of lichens in the winter diets of Rangifer. (3) 1977, Initiation of study to examine the importance of

introduced revegetation species to arctic herbivores. (4) 1978, Conclusion of studies on the effects of nutritional and environmental factors on accumulation and metabolism of radiocesium.
KEYWORDS: ALASKA;ENERGY;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;DEER;WILD ANIMALS;MINING;TERRESTRIAL ECOSYSTEMS;PHYSIOLOGY;BEHAVIOR;ARCTIC REGIONS;FALLOUT;RADIOISOTOPES;FOOD CHAINS;NUTRITION;REVEGETATION;PLANTS;PETROLEUM;TUNDRA;DISEASES;IN VIVO;METABOLISM;LICHENS;CESIUM 137

<089517>
TITLE: Low Level Chronic Irradiation of Salmon
PROJECT NUMBER: 006412
PRINCIPAL INVESTIGATOR: Hershberger, W.K.
ADDRESS: College of Fisheries, University of Washington, 204 Fisheries Center, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Coll. of Fisheries
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George W., Jr.
TELEPHONE: C(301)353-5548
TYPE OF FUNDING: Contract No.-AT(45-1)-2225-T2
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (95%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This program was originally planned and designed to evaluate the effects of ionizing radiation from radioactive effluents of nuclear reactors on the salmon. Although under present regulations very little if any radioactivity from nuclear power plants affects the rivers, there is a major public concern about the potential danger to the salmon which use the waters for spawning and nursery areas. More data is needed to assure the public that even in the unlikely event of a ''leak'', the possibility of radiation damage to aquatic resources is remote. To provide information addressed to this concern, experiments were designed and carried out at the College of Fisheries to investigate the long-term effects of chronic irradiation on salmon through use of the salmon runs developed at the college.
APPROACH: The program was originally planned and designed to evaluate the effects of radioactive effluents from nuclear reactors on the salmon. One of the major problems posed by placement of nuclear reactors on major rivers is the long-term effects exposure to chronic irradiation has on the chinook salmon (Oncorhynchus tshawytscha) which use the river as a spawning and nursery area. To evaluate these effects, chinook salmon eggs and alevins were exposed to low levels of gamma irradiation from a Co-60 source from fertilization until the yolk sac was completely absorbed. These fish were compared with a similar stock that was not exposed to irradiation. The level of exposure was incrementally increased from 0.5 R/day in 1960 to 1.3 R/day in 1965, 2.8 R/day in 1966, 5.0 R/day in 1967, 10.0 R/day in 1968, 20.0 R/day in 1969, and 50.0 R/day in 1970. After a period of rearing in freshwater, the fish were released to migrate to sea where they compete in the natural environment. The effects of the irradiation are monitored during the early development of the fish and when the fish return as adults from the sea. Possible genetic changes are also monitored in the returning adults and in the F/sub 1/ progeny.
RESULTS: No damaging effects were found at the lower exposure rates (0.5-5.0 R/day). At the higher levels (10-50 R/day) the irradiated fish, when compared to the controls, demonstrated slower growth, increased mortality, damage to the gonadal tissue, lower numbers of returning adults, and some sterility in the adult males. Genetic analysis of the returning adults and their F/sub 1/ progeny has shown some genetic differences which could be explained by the irradiation treatment. The data for the highest level of exposure (50 R/day) will be evaluated further as the adults return.
PROJECT MILESTONES: Analysis and summarization of the entire series of experiments should be completed by the end of 1976 providing information on biological effects on chinook salmon of low levels of chronic irradiation.
KEYWORDS: COBALT 60;GAMMA RADIATION;LOW DOSE IRRADIATION;CHRONIC IRRADIATION;SALMON;DELAYED RADIATION EFFECTS;GONADS;FERTILITY;STERILITY;GENETICS;REPRODUCTION

<089518>
TITLE: Control of Productivity and Population Characteristics in Aquatic Communities
PROJECT NUMBER: 006414
PRINCIPAL INVESTIGATOR: Edmondson, W.T.
ADDRESS: Department of Zoology, University of Washington, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George W.
TELEPHONE: C(301)353-5548
TYPE OF FUNDING: Contract No.-AT(45-1)-2225-T23
77 FUNDING: Energy Research and Development Administration FY77:$31,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Saline lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Building on a large record of previous experience and data, the project continues to investigate some of the mechanisms that control productivity, abundance, and the general character of aquatic communities. Emphasis is on the study of lakes that have been modified in some clear way, and can be treated as experiments and on lakes that have some distinct character especially well developed. Most of the data concern the changes in fauna in two saline lakes that have been diluted and in a lake that was formerly meromictic (permanently stratified) that became mixed.
APPROACH: Measurements are made of appropriate properties of the environment and of the kind and quantity of organisms and of their productive activities. Correlations are established between changes in the character of the lake and the biological characteristics, and are followed up by appropriate experiments in the laboratory. While most emphasis has been on the changes brought about by dilution of salt lakes and mixing of a meromictic lake, certain special problems have been picked out for detailed study. The ecological effect of the carotenoid content of red copepods is one; the carotenoid protects the animals against lethal solar radiation. The special effectiveness of the predatory insect Chaoborus in controlling the structure of freshwater planktonic communities is another.

RESULTS: The results will be an improved understanding of what controls the abundance and species makeup of freshwater communities and the communities of salt lakes. We should be able to predict better the effects of certain kinds of environmental disturbances and of the various techniques available for restoration.
KEYWORDS: AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;LAKES;SURFACE WATERS;MIXING;PLANKTON;FRESH WATER;POPULATION DYNAMICS;WASHINGTON;LIMNOLOGY;ECOLOGY

<089519>
TITLE: Biogeochemistry of Transuranics-Bikini
PROJECT NUMBER: 006418
PRINCIPAL INVESTIGATOR: Schell, W.R.
ADDRESS: Laboratory of Radiation Ecology, College of Fisheries, University of Washington, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Lab. of Radiation Ecology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-E(45-1)-2225-T18
77 FUNDING: Energy Research and Development Administration FY77:$61,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: METALS/Plutonium;METALS/Americium;METALS/Fp;METALS/Lead;METALS/Pb-210 (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific Bikini;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Inshore Puget Sound
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this program is to study the biogeochemistry of the transuranic radionuclides in Bikini Atoll. In particular, this year's program is to continue investigations of the changes since 1958 in the radionuclide concentrations and redistribution processes of the atoll, with particular reference to the measurements of the concentrations and physico-chemical states of transuranic radionuclides in the water column.
APPROACH: The approach will be to collect water samples for radionuclides at selected stations in the lagoon with the Battelle large-volume water sampler (BLVWS) and by conventional methods of co-precipitation. Changes in the physico-chemical state of Pu were indicated in 1972 from injection at the sediment-water interface to the water column. Samples will be collected to evaluate these processes and to measure the uptake of transuranic elements in the food chain. It is expected that the physico-chemical states of radionuclides are fundamental to their uptake by organisms.
RESULTS: From these results, we plan to evaluate those processes which are important to the remobilization of transuranium and other radionuclides in natural ecosystems. The results of the measurements should also give sufficent data to evaluate the new sampling system (BLVWS) for collecting and concentrating low levels of radionuclides and trace quantities of heavy metals in seawater.
PROJECT MILESTONES: The data collected so far have shown that (1) the Pu and Am are not removed from the atoll ecosystem once they are associated with sediments, (2) the concentrations of Pu and Am in the Bikini Lagoon water vary from 3-250 pCi/m-cubed and depend strongly on location, and (3) the highest concentrations of Pu and Am are found associated with sediment located not in the bomb craters but in the NW quadrant of the lagoon.
KEYWORDS: FATE;TRANSURANIUM ELEMENTS;BIOGEOCHEMISTRY;BIKINI;RADIOACTIVITY;FOOD CHAINS;SEAWATER;SEDIMENTS;RADIOECOLOGICAL CONCENTRATION;PLUTONIUM;AMERICIUM;RADIONUCLIDE MIGRATION;ECOSYSTEMS

<089520>
TITLE: Biological Oceanography of the Coastal Waters off Washington
PROJECT NUMBER: 006511
PRINCIPAL INVESTIGATOR: Anderson, G.C.
ADDRESS: Department of Oceanography, Univ. of Washington, Seattle, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Dept. of Oceanography
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George W.
TELEPHONE: F233-5548;C(301)353-5548
TYPE OF FUNDING: Contract No.-AT 45-1-2225 TA 26
77 FUNDING: Energy Research and Development Administration FY77:$281,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);SOLAR/General (50%)
POLLUTANTS: METALS (5%);PARTICULATES (5%);ORGANICS (5%);HEAT, THERMAL (5%);SPECIFIED OTHER POLLUTANTS/Transfer through marine food chain (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The goals include a better understanding of the communities of organisms, including the processes governing them, in the water column, on the sea bed, and in the surf zone. The investigations concentrate on the algal producers of organic matter with emphasis on the formation and maintenance of subsurface maximum layers, the subsequent consumption by herbivorous zooplankton and its growth, and the fate of the organic matter that reachs the sea bed. The role of benthic organisms in nutrient recycling and resultant effect on the plankton of the continental shelf is being studied, and investigations are proposed to assess mechanisms and species involved in controlling community structure and function. Quantitative models of plankton production are under development in cooperation with the physical circulation studies as part of a long-term program to improve our quanititative understanding of the system.
APPROACH: The project is an extension of a multidisciplinary study begun in 1961 on the effects of the Columbia River on the Northeast Pacific Ocean and includes, in addition to biological studies, investigations of the physics, chemistry, and geology of the river effluent area. Since 1971, the biological research has functioned as a separate contract as have the physical oceanography and geochemistry programs.
RESULTS: The research is expected to provide insight into the dynamics of this complex coastal system as well as to provide information of practical interest. The siting of nuclear power plants along the outer coasts

and offshore regions over continental shelves requires a basic understanding of the processes governing the distribution and abundance of organisms found in these highly productive regions of the oceans. Our studies are aimed at principles and concepts, not only applicable to the outer coast of Washington but to coastal zones in general. Our ultimate aim is to simulate the gross characteristics of biological data and, in so doing, identify and quantify the physical, biological, and chemical processes that determine the distribution of plankton organisms. If those processes can be described quantitatively, models can then be used as experimental tools to determine the effects of certain modifications of the coastal environment on biological production.
PROJECT MILESTONES: In the coming year, we plan to accomplish the following: first, the sensitivity analysis of the offshore model will be completed, appropriate conclusions drawn, and recommendations made regarding those particular biological and physical processes which should be given highest priority in field work. Second, a summary of relevant field data, including biological and chemical parameters, recently acquired off the Washington-Oregon coast will be assembled, preferably in the form of a working report, to facilitate model evaluation and comparison, and then be made available to those who are involved in all phases of the project. Third, the numerical model of primary production and nutrient distributions will be modified to model the effect of the circulation of nutrient-rich, upwelled water near the continental shelf. Fourth, certain submodels will be investigated in greater detail.
KEYWORDS: FATE;PRIMARY PRODUCTION;OCEANOGRAPHY;COASTAL WATERS;WASHINGTON;AQUATIC ORGANISMS;SEA BED;ALGAE;PLANKTON;BENTHOS;BIOLOGICAL MODELS;GEOCHEMISTRY;NUCLEAR POWER PLANTS;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;POLLUTION;METABOLISM;FOOD CHAINS;MATHEMATICAL MODELS

<089521>
TITLE: Physical Oceanography and Sediment Transport on the Washington Continental Shelf
PROJECT NUMBER: 006512
PRINCIPAL INVESTIGATOR: Smith, J.D.;Hickey, B.M.
ADDRESS: Dept. of Oceanography WB-10 University of Washington, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Dept. of Oceanography
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: C(301)353-3035
TYPE OF FUNDING: Contract No.-E(45-1)-2225 TA 25
77 FUNDING: Energy Research and Development Administration FY77:$213,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);SOLAR/Ocean, wind (50%)
POLLUTANTS: PARTICULATES/Water-borne (34%);ORGANICS/Water-borne (33%);HEAT, THERMAL/Water-borne (33%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The ultimate goal is to provide tested predictive models to characterize the current field, wave motion and associated movement of sediment on the continental shelf.
APPROACH: A field program of direct current, wind and hydrographic measurements on the continental shelf is designed to produce data that are required to elucidate the physical processes of major concern and to provide input to physical oceanographic models of shelf circulation. Measurements of the flow and pressure fields in the bottom boundary layer are made to provide input for sediment transport modeling.
RESULTS: Detailed understanding of physical processes active on continental shelves in order to provide the ability to predict where pollutants and thermal effluents are transported and to answer questions of sediment transport related to siting of offshore nuclear power plants.
KEYWORDS: FATE;WASHINGTON;CONTINENTAL SHELF;COASTAL WATERS;OCEANOGRAPHY;SEDIMENTS;DIFFUSION;MATHEMATICAL MODELS;THERMAL EFFLUENTS;OFFSHORE NUCLEAR POWER PLANTS;ENVIRONMENTAL EFFECTS;THERMAL POLLUTION;WATER POLLUTION

<089522>
TITLE: Chemical and Geochemical Studies off the Coast of Washington
PROJECT NUMBER: 6513
PRINCIPAL INVESTIGATOR: Carpenter, R.
ADDRESS: Oceanography Department WB-10, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Dept. of Oceanography
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: C(301)353-3035
TYPE OF FUNDING: Contract No.-AT 45-1-2225-TA24
77 FUNDING: Energy Research and Development Administration FY77:$61,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (75%);NUCLEAR/General (25%)
POLLUTANTS: METALS (25%);ORGANICS (25%);SPECIFIED OTHER POLLUTANTS/Radioisotopes (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Develop a scientific base for predicting and testing the behavior and fate of various trace chemicals in coastal and estuarine areas.
APPROACH: Perform laboratory and field studies off the Washington coast north of Columbia River including: (1) surface chemical studies of scavenging of various species dissolved in seawater by well characterized natural particulates; (2) studies of uptake and transfer of several isotopes in particularly well defined parts of the marine food web; (3) studies of the behavior of Pb-210 and Po-210 in sediments off the Washington coast and the application of Pb-210 dating to determine sediment accumulation rates over the past 100 years.
RESULTS: Several M.S. theses, Ph.D. dissertations and publications in referenced scientific journals.
KEYWORDS: LEAD 210;POLONIUM 210;RADIOECOLOGICAL CONCENTRATION;SEDIMENTS;COASTAL WATERS;PACIFIC OCEAN;SEAWATER;SCAVENGING;FOOD CHAINS;RADIONUCLIDE MIGRATION;AQUATIC ECOSYSTEMS;RADIOACTIVE EFFLUENTS

<089523>
TITLE: Studies on the Concentrations of Iron-55 in South Pacific Ocean water and Marine Organisms, and in the Columbia River
PROJECT NUMBER: 006593
PRINCIPAL INVESTIGATOR: Jennings, C.D.
ADDRESS: Department of Natural Science, Oregon College of Education, Monmouth, OR 97361
AFFILIATION: Oregon Coll. of Education, Monmouth (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-E(45-1)2231 Task Agreement No. 1
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Iron-55 (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Global;COASTS/Far West;COASTS/Northwest;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Our objective is to learn the fate and mechanism of transport of iron-55 in the marine envircnment.
APPROACH: We plan to explore the problem of selective concentration of iron-55 in marine organisms by sampling seawater, zooplankton, fish and sediments from the same locations. We also intend to study mechanisms of vertical transport, considering both biological and physical mechanisms of transport. Causes of selective concentration of iron-55 will be studied by various chemical extractions of iron-55 and stable iron from naturally labeled sediments and by allowing organisms to remove iron-55 from naturally labeled sediments.
RESULTS: We expect to quantify our observation that marine organisms concentrateiron-55 in preference to stable iron in the ocean.
KEYWORDS: FATE;IRON 55;RADIONUCLIDE MIGRATION;SEAWATER;PACIFIC OCEAN;COLUMBIA RIVER;AQUATIC ORGANISMS;RADIOECOLOGICAL CONCENTRATION;PLANKTON;FISHES;SEDIMENTS;AQUATIC ECOSYSTEMS;OCEANOGRAPHY

<089525>
TITLE: Determination of Diffusion Coefficients and Distribution Ratios of Americium, Curium, and Neptunium in Soil-Aquatic Environments
PROJECT NUMBER: 006781
PRINCIPAL INVESTIGATOR: Sheppard, J.C.
ADDRESS: Department of Chemical Engineering, Washington State University, Pullman, WA 99163
AFFILIATION: Washington State Univ., Pullman (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Franklin, Ralph E.
TELEPHONE: F233-4904
TYPE OF FUNDING: Contract No.-E(45-1)-2221 T-12
77 FUNDING: Energy Research and Development Administration FY77:$39,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objectives of the proposed research are to determine distribution ratios and diffusion coefficients of Am/sup 3+/, Cm/sup 3+/, and NpO/sub 2//sup +/ in representative soil-squatic environments. Determination of the important environmental factors, such as adsorption, complex formation with organic components of the soil, and radiocolloid formation, is a secondary objective of the research.
APPROACH: Distribution ratios of Am/sup 3+/, Cm/sup 3+, and NpO/sub 2//sup +/ for the soil-water system will be determined using alpha counting techniques. Diffusion coefficients will be determined by the method developed by Olsen, Kemper, and Van Schaik. To minimize contamination problems, sub-microcurie amounts of Am-241, Cm-244, and Np-237 will be used. Gamma counting techniques will be used for the diffusion experiments. Radiocolloid formation of Am/sup 3+/, Cm/sup 3+/, and NpO/sub 2//sup +/ will be determined by autoradiographic, dialysis, centrifugation, and filtration methods. Complex formation will be determined by well known distribution techniques.
RESULTS: Distribution ratios of 241-Am/sup 3+/, 244-Cm/sup 3+/, and 237-NpO/sub 2//sup +/ have been determined for several representative soils. Diffusion coefficients of NpO/sub 2//sup +/ and Am/sup 3+/ in representative soils have been determined. The radiocolloidal behavior of Am/sup 3+/ and Cm/sup 3+/ in the soil-aquatic environment has been established.
PROJECT MILESTONES: (1) Setting up of laboratory procedures. 82) Establishment of experimental methods. (3) Determination of ditribution ratios of 241-Am/sup 3+/ and 237-NpO/sub 2//sup +/. (4) Construction, testing, and use of diffusion cells. (5) Determination of diffusion experiments initiated.
KEYWORDS: EFFLUENTS;AMERICIUM 241;CURIUM 244;NEPTUNIUM 237;DIFFUSION;SOILS;WATER;RADIONUCLIDE MIGRATION;RADIOCOLLOIDS;COMPLEXES;DISTRIBUTION

<089526>
TITLE: Reproductive Biology of Trout in a Thermally Enriched River: The Firehole River of Yellowstone National Park
PROJECT NUMBER: 006843
PRINCIPAL INVESTIGATOR: Kaya, C.M.
ADDRESS: Dept. of Biology, Montana State Universty, Bozeman, MT 59715
AFFILIATION: Montana State Univ., Bozeman (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(45-1)-2228 Task agreement No. 2
77 FUNDING: Energy Research and Development Administration FY77:$1,000
TECHNOLOGY: GENERAL SCIENCE (100%)

ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Other hydrographic areas Streams
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Heated water from natural sources raise the temperatures of the Firehole River by an average of more than 10 C, an amount comparable to the increase in temperature of cooling water used by nuclear powered electric generating plants. This stream is inhabited by rainbow and brown trout, whose reproduction is known to be especially sensitive to increased temperatures. The purpose of this study is to determine the effects of such an elevated thermal regime on the reproduction of resident trout, and the nature of possible reproductive adaptations, if any, to this altered environment.
APPROACH: Temperatures of the river above, within, and below the sources of heated water continuously monitored by recording thermometers. Trout sampled from thermally affected and unaffected areas for ovary and testis samples, analyzed for information on histological progress and normality of development and seasonal reproductive cycling. Occurrence and timing of reproduction also monitored by samplings for young and observations of possible spawning ares. Movements of fish at the sample areas determined by mark-and-recapture methods employing electrofishing. Laboratory determinations to be made of thermal resistance of young, and of thermal limits for seasonal gonadal development.
RESULTS: We hope to answer the question of whether rainbow and brown trout can continue to reproduce in an originally cold-water stream whose temperatures have been raised by an amount comparable to that produced by a nuclear power-generating station. If they are able to, we hope to determine how this is accomplished under temperatures that often exceed their published lethal levels; whether they have increased thermal tolerances, or behavioral adaptations, or some other means of accommodation. If trout residing in this one stream have been able to adapt successfully to such a high level of thermal elevation, then the potential relevance to the question of discharge of waste heat into similar streams is obvious.
KEYWORDS: TROUT;REPRODUCTION;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;BIOLOGICAL ADAPTATION;FISHES;REPRODUCTION;WATER;WASTE HEAT;TEMPERATURE EFFECTS

<089527>
TITLE: The Effect of Graded Doses of Ionizing Radiation on the Human Testis
PROJECT NUMBER: 006865
ADDRESS: Swedish Hospital Medical Center, Seattle, WA
AFFILIATION: Swedish Hospital Medical Center, Seattle, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
77 FUNDING: Energy Research and Development Administration FY77:$23,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Neutrons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
KEYWORDS: MAN;TESTES;NEUTRON THERAPY;SPERMATOGENESIS;BIOLOGICAL RADIATION EFFECTS;NUCLEAR MEDICINE;HEALTH HAZARDS;NEUTRON DOSIMETRY;IONIZING RADIATIONS

<089528>
TITLE: Establishment, Succession, and Stability of Vegetation on Surface Mined Lands in Eastern Montana
PROJECT NUMBER: 007002
PRINCIPAL INVESTIGATOR: Sindelar, B.W.
ADDRESS: Animal and Range Sciences Dept., Bozeman, MT 59715
AFFILIATION: Montana State Univ., Bozeman (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: C(301)353-5078
TYPE OF FUNDING: Contract No.-E(45-1)-2228
77 FUNDING: Energy Research and Development Administration FY77:$38,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To investigate plant establishment and succession on treated surface mined coal lands in SE. Montana; to investigate the stability and permanence of artificial plant communities on surface mined lands; to investigate the nature and rate of soil development on surface mined lands.
APPROACH: Establishment, succession and soil development are being investigated on strip-mine spoil dumps created 45 to 53 years ago. Revegetation of sites disturbed less than 5 years ago are included in the chronological sequence evaluation. Basic methodology includes detailed monitoring of quadrants located within fenced enclosures on lands mined for coal since 1923. Thirteen enclosures on 1 to 8 year old reclamation plantings and on 44 to 53 year old naturally revegetated coal spoils were established. Transects were set up to monitor plant population parameters including cover, density, frequency, constancy, and diversity. Root production, above ground biomass, and soil development are monitored. Rate and trends of plant succession over a five year or longer period will be analyzed. Permanent stereophotographic records of vegetational development over the period are being collected.
RESULTS: Success of reclamation using existing reclamation technology is compared with natural recovery processes. Data have been obtained for the common measures of vegetative succession and development, e.g., biomass productivity, cover, frequency and density. Comparative results are presented; total production of disturbed sites is greater than that of an undisturbed site, but composition is different. Productivity of the control site is dominated by native perennial grasses while the 40 to 50 year-old sites produce largely shrubs. This is an important observation because the agriculture economy of the range is highly dependent on the native perennial grass component of the grassland ecosystem. In contrast, where disturbed lands have been seeded with native species, the productivity of native perennial grasses exceeds that of the reference site after a four to nine year period. It is apparent from compositional differences 40 to 50 years after disturbance that plant succession has not reached the same endpoint as the native

undisturbed community. Succession by natural mechanisms over this period, unaided by designed reclamation measures, evidently has not satisfied Montana's statutory requirement of strip-mined land reverting to a natural state.
KEYWORDS: GRASSLANDS;MONTANA;COAL MINING;ENVIRONMENTAL EFFECTS;PLANTS;SOILS;REVEGETATION;LAND RECLAMATION;TERRESTRIAL ECOSYSTEMS;SURFACE MINING

<089529>
TITLE: Survey of Viability of Indigenous Grasses, Forbs, and Shrubs: Techniques of Initial Acquisition and Treatment for Propagation in Preparation for Future Land Reclamation in the Ft. Union Basin
PROJECT NUMBER: 007003
PRINCIPAL INVESTIGATOR: Eddleman, L.E.
ADDRESS: School of Forestry, University of Montana, Missoula, MT 59801
AFFILIATION: Montana Univ., Missoula (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: F233-5078
TYPE OF FUNDING: Contract No.-E(45-1)-2232-TA2
77 FUNDING: Energy Research and Development Administration FY77:$45,000; Forest Service
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northwest;COASTS/Other coasts Northern Great Plains
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives are to: (1) inventory natural seed maturation and production, (2) determine optimum seed collection and handling procedures, (3) determine physical and chemical requirements for breaking seed dormancy, (4) measure seed viability and seedling vigor, (5) examine vegetative propagation characteristics, and (6) determine phenology of native species for application to reclamation of strip-mined land.
APPROACH: Study phenology of seed maturation and dispersal, measure production of viable seed in the field by species and ecotype, examine several systems of collection, treatment, and storage; measure germination under controlled environment conditions and use various mechanical and chemical means of breaking dormancy as required; chemicals used are acetone, ethanol, and sulfuric acid all under vent-hood conditions. Seedling vigor is to be determined from root and shoot rate production. Cuttings are to be studied for ease of rooting. Test plots are established on strip-mined land.
RESULTS: Data have been obtained on the phenology of seed maturation for approximately 40 native species, on seed production under natural conditions, on seed collection methods and handling, on physical requirements for breaking seed dormancy, and on vegetative propagation methods. Results from this research are important to revegetation of strip-mined lands in the Northern Great Plains. The research is providing valuable information on suitable native plant species in the reclamation of strip-mined land in the semi-arid west.
PROJECT MILESTONES: (1) Complete preliminary Native Plant Seed Manual for Fort Union Basin from existing data 10/76. (2) Complete collection handling and germination requirements on major plant species 10/77. Update on Native Plant Seed Manual 10/77. (3) Complete germination requirements of minor plant species 10/78. (4) Complete vegetation propagation evaluation 10/78.
KEYWORDS: LAND RECLAMATION;PLANTS;SEEDS;GROWTH;TERRESTRIAL ECOSYSTEMS;PLANT BREEDING;PLANT GROWTH;COAL MINING;SURFACE MINING;REPRODUCTION;VEGETATIVE PROPAGATION

<089533>
TITLE: Personnel Protection in Oxygen Deficient Atmosphere
PROJECT NUMBER: 600012
PRINCIPAL INVESTIGATOR: Ballif, J.L.
ADDRESS: Hanford Engineering Development Laboratory, P.O. Box 1970, Richland, WA 99352
AFFILIATION: Westinghouse Hanford Co., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety, Operational Safety and Health Branch
MONITOR: Ross, Donald M.
TELEPHONE: F233-4408
TYPE OF FUNDING: Contract No.-E(45-1)-2170;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$67,000
TECHNOLOGY: NUCLEAR/Fission Breeders (90%);CONSERVATION/General (10%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: DEVELOPMENT (50%);FULL SCALE DEMONSTRATION (25%);ANALYTICAL (25%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To provide standardized procedures and related training aids. To significantly lower the incidence of fatalities and injuries relating to personnel entering oxygen deficient atmospheres. This relates particularly to the reactor complex.
APPROACH: (1) Determine the best and most effective procedures currently in place throughout industries using inert gases. Prepare a standard for industry approval. (2) The proposal to odorize the large spare volumes and other industrial uses to provide inherent personnel warning. (3) Provide a set of training aids to assist in teaching and applying this technology.
RESULTS: (1) Operational safety standards. (2) Training aids. (3) Reports.
PROJECT MILESTONES: (1) Draft of standard at 12 months. (2) Completed standard at 24 months. (3) Training aid package at 24 months.
KEYWORDS: OXYGEN DEFICIENCY--RANGES FROM 14% TO 19%);ATMOSPHERES;HEALTH HAZARDS;SAFETY STANDARDS;EDUCATION;MAN;AIR QUALITY;INHALATION;RESPIRATION;SAFETY

<089534>
TITLE: Hydrocarbon Studies in Puget Sound and off the Washington Coast
PROJECT NUMBER: 008014
PRINCIPAL INVESTIGATOR: Carpenter, R.
ADDRESS: University of Washington WB-10, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Dept. of Oceanography
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Div. of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: C(301)353-3035

TYPE OF FUNDING: Contract No.-AT 45-1-2225-T40
77 FUNDING: Energy Research and Development Administration FY77:$87,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (70%);PROCESSING, CONVERSION (20%)
LLUTANTS: ORGANICS/Hydrocarbons (100%)
ARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Define in samples of organisms and sediments from the study area the naturally occurring patterns of aliphatic and aromatic and S-containing hydrocarbons, the extent of contamination by fossil fuel hydrocarbons at this time, and the transfer of both natural and fossil fuel hydrocarbons through parts of the marine food web.
APPROACH: Collect samples of phytoplankton, zooplankton, neuston, and sediment cores; extract hydrocarbons from the samples and apply the techniques of gas chromatography, high pressure liquid chromatography, ultraviolet fluorescence spectroscopy, mass spectroscopy, combined gas chromatograph/mass spectrometry, and /sup 14/C//sup 12/C and /sup 13/C//sup 12/C ratios.
RESULTS: Several M.S. and Ph.D. theses, and numerous papers published in scientific journals.
PROJECT MILESTONES: Annual progress reports.
KEYWORDS: FOSSIL FUELS;HYDROCARBONS;WATER POLLUTION;COASTAL WATERS;PACIFIC OCEAN;PLANKTON;SEDIMENTS;AQUATIC ECOSYSTEMS;CHEMICAL EFFLUENTS;OIL SPILLS

<089536>
TITLE: Surveillance of Surplus Facilities
PROJECT NUMBER: 800010
PRINCIPAL INVESTIGATOR: Merrick, D.C.
ADDRESS: Atlantic Richfield Hanford Company, Richland, WA 99352
AFFILIATION: Atlantic Richfield Hanford Co., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: Richland Operations Office
TYPE OF FUNDING: Contract No.-E(45-1)-2130
77 FUNDING: Energy Research and Development Administration FY77:$350,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Hanford
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Provide surveillance of contaminated facilities presently surplus to the needs of the Energy Research and Development Administration's programs.
APPROACH: Periodic surveillance by radiation monitoring personnel to identify any new hazards or changing conditions.
RESULTS: Containment of existing contamination.
KEYWORDS: SURVEILLANCE;RADIATION MONITORING;NUCLEAR FACILITIES;DECOMMISSIONING;PERSONNEL MONITORING;CONTAMINATION;LAND POLLUTION ABATEMENT;AIR POLLUTION ABATEMENT;WATER POLLUTION ABATEMENT;MAINTENANCE;INSPECTION

<089537>
TITLE: Surplus Facilities Surveillance
PROJECT NUMBER: 800011
PRINCIPAL INVESTIGATOR: Baker, J.T.
ADDRESS: Room 1A, 1720-K Building, 100-K Area, UNI, Richland, WA 99352
AFFILIATION: United Nuclear Industries, Inc., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: Richland Operations Office
TYPE OF FUNDING: Contract No.-E(45-1)-1857
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (60%);VISUAL AESTHETICS (20%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (20%)
CHARACTER OF STUDY: PRODUCTION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Provide the maintenance, surveillance and property control of the retired Hanford Reactor facilities in 100 D-DR, 100-F and 100-H Areas, to assure the facilities are maintained in safe and/or protected condition.
APPROACH: The reactor buildings and the surrounding cyclone fences are maintained in a locked status and an approved permit is required for entry. Fire protection equipment is maintained in service and the housekeeping of area grounds is maintained at a level to minimize fire and personnel safety hazards. Scheduled radiation monitoring surveillance is made of the posted radiation zones in the reactor buildings and of all the burial grounds, cribs and trenches to assure they are controlled within prescribed limits.
RESULTS: The retired Hanford Reactor Facilities are maintained in a safe and secured condition to minimize damage due to fires, personnel injuries and loss of Government property. Radiation monitoring surveillance prevents the release of radioactive contaminants to the environment.
PROJECT MILESTONES: Continuous program.
KEYWORDS: HAPO;SECURITY;SAFETY;BUILDINGS;SAFEGUARDS;REACTOR DECOMMISSIONING;RADIATION MONITORING;RADIOACTIVE WASTES;ENVIRONMENTAL IMPACTS;GAMMA RADIATION

<089538>
TITLE: Contaminated Equipment Volume Reduction
PROJECT NUMBER: 800014
PRINCIPAL INVESTIGATOR: Beitel, G.A.
ADDRESS: Atlantic Richfield Hanford Company, Richland, WA 99352
AFFILIATION: Atlantic Richfield Hanford Co., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: Richland Operations Office
TYPE OF FUNDING: Contract No.-E(45-1)-2130
77 FUNDING: Energy Research and Development Administration FY77:$160,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: METALS (10%);PARTICULATES (10%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (25%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (25%);FULL SCALE DEMONSTRATION (25%);PRODUCTION (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific Hanford
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of this program is to develop, design, and demonstrate process equipment which will reduce the volume of contaminated equipment to a size and form suitable for terminal storage or disposal.
APPROACH: Equipment and metallic waste, typically, has an average void volume of 90 to 95 percent. Since prior attempts to develop decontamination techniques of general applicability which can reduce contamination to releasable levels at reasonable costs have not been successful, this program plans to develop methods to melt the scrap metal and store the contaminated waste as ingots. A cold mold vacuum furnace will be built and tested. Size reduction to convert large process vessels to pieces small enough to be accepted by the proposed vacuum furnace appear to be one of the most difficult aspects of the problem. Future plans are to design and build a size reduction system which can safely cut vessels into pieces small enough to charge a melt furnace.
RESULTS: A vacuum furnace will be designed, built and demonstrated by FY-1980. (1) A size reduction facility will be designed, built and demonstrated by FY-1979. The final result of this program is the demonstration of a system which can reduce unwieldy, irregularly shaped metallic scrap to a convenient storable product. Laboratory tests suggest that it may also be possible to use slag entrapment of plutonium oxide to reduce most of the resulting ingots to non-TRU status. The final storable product could be non-TRU low-level waste in a metal matrix.
KEYWORDS: EQUIPMENT;DESIGN;WASTE STORAGE;WASTE DISPOSAL;CONTAMINATION;DECONTAMINATION;RADIOACTIVE WASTE STORAGE;RADIOACTIVE WASTES;MELTING;PLUTONIUM;RADIOACTIVE EFFLUENTS;FURNACES;DESIGN

<089540>
TITLE: Transportation of Radioactive Cargoes Exhibit
PROJECT NUMBER: 800184
PRINCIPAL INVESTIGATOR: Valett, B.B.
ADDRESS: Northwest College and University Association for Science (NORCUS), Richland, WA 99352
AFFILIATION: Northwest Coll. and Univ. Association for Science, Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Dunckel, T.L.
TELEPHONE: F233-5464
TYPE OF FUNDING: Contract No.-EY-76-C-06-1011
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: NOXIOUS GAS (10%);PARTICULATES (20%);RADIATION (60%);HEAT, THERMAL (10%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This activity is an extension of the ERDA public education program. The exhibit ''Transporting Radioactive Cargoes'' is designed to be used primarily at convention sites in the western U.S. Its purpose is increased public awareness and understanding of the present and potential requirements for the transport of radioactive materials. It emphasizes ERDA's continuing concern for the safety of every citizen and the protection of our environment.
APPROACH: Show a specially designed exhibit manned by a NORCUS teacher-demonstrator at large conferences of the Transportation Industry and other concerned groups to emphasize ERDA's continuing concern for the safety of every citizen and protection of our environment in the transport of radioactive materials.
RESULTS: To increase public awareness and understanding of the present and potential requirements for the transport of nuclear materials.
PROJECT MILESTONES: Show exhibit at 12 to 16 western U.S. conferences and meetings each year. Provide necessary exhibit maintenance. Evaluate each showing within two weeks.
KEYWORDS: RADIOACTIVE MATERIALS;TRANSPORT;RADIATION PROTECTION;ENVIRONMENT;HUMAN POPULATIONS;AUTOMATION;EDUCATION;SAFETY;INFORMATION;DISPLAY DEVICES

<089541>
TITLE: Alaska Regional Energy Planning Project
PROJECT NUMBER: 007189
PRINCIPAL INVESTIGATOR: McConkey, W.C.
ADDRESS: Alaska Division of Energy and Power Development, 338 Denali Street, Anchorage, AK 99501
AFFILIATION: Alaska State Div. of Energy and Power Development, Anchorage (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Office
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-EY 76-C-06-2435
77 FUNDING: Energy Research and Development Administration FY77:$240,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/Fission (20%);HYDROELECTRIC (10%);GEOTHERMAL/General (10%);SOLAR/General (10%);CONSERVATION/General (20%)
ENERGY CYCLE: EXTRACTION (30%);COMBUSTION IN SITU (30%);TRANSPORTATION (20%);COMBUSTION OR END USE (20%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (10%);PARTICULATES (20%);ORGANICS (10%);RADIATION (20%);NOISE, VIBRATION

(10%);HEAT, THERMAL (10%);VISUAL AESTHETICS (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Estuarine;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
OJECT DESCRIPTION: Help improve basis for state energy planning by assessing environmental and social costs of options.
APPROACH: Analytical, statistical and projective.
RESULTS: Descriptions of development options and their environmental and social impacts and costs.
PROJECT MILESTONES: Interim reports due September 1977 and 1978. Final report September 1979.
KEYWORDS: ASSESSMENTS;ALASKA;ENERGY SOURCES;ENERGY DEMAND;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;COST BENEFIT ANALYSIS;ENERGY POLICY;PLANNING;OIL SPILLS;MINING

<089542>
TITLE: Particulate Dynamics
PROJECT NUMBER: 007301
PRINCIPAL INVESTIGATOR: Pak
AFFILIATION: Oregon State Univ., Corvallis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: AIR POLLUTION;AEROSOLS;PARTICLES;CHEMICAL REACTION KINETICS;OREGON

<089544>
TITLE: Nutritional Significance of the Copper-Bering River Intertidal Systems to Spring-Migrating Shorebirds Breeding in Western Alaska
PROJECT NUMBER: 007224
PRINCIPAL INVESTIGATOR: Norton, D.C.;West, G.C.
ADDRESS: Institute of Arctic Biology, Fairbanks, AK 99701
AFFILIATION: Alaska Univ., Fairbanks (USA). Inst. of Arctic Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: C(301)353-4905
77 FUNDING: Energy Research and Development Administration FY77:$38,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Alaska;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Because of the energy-related projects now under construction and those proposed for rapid implementation on or adjacent to the coast near the mouth of the Copper-Bering River system, it is imperative to document the importance of this area to the survival of two species of migrant shorebirds, the western sandpiper and the dunlin. This question arises because of three potentially threatening energy-related developments close to the Copper River intertidal system: (1) marine oil-tanker traffic through Prince William Sound, (2) offshore continental shelf leasing, and (3) development of a large natural gas liquefaction plant at Sheep Bay.
APPROACH: Up to 100 birds of each species will be shot for detailed carcass analysis at stopover locations for the two species during April and May. Cinematographic records on 16 mm film will be made periodically at Bodega Bay, California and the Copper River Delta to determine whether rates of jabbing and probing actually differ significantly between wintering and migrating birds. A trip to the major collections in the continental U.S. will be made to record occurrence, phenology, body weights and other pertinent parameters recoverable from museum collections at low cost and at great benefit to extending the span of years covered by the study.
RESULTS: Applications of the information presented in reports and publications of this project will be important in documenting or refuting the supposed importance of the Copper-Bering River system. The results may be useful in specifically indicating protective measures by state and federal resources.
PROJECT MILESTONES: Initiation of research, April 1, 1977; project completion and final report, March 31, 1978.
KEYWORDS: ESTUARIES;BASELINE ECOLOGY;PETROLEUM INDUSTRY;NATURAL GAS INDUSTRY;ENVIRONMENTAL IMPACTS;BIRDS;POPULATION DYNAMICS;INVENTORIES;OIL SPILLS;HYDROCARBONS;BIOLOGICAL EFFECTS;CALIFORNIA;WATERSHEDS;NUTRITION

<089545>
TITLE: Cycling of Transuranic Radionuclides in the Columbia River, Its Estuary and the North Pacific Ocean
PROJECT NUMBER: 007205
PRINCIPAL INVESTIGATOR: Beasley, T.M.
ADDRESS: School of Oceanography, Oregon State University, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA). School of Oceanography
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-EY-76-S-06-2227
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific Columbia River;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Estuary
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To characterize the concentrations and distributions of transuranics in sediments of the Columbia River, its estuary and offshore Pacific Ocean. To determine uptake, loss and tissue distribution of Pu in aquatic and marine organisms, with emphasis on determining whether main uptake route is food or water.

APPROACH: Core samples will be collected and analyzed for Pu by alpha spectroscopy and sections age dated by the lead-210 method. Aquaria experiments using plutonium-237 tracer will be conducted with the aquatic and marine organisms.
RESULTS: Clarification of the geobiochemical behavior of plutonium buried in the sediments.
KEYWORDS: AQUATIC ECOSYSTEMS;COLUMBIA RIVER;ESTUARIES;PACIFIC OCEAN;RADIONUCLIDE MIGRATION;PLUTONIUM;RADIOECOLOGICAL CONCENTRATION;SEDIMENTS;SAMPLING;AQUATIC ORGANISMS;RADIONUCLIDE KINETICS;TISSUE DISTRIBUTION;SEAWATER;FOOD CHAINS;ENVIRONMENTAL TRANSPORT;PACIFIC OCEAN

<089546>
TITLE: Mesoscale Studies of Flow Regimes and Fluxes of Particulate Matter in Coastal Waters
PROJECT NUMBER: 007240
PRINCIPAL INVESTIGATOR: Pak, H.
ADDRESS: School of Oceanography, Oregon State University, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA). School of Oceanography
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES/Suspended oceanic (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To characterize the optical properties of suspended particulate matter (spm) accounting where possible the ratio organic/inorganic. To characterize the distributional patterns of spm in an oceanic area including the non-conservative behavior of the biogenic fraction.
APPROACH: In a small area off the Oregon coast make measurements of: wind speed and direction, current profile, CTD profile, light scattering profile, particle size distribution, physical properties of particles, nutrient profile, pigment composition profile, C/N profile, carbon productivity profile, zooplankton density profile, zooplankton species profile.
RESULTS: Ability to predict patterns and fluxes of suspended particulate matter in near-shore oceanic environments.
KEYWORDS: OREGON;COASTAL WATERS;PARTICLES;PARTICLE SIZE;ENVIRONMENTAL TRANSPORT;ZOOPLANKTON;BIOMASS;NUTRIENTS;PACIFIC OCEAN;TIME DEPENDENCE;AQUATIC ECOSYSTEMS;OCEANOGRAPHY;SEDIMENTS

<089547>
TITLE: Heterogeneous Oxidation of Sulfur in the Atmosphere
PROJECT NUMBER: 006947
PRINCIPAL INVESTIGATOR: Harrison, H.
ADDRESS: Department of Atmospheric Sciences, University of Washington, Seattle, WA 98195
AFFILIATION: Washington Univ., Seattle (USA). Dept. of Atmospheric Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert W.
TELEPHONE: F233-3764;C(301)353-3764
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To investigate the heterogeneous oxidation of SO2 in solution and catalyzed by metal ions and NOx.
APPROACH: Reaction rates and reaction products will be identified in laboratory studies of the reaction of SO2 in the presence of metal ion catalysts and NOx.
RESULTS: The results of these studies will be compared to rates derived in field experiments and applied to the estimation of SO2 conversion parameterization in numerical models.
KEYWORDS: CHEMICAL EFFLUENTS;AEROSOLS;SULFUR DIOXIDE;NITROGEN OXIDES;CHEMICAL REACTIONS;METALS;CATALYTIC EFFECTS;OXIDATION;CHEMICAL REACTION KINETICS

<089548>
TITLE: Precipitation Scavenging Studies
PROJECT NUMBER: 007350
PRINCIPAL INVESTIGATOR: Slinn, W.G.N.
ADDRESS: Oregon State University, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert W.
TELEPHONE: F233-3764;C(301)353-3764
TYPE OF FUNDING: Contract No.-EY-76-S-06-2227
77 FUNDING: Energy Research and Development Administration FY77:$54,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All pollutants (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (25%);ANALYTICAL (75%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This effort is an attempt to consolidate existing knowledge in the fields of atmospheric cleansing processes and to resolve substantial differences between data and theory in the precipitation

scavenging of submicron aerosols.
APPROACH: (1) Prepare a chapter ''Precipitation Scavenging Estimates'' for ERDA book Atmospheric Sciences and Power Production. (2) Prepare a contribution to the ERDA Critical-Creative Review Series entitled ''Natural Atmospheric Cleansing Processes'' and organize this suitably for use as a college text.
KEYWORDS: AEROSOLS;PRECIPITATION SCAVENGING;SURFACE AIR

<089550>
TITLE: CTD System for West-Coast ERDA Contractors
PROJECT NUMBER: 007409
PRINCIPAL INVESTIGATOR: Small, L.F.
ADDRESS: Oregon State University, School of Oceanography, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA). School of Oceanography
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-EE-76-S-06-2227
77 FUNDING: Energy Research and Development Administration FY77:$7,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;COASTS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: A CTD system (Chlorinity, Temperature, Density) is being provided to ERDA contractors in the Pacific Northwest for oceanographic studies. The availability of the CTD to the contractors will allow them to charter the smallest vessels needed for their studies rather than use vessels which have a CTD on board but may be larger than necessary.
KEYWORDS: OCEANOGRAPHY;SEAWATER;CHEMICAL ANALYSIS;SAMPLING;CHLORINE;MEASURING INSTRUMENTS;TEMPERATURE MEASUREMENT;PACIFIC OCEAN;DENSITY;MONITORING

Energy Research and Development Administration/San Francisco Operations Office

<090001>
TITLE: Basic Studies of Physiological Systems
PROJECT NUMBER: 000216
PRINCIPAL INVESTIGATOR: Patt, H.M.;Maloney, M.A.;Harris, J.W.;Phillips, T.L.
ADDRESS: Laboratory of Radiobiology, San Francisco, CA 94143
AFFILIATION: California Univ., San Francisco (USA). Lab. of Radiobiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-AT(04-3)-1012;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$572,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (30%);GENERAL SCIENCE (50%)
POLLUTANTS: NOXIOUS GAS (5%);METALS (5%);PARTICULATES (5%);ORGANICS (10%);RADIATION (30%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To identify mechanisms that control the growth and balance of organized mammalian cell populations and the way in which these mechanisms are affected by energy-related toxic agents. The studies are focused on bone marrow regulation and regeneration, modulation of the extracellular environment and comparative tissue sensitivity.
APPROACH: Experiments are performed in vivo with mice and rabbits and in vitro with hematopoietic and stromal cells of bone marrow and spleen, endosteal cells, macrophages, fibroblasts and tumor cell lines. Biochemical, cytological, physiological and specific lethal endpoints are used in conjunction with a variety of perturbations to uncover control systems and to develop methods for evaluation of acute and chronic sequelae of exposure to prototypic environmental contaminants.
RESULTS: (1) Relationship of bone to bone marrow function: possible implications of damage by bone-seeking agents. (2) Role of bone marrow stroma in hematopoietic stem cell regulation: implications of stromal damage. (3) Hematopoietic stem cell traffic: possible effect of airborne pollutants on circulatory stem cells. (4) Simulation of chronic localized bone marrow exposure to chemical carcinogens. (5) Role of macrophage activation in chronic inflammatory processes in lung and other tissues. (6) Interaction of potential carcinogens during cytotoxic T lymphocyte differentiation. (7) Modification of interactions of carcinogenic agents and cellular components by sulfhydryl reagents. (8) Application of radiation-derived specific lethal endpoints to evaluation of low level toxicity by chemical agents. (9) Application of single X-ray dose equivalents to prediction of radiation tolerance in man.
PROJECT MILESTONES: (1) In vitro Hematopoietic Stem Cell Assay FY 1978. (2) Circulating stem cell turnover parameters FY 1978. (3) Establishment of functional indices for bone-bone marrow interactions FY 1979. (4) Influence of sulfhydryl reagents on interactions of carcinogenic agents and cellular components FY 1977. (5) Possible implications of lung macrophage activation FY 1978. (6) Application of radiation-derived specific lethal endpoints to low-level pollutant effects FY 1978.
KEYWORDS: HEMATOPOIESIS;BONE MARROW CELLS;SPLEEN CELLS;TUMOR CELLS;BIOLOGICAL REGENERATION;STEM CELLS;PHYSIOLOGY;AIR POLLUTION;BIOLOGICAL EFFECTS;MACROPHAGES;ANIMAL CELLS;PATHOLOGICAL CHANGES;TOXICITY;BLOOD FORMATION;CONNECTIVE TISSUE

<090002>
TITLE: DNA Replication and Repair
PROJECT NUMBER: 000217
PRINCIPAL INVESTIGATOR: Painter, R.B.;Cleaver, J.E.
ADDRESS: Laboratory of Radiobiology, San Francisco, CA 94143
AFFILIATION: California Univ., San Francisco (USA). Lab. of Radiobiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-AT(04-3)-1012;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$333,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (40%);GENERAL SCIENCE (35%)
POLLUTANTS: METALS (10%);ORGANICS (40%);RADIATION (45%);HEAT, THERMAL (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The research in this area is concerned with the effects of energy-related toxic agents (e.g., radiation, chemical carcinogens) on the organization and replication of eukaryotic DNA. The consequences of these effects, as manifested in changes in RNA and protein synthesis and in mutagenesis and carcinogenesis, are also under study.
APPROACH: Mammalian cells in culture are used: After being exposed to agents suspected or known to damage DNA the response of the normal DNA replicative system and of the systems which repair damage are monitored using isopycnic centrifugation, velocity sedimentation, gel electrophoresis, autoradiography and other techniques along with radioisotopic tracers. Viability and mutation rates are also measured in some studies.
RESULTS: This program continues to reveal how radiation and other noxious agents damage DNA, how the mammalian cellular repair systems respond to the damage and how the system that normally replicates the genetic materials (DNA) responds to such damage. A spin off of this work has been and continues to be information on how the genetic material is normally organized and duplicated in mammalian cells.
PROJECT MILESTONES: (1) Identification of lesion inhibiting initiation of DNA synthesis FY 1978. (2) Determination of repairability of DNA-protein cross links FY 1977. (3) Chemically characterize DNA-protein cross link FY 1978. (4) Define the comparative mutation rate for C-14 compared to H-3-induced mutagenesis FY 1977. (5) Identify the chromosome carrying the human UV-specific endonuclease FY 1978.
KEYWORDS: REPAIR;IONIZING RADIATIONS;BIOLOGICAL RADIATION EFFECTS;DNA REPLICATION;CARCINOGENS;BIOLOGICAL EFFECTS;DNA;BIOLCGICAL REPAIR;MUTAGENESIS;CARCINOGENESIS;RNA;PROTEINS;BIOSYNTHESIS;ANIMAL CELLS;CELL CULTURES;ULTRAVIOLET RADIATION;X RADIATION;CARBON 14;TRITIUM

<090003>
TITLE: Elucidation of Chromosome Structure
PROJECT NUMBER: 000218
PRINCIPAL INVESTIGATOR: Wolff, S.;Blumenthal, A.B.
ADDRESS: Laboratory of Radiobiology, University of California, San Francisco, San Francisco, CA 94143
AFFILIATION: California Univ., San Francisco (USA). Lab. of Radiobiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-AT(04-3)-1012;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$257,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS/Mutagens;ORGANICS/Carcinogens (35%);RADIATION/X ray;RADIATION/Uv-irradiation (35%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of these experiments is to be able to reverse the genetic changes that are induced by the contaminants and pollutants produced in the process of the generation of energy. In order to do this, we have to have a more complete understanding of the biophysical and biochemical processes involved in the genesis of the genetic changes. The program is designed therefore to obtain a basic understanding of chromosome structure, function, exchange formation, and replication in order to elucidate the mechanisms involved in the induction of chromosome changes by radiation and other environmental mutagens that are formed in the chain of energy production.
APPROACH: Inasmuch as we still do not have a complete understanding of eukaryotic chromosomes and how radiation and other mutagens can disrupt their structure and function, the genetics program focuses on biochemical and biophysical studies of the structure of chromosomes and the mechanisms by which aberrations are induced. The processes involved in the production of chromosome exchanges are being investigated in order to gain insights into the mechanisms involved in chromosomal replication, breakage, repair, and mutation induction.
RESULTS: The relation between sister chromatid exchange in somatic cells and genetic recombination that occurs in meiosis hopefully will be determined. In addition, the lesions that are involved in the production of sister chromatid exchanges, which seem to be different from those lesions involved in the induction of chromosome aberrations, will be characterized in studies using x rays, ultraviolet light, and mutagen-carcinogens. An in vitro system will be developed to enable us to determine the effect of compounds requiring metabolic activation to induce sister chromatid exchanges. The physical, enzymatic, and genetic analysis of chromosome replication and repair will give further clues to the basic principles of chromosome structure and the mechanisms of lethal chromosome damage.
PROJECT MILESTONES: FY 1977-1978 The structure of DNA replication sites in isolated chromatin will be described. FY 1977-1978 The effects of radiation damage to replicating embryonic DNA will be observed by electron microscopy. FY 1978 Drosophila mutants will be obtained which affect DNA replication and repair. FY 1977-1978 New staining methods will be used which will enable us to observe sister chromatid exchange in meiotic cells. FY 1977-1978 The lesions which are involved in the induction of sister chromatid exchanges will be characterized. FY 1977 The biological longevity of chemically-induced lesions that affect chromosomes will be determined.
KEYWORDS: CHROMOSOMES;BIOPHYSICS;BIOCHEMISTRY;CHROMATIN;DNA REPLICATION;CHROMOSOMAL ABERRATIONS;RADIOINDUCTION;BIOLOGICAL RADIATION EFFECTS;GENE RECOMBINATION;MUTAGENS;DROSOPHILA;CARCINOGENS;ANIMAL CELLS;GENETICS;MUTAGENESIS

<090005>
TITLE: The Effect of Prolonged Low Dose Rate Co-60 Gamma Ray Exposure of Beagles
PROJECT NUMBER: 000433
PRINCIPAL INVESTIGATOR: Goldman, M.
ADDRESS: Radiobiology Laboratory, University of California, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA). Radiobiology Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)-472
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Gamma (100%)
CHARACTER OF STUDY: RESEARCH (75%);DEVELOPMENT (25%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Studies using Co-60 irradiation of susceptible beagle populations are being designed to: (1) Evaluate the promotional aspects of leukemogenesis as reflected in bone marrow culture systems supporting hematopoietic stem cells as well as poietin producing cell populations; (2) Define the role of ''candidate'' mesenchymal progenitor cells in the chronic irradiation state and in radiation-induced leukemia; (3) Construct a cellular map of radiation injury using in vitro culture technique; (4) Correlate the general and leukemic-specific immune responses to the pathogenesis of radiation-induced disease; and (5) Study the efficacy of bone marrow-plaque transplantation therapy and TF immunotherapy in the radiation-induced leukemia model.
APPROACH: A variety of dose levels will be included; the higher levels (14 R/day and 5 R/day) to insure the production of sufficient cases of leukemia to permit the proposed evaluations, and lower levels (0.5 R/day and 1.5 R/day) to allow determinations of the ability of the proposed techniques to serve as sensitive biologic indicators of radiation injury. The variety of doses would also facilitate the study of mechanisms involved in radiation leukomogenesis as well as permit the determination of dose response relationships. Several in vitro techniques have been developing radiation-induced myeloproliferative disorders in association with the internal emitter program. The use of these techniques in the Co-60 leukemogenesis study will allow for extension of preliminary observations and for comparative studies on pathogenetic mechanisms involved in leukemogenesis in animals subjected to intramedullary as opposed to whole-body forms of radiation. The dogs at the higher leukemogenic levels will also provide an ''anchor point'' for low level biodosimetric studies being performed simultaneously for the purpose of risk modeling for man (NRC).
RESULTS: The major leukemogenesis study will be underway during FY 78. The field will be filled with weanling beagles at the 15, 10, 5, and 2 R/day dose levels in order to provide for animals manifesting with radiation-induced myeloproliferative disorders inducing leukemia. In these animals several routine hematological evaluations on peripleural blood and bone marrow will be performed as will be several quantitation of changes in in vitro colony forming units for granulocyte-monocyte, lymphoid and candidate mesenchymal progenitor populations. Changes in T, B-lymphocyte ratios and reduction in immune response in the higher dose level may be observed. Thus, the temporal quantitation of changes in the various hematological and immunological parameters will be determined for animals manifesting with continuous irradiation, preleukemic and leukemic conditions.
PROJECT MILESTONES: Beagles will be placed in the Co-60 field as they become available. It is anticipated that all the dogs will have been entered into the study by FY 79. Blood and bone marrow samples will be taken prior to irradiation and sequentially during and following the end of irradiation in accordance with a detailed schedule.
KEYWORDS: COBALT 60;GAMMA RADIATION;LOW DOSE IRRADIATION;DOSE RATES;CHRONIC IRRADIATION;BEAGLES;BIOLOGICAL RADIATION EFFECTS;HEMATOPOIETIC SYSTEM;LEUKEMIA;RADIOINDUCTION;RADIATION INJURIES;BIOLOGICAL INDICATORS;LEUKEMOGENESIS;BLOOD;IMMUNOLOGY;IN VITRO;IN VIVO;NEOPLASMS

<090007>
TITLE: Cellular and Cytogenetic Evaluation of Radiation Quality
PROJECT NUMBER: 000436
PRINCIPAL INVESTIGATOR: Wolf, H.G.
ADDRESS: Radiobiology Laboratory, University of California, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA). Radiobiology Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)-472
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%)
POLLUTANTS: METALS (15%);PARTICULATES (10%);RADIATION (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This study involves the cytogenetic evaluation of hard and soft tissues obtained from animals to bone-seeking radionuclides and non-nuclear energy derived pollutants. Additional studies to characterize the morphologic and behavioral parameters of canine mammary tumors are conducted. Dogs and rodents are used as experimental animals in the conduct of these studies. The objectives being to provide additional techniques to aid in the biomedical assessment of various pollutants derived from energy production.
APPROACH: Various tissues, i.e., blood, bone marrow, hard and soft tumors, are prepared for cytogenetic evaluation. Karyotypes are analyzed and abnormalities noted. Data obtained is compared to normal and dose-effect relationships and differences between tumor types are compared. Mammary tissues, malignant and normal or benign, are studied in chick embryo or egg culture techniques to determine invasiveness and correlate this with morphologic appearance of various tissue.
RESULTS: The results of these studies will provide basic information about the various tissues studied. Information that can be utilized in the development of treatment of the diseases studied. Dose response relationships relating to various pollutants and levels of pollutants will be derived.
PROJECT MILESTONES: (1) Sr-90 or Ra-226 induced tumor evaluation by cytogenetic means completed September 30,

1978. (2) Mammary tumor studies methodology development completed September 30, 1977. (3) Mammary tumor studies reduced in scope September 30, 1978.
KEYWORDS: CYTOGENETICS;STRONTIUM 90;RADIUM 226;BIOLOGICAL RADIATION EFFECTS;SKELETON;DOGS;RODENTS;NEOPLASMS;RADIOINDUCTION;DOSE-RESPONSE RELATIONSHIPS;CORRELATIONS;CHROMOSOMAL ABERRATIONS;CARCINOGENS;TOXICITY

<090008>
TITLE: Comparative Toxicity of Sr-90 and Ra-226
PROJECT NUMBER: 000438
PRINCIPAL INVESTIGATOR: Goldman, M.
ADDRESS: Radiobiology Laboratory, University of California, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA). Radiobiology Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)-472
77 FUNDING: Energy Research and Development Administration FY77:$1,095,000
TECHNOLOGY: NUCLEAR/Fissicn Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: COMBUSTION OR END USE (20%);WASTE MANAGEMENT (80%)
POLLUTANTS: RADIATION/Strontium-90;RADIATION/Radium-226 (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Determine and quantify the spectrum of dose-effects resulting from continual acute and/or fractionated exposure to beta and alpha emitting bone-seeking radionuclides in a colony of canines studied for their lifespan. Develop sensitive indicators of radiation injury, mechanism of effects and amelioration, models for human risk assessment.
APPROACH: Exposure to Sr-90 fed at graduated levels from mid-gestation to adulthood covering a 10/sup 3/ range of dose are compared to comparable dosages acutely given to adults and to dogs receiving fractionated, graded administration of Ra-226 as young adults. Metabolic, dosimetric, clinical and patholcgic parameters are included, as well as fundamental cellular, immunologic, and ultrastructural studies.
RESULTS: Metabolic model of beta and alpha emitters in dogs extrapolated to man for those commitment estimates related to standards for exposure limitation. Pathogenesis of chronic low level tissue irradiation. Rapid biodosimetric assessment of radiation exposure. Development in vitro model for cell effects of tissue irradiation and repair.
PROJECT MILESTONES: This study is a life-span study. The beagles currently have a median age of 10-11 years. Data are being collected on clinical and pathologic changes including geriatric effects, so that radiation-induced changes may be distinguished from normal aging effects. (1) Determine dose effect curve for radiation effects of Sr-90 vs Ra-226 (1984); (2) Evaluate radiation quality factor of chronic beta exposure of skeleton to fractionated alpha exposure (1984); (3) Determine ''map'' of cells at risk for cancer induction in skeleton (1979); (4) Develop age related metabolic and dosimetric model for radionuclides in dog adapted to human extrapolation (1980); (5) Develop sensitive injury repair model for radiation effects (1983).
KEYWORDS: STRONTIUM 90;RADIUM 226;TOXICITY;COMPARATIVE EVALUATIONS;CHRONIC IRRADIATION;FRACTIONATED IRRADIATION;ACUTE IRRADIATION;MAN;BEAGLES;DOSE COMMITMENTS;DOSIMETRY;LIFE SPAN;DOSE-RESPONSE RELATIONSHIPS;SKELETON;BIOLOGICAL RADIATION EFFECTS;NEOPLASMS;RADIOINDUCTION;BLOOD;INGESTION

<090009>
TITLE: Developmental Regulation
PROJECT NUMBER: 000449
PRINCIPAL INVESTIGATOR: Harary, I.
ADDRESS: University of California at Los Angeles, 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E-(04-1) GEN 12
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this research are to understand the factors that control the development and maintenance of specific function of the mammalian heart. This includes development of the capacity to synthesize myosin in myoblasts, its control in mature myocytes, location of lipoprotein lipase in heart cells and its role in cell nutrition, the effect of heavy metals on heart cells in culture and a study of the structure and function of chromatin in developing systems and the role of cycAMP and Ca/sup 2+/ protein synthesis.
APPROACH: For most of these studies, the beating heart cells in culture is being used. To study the control of myosin synthesis by Ca/sup 2+/ and cycAMP, the effect of catecholamines and Ca/sup 2+/ concentration on beating, myosin synthesis and cycAMP level (in relationship tc phosphodiesterase activity) are being investigated. The study of the physical nature of phosphodiesterase and the location and isolation of adenyl cyclase will be carried out. Continued investigation of the effect of Pb and Cd on the properties of muscle cells, particularly fusion of skeletal muscle cells, will be investigated in embryos of pregnant rats fed these metals. The structure of chromatin at stages of development will be studied.
RESULTS: A model for the relationship of beating of heart cells and Ca/sup 2+/ flux has been formulated and will be tested in a sarcoplasmic reticulum preparation. The isolation of a reasonably pure preparation of sarcolemma from heart has been accomplished and will be used to measure the control of adenylcyclase, a constitutive enzyme. The development of myoblasts to myocytes in vivo and in culture has been quantitated and will be related to control of myosin synthesis. The location of lipoprotein lipase in the heart has been determined and the relationships of this enzyme to heart cell nutrition will be investigated.
PROJECT MILESTONES: In FY 1977 the relationship of Ca/sup 2+/ to myosin synthesis should be understood. A Ca/sup 2+/ dependent phosphodiesterase activator protein will be localized and its nature further clarified. Phosphodiesterase itself will be isolated and its nature as a monomer-dimer complex will be

reported. In FY 1978 the mechanism of heavy metal action on developing cells will be reported. The complex interrelationships of Ca/sup 2+/, catecholamines, cycAMP and phosphodiesterase in muscle cell development will be delineated.
KEYWORDS: MYOSIN;BIOSYNTHESIS;HEART;PHYSIOLOGY;CELL CULTURES;LEAD;CADMIUM;BIOLOGICAL EFFECTS;CHROMATIN;MOLECULAR STRUCTURE

<090010>
TITLE: Membrane Biosynthesis and Properties (Formerly General Metabolism)
PROJECT NUMBER: 000451
PRINCIPAL INVESTIGATOR: Mead, J.F.
ADDRESS: 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E-(04-1) GEN 12
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To show how the lipid components of the brain membranes are transported into the brain, metabolized and removed. (2) To study the mechanism of destruction of the membrane lipids by an oxidative process initiated by gaseous and other pollutants. (3) To understand the means by which malignant cells are able to induce transport of membrane lipids from other tissues.
APPROACH: (1) This research involves the synthesis, administration by several routes, separation, analysis and structure determination of labeled lipids for metabolism by brain. (2) This project involves the exposure to oxidative pollutants of model or actual biomembranes, the analysis of the products and the rate and mechanism of their formation and the inhibition of the oxidative destruction in vitro and in vivo. (3) This project will involve the analysis of the membrane lipids of growing tumors and of other organs affected by the tumor growth and will attempt to study by means of labeled fatty acids the turnover of normal membrane lipids as affected by tumor growth.
RESULTS: (1) An understanding of the means by which brain development depends on the nutrients and their access to the brain through the blood and of the mechanisms by which the brain membranes are formed as well as the interruption of this process by toxic substances in the environment. (2) An understanding of the mechanism of oxidative damage to membranes initiated by atmospheric pollutants and suggested means of preventing such damage. (3) An understanding of the means by which a growing tumor can influence other tissues to supply it with required constituents and suggestions as to how to interrupt this communication and transport.
PROJECT MILESTONES: (1) Fall 1976 Submission of 4-5 manuscripts describing characteristics of destruction of membranes by autoxidative processes and their protection by antioxidants. (2) Winter 1976-7 Shifting of emphasis of research from mechanisms of damage to initiation by pollutants. (3) FY 1978 The relationships between the fatty acid elongation in the brain, the transport of these cellular membrane building units from other sources and myelination and certain other aspects of brain development should be clarified.
KEYWORDS: LIPIDS;TRANSPORT;CELL MEMBRANES;BRAIN;METABOLISM;POLLUTION;BIOLOGICAL EFFECTS;BIOCHEMISTRY;ENZYMES;NEUROLOGY;OXIDATION;TOXINS

<090012>
TITLE: Molecular Mechanisms of Nucleoprotein Damage
PROJECT NUMBER: 000454
PRINCIPAL INVESTIGATOR: Myers, L.S. Jr.
ADDRESS: Laboratory of Nuclear Medicine and Radiation Biology, 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-1)GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (10%);FOSSIL FUEL/Oil and Gas (10%);NUCLEAR/Fission (80%)
POLLUTANTS: METALS (10%);ORGANICS (10%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this research are: to determine the molecular mechanisms by which alpha-, beta-, and gamma-, accelerated heavy ion and ultraviolet radiations and energy-related toxic chemicals damage living organisms and to use this information in developing means of preventing or repairing the damage and of sensitizing cells to radiation or chemicals so as to take advantage of the damage for cancer therapy and other biological and medical purposes.
APPROACH: This research is carried out largely with DNA and RNA because of their importance in the reactions involved. Using such techniques as pulse radiolysis, EPR spectroscopy, uv absorption spectroscopy and tracer studies, attempts are made to understand the nature of the immediate products formed by the various damaging entities and the means by which these initial substances are transformed into intermediate and final products. These results will explain the nature of the damaging reactions in each case and this knowledge will, through extrapolation, lead to an understanding of the toxic effects in living organisms.
RESULTS: In FY 1976 the mechanism of attachment of alcohols to nucleotides (AMP and TMP) under the influence of ionizing radiation should be partially understood and in 1977 should be clarified. At this point, research will continue using other types of small molecules. The mechanism by which 5-bromouracil sensitizes DNA to ionizing radiation has been hypothesized as the result of formation of the uracilyl free radical, which then reacts by hydrogen abstraction from neighboring groups. This reaction should be understood in 1977 and applied to studies of other radiation modifiers. The effects of radiation and chemical toxicants on lymphocytes leading to DNA repair will lead to an assessment of the comparative hazard from these agents.
PROJECT MILESTONES: In 1976 the first major review of ionizing radiation-induced attachment reactions of nucleic acids and their components was published. In 1977 results of research in this field should be forthcoming and the mechanism of sensitization of DNA to radiation by bromouracil should be understood.

In 1978 the mechanism of damage to DNA in lymphocytes by radiation and chemical toxicants should be revealed and should lead, in 1978, to suggestions for modifying radiation and chemical damage.
KEYWORDS: ALPHA PARTICLES;BETA PARTICLES;GAMMA RADIATION;HEAVY IONS;ULTRAVIOLET RADIATION;IRRADIATION;DNA;RNA;BIOLOGICAL RADIATION EFFECTS;BROMOURACILS;RADIOSENSITIVITY EFFECTS;NEOPLASMS;PLUTONIUM

<090013>
TITLE: Molecular Damage to DNA and Its Modifications
PROJECT NUMBER: 000455
PRINCIPAL INVESTIGATOR: Ward, J.F.
ADDRESS: Laboratory of Nuclear Medicine and Radiation Biology, 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-1)GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$201,000
TECHNOLOGY: FOSSIL FUEL/Coal (10%);FOSSIL FUEL/Oil and Gas (10%);NUCLEAR/Fission (80%)
POLLUTANTS: METALS (10%);ORGANICS (10%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this research are to translate knowledge of the effects of radiation and fossil fuel-related pollutants on substances of known structure and properties into an understanding of the effects of these agents on more complex substances of biological origin and, in turn, to attempt, by this means, to understand their effect on living organisms.
APPROACH: At present, the investigation is concerned with radiation effects on DNA as the most likely substance involved in ultimate radiation damage and to the effects of hydroxyl radicals as the most likely effector of damage in aqueous media. Model systems for DNA are the deoxynucleotides, in which different types of damage, such as strand breakage and base damage are studied. Information gained with the model systems is being applied to the study of the complex DNA molecule.
RESULTS: Yields of strand breaks and base damage have been shown to increase with post-irradiation time under a variety of conditions. Measures used are yield of monophosphate end groups, the further yield of breaks with a single strand specific ribonuclease and the spectrum of the .OH-DNA transient and its reaction with oxygen. The modifying effects of chromosomal structure on DNA will be measured by irradiation of DNA-histone complexes. The altered base, 8-hydroxyadenine is being analyzed as a measure of damage to DNA by its easy separation and uv absorption. Similar assays of thymine will be developed. High LET damage to DNA is being investigated using alpha particles from the Berkeley 184'' cyclotron with particular attention to interstrand cross-links. These several methods of assay for damage will also be used to assess the effects of radiosensitizers, such as metranidazole, other nitroimidazoles and nitrofuranes.
PROJECT MILESTONES: In FY 1976, the strand-break and base damage and release methods of assay should have provided information on the effects of both high and low LET radiation on the DNA molecule. In FY 1977, the effects of histones will lead to a better understanding of chromosome damage and the effects of radiosensitizers will have been assessed.
KEYWORDS: GAMMA RADIATION;X RADIATION;MUTAGENESIS;PATHOGENESIS;IRRADIATION;DNA;BIOLOGICAL RADIATION EFFECTS;STRAND BREAKS;RADIOINDUCTION;HYDROXYL RADICALS;RADIOSENSITIZERS;LET;ALPHA PARTICLES

<090014>
TITLE: Mammalian Cell Biology
PROJECT NUMBER: 000456
PRINCIPAL INVESTIGATOR: Gerschenson, L.E.
ADDRESS: 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-1)GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$85,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To study the regulation of genetic expression by hormonal and other effectors, such as carcinogens and (2) to understand the mechanism of action of lead compounds in their toxic effects on cells and to attempt to modify these effects by substances such as hormones, enzymes and inhibitors.
APPROACH: The experimental systems are several established cell lines: an epithelial liver cell line (RLC-GAI) cultured in chemically defined medium and a culture of rabbit endometrial cells, also in chemically defined medium and retaining its response to hormones and glial and neuroblastoma cell lines. Addition of lead nitrate to the RLC-GAI cells has been shown to induce delta-aminolevulinate (ALS) synthetase and to inhibit cell growth. The effect of lead in inhibiting heme synthesis was found to be related to ALS induction but not to cell growth and this latter effect is not clear. Therefore the effect of lead on the glial and neuroblastoma cells was assessed and attempts to isolate lead-resistant lines from these cells have been initiated.
RESULTS: In 1976 the antagonistic actions on the endometrial cells of diethylstilbestrol and progesterone have been described and their relationship to cell proliferation and secretion are being delineated. Their effect on chemical carcinogenesis is also being clarified. In 1977, the techniques of cell fusion should lead to an understanding of the relationships of hormonal receptors in the fused cells to hormone-dependent function. Lead resistant cell lines will reveal the mechanism of lead toxicity, possibly through mutagenesis.
PROJECT MILESTONES: (1) In 1976, an understanding of the actions of hormones and the related action of chemical carcinogens on endometrial cells will be obtained. (2) In 1977, some understanding of the nature of lead toxicity and cell resistance to this toxicity should be on hand.
KEYWORDS: LEAD;TOXICITY;ANIMAL CELLS;HORMONES;CELL CULTURES;PROGESTERONE;CELL PROLIFERATION;CARCINOGENESIS;NEOPLASMS;CARCINOGENS;MUTAGENESIS;PATHOGENESIS

<090015>
TITLE: Biosynthetic Control
PROJECT NUMBER: 000457
PRINCIPAL INVESTIGATOR: Fulco, A.J.
ADDRESS: Lab. of Nuclear Medicine and Radiation Biology, UCLA, 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-1)GEN-12;Grant No.-5-RO 1 AI 09829-07
77 FUNDING: Energy Research and Development Administration FY77:$82,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To investigate the biological control mechanisms that adaptively regulate lipid composition, particularly the unsaturated fatty acid composition, of cell membranes in response to changes in temperature, oxygen tension and other environmental factors and (2) to characterize the O/sub 2/-dependent hydroxylases from microorganisms that initiate the oxidation of hydrocarbon chains. (3) To provide a rational basis for assessing the biological effects of hydrocarbon pollution of the environment and to determine the feasibility of utilizing selected microorganisms to remove such pollution from the environment.
APPROACH: (1) Bacillus megaterium is subjected to changes in temperature between 35 and 20 degrees and the rate of fatty acid desaturation is measured and related to desaturase activity, biosynthesis and denaturation. (2) A soluble hydroxylase, prepared from B. megaterium, is used to study the kinetics of hydroxylation of the hydrocarbon portion of compounds containing long alkyl chains under different conditions and the rate and location of the hydroxylation are used to gain information on the enzyme system.
RESULTS: (1) An understanding of the mechanism of the temperature effect on the bacterial Triangle 5-desaturase and on the properties of the membranes of which the lipids form a major part. (2) The clarification of the mechanism of action of the hydroxylase, with particular reference to substrate specificity with the ultimate aim of understanding the factors involved in its ability to attack hydrocarbon chains.
PROJECT MILESTONES: In FY 1977: (1) An understanding of the relationships between desaturation of exogenous and endogenous fatty acids leading to clarification of the nature of the fatty acid pools. A fatty acid auxotroph of B. megaterium will be created and will reveal the relationship between fatty acid structure and growth at different temperatures. (2) The components of the hydroxylase system will be separated and identified and structure of the active site of the enzyme will be investigated.
KEYWORDS: LIPIDS;CARBOXYLIC ACIDS;CELL MEMBRANES;OXYGEN;HYDROXYLASE;MICROORGANISMS;BACILLUS MEGATERIUM;BIOSYNTHESIS;HYDROCARBONS;HOMEOSTASIS;POLLUTION;BIOLOGICAL EFFECTS;BIOCHEMICAL REACTION KINETICS;TEMPERATURE DEPENDENCE;CLIMATES;ENZYMES;METABOLISM;OIL SPILLS;OXIDATION

<090017>
TITLE: Cellular and Molecular Neurobiology
PROJECT NUMBER: 000459
PRINCIPAL INVESTIGATOR: De Vellis, J.
ADDRESS: 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-1)GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (60%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this research are to study the effects of a number of substances that affect the development and functional differentiation of the brain, e.g., environmental pollutants, hormones and drugs. This is done largely by focusing on the regulation of certain key enzymes, glycerol phosphate dehydrogenase (GPDH) and lactate dehydrogenase (LDH). As a model for the whole brain, the studies are conducted largely with specific glial and neuronal cell lines.
APPROACH: To study the regulation of GPDH, a rat glial cell line, C-6, is used and a radioimmunoassay for GPDH has been developed. GPDH-induction is also used as a measure of the effect of lead. Protein kinase activity and cAMP-dependent protein phosphorylation are measured in subcellular fractions of the glial cells whereas the effect of catecholamines on the secretion of gonadotropins and gonadotropin-releasing hormones is studied in cell cultures prepared from pituitaries of gonadectomized rats.
RESULTS: Increased GPDH activity induced by glucocorticoid has been shown to be due to increased synthesis. Use of a cell-free synthesizing system will permit the study of regulation of this synthesis by hormone-receptor interaction and to isolate its specific messenger RNA. Stemming from this research may be the development of a routine diagnostic test for minimal heart damage based on GPDH assay. GPDH has been located in intervascular oligodendrocytes but not in neurones. Whether it is also present in astrocytes will be determined. A mechanism of induction of enzymes by catecholamines may have been shown to involve the redistribution of protein kinase activity between cell organelles. The study of the regulation of PK through cycAMP or cycGMP by catecholamines leading to enzyme induction and to feedback inhibition of adenylcyclase by a specific peptide will be aided by characterization of the peptide.
PROJECT MILESTONES: During FY 1977, the effect of lead and cadmium on GPDH synthesis induction and the mechanism and site of this action will be clarified. The cellular localization of GPDH will be confirmed and its use as a marker enzyme for oligodendrocytes will permit a facile identification of these cells. The routine diagnostic test for minimal heart damage using GPDH will be tested.
KEYWORDS: POLLUTION;HORMONES;DRUGS;BIOLOGICAL EFFECTS;CELL DIFFERENTIATION;BRAIN;GLUCOCORTICOIDS;ENZYMES;CATECHOLAMINES;DEHYDROGENASES;BIOSYNTHESIS;LEAD;CADMIUM;METABOLISM;NEUROLOGY;TOXICITY

<090018>
TITLE: Developmental Neurobiology
PROJECT NUMBER: 000460
PRINCIPAL INVESTIGATOR: Herschman, H.
AFFILIATION: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
MONITORING AGENCY: California Univ., Berkeley (USA)
77 FUNDING: Energy Research and Development Administration FY77:$135,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<090025>
TITLE: Environmental and Host Factors in Lymphomagenesis
PROJECT NUMBER: 000469
PRINCIPAL INVESTIGATOR: Hays, E.F.
ADDRESS: 900 Veteran Ave., Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C. E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-1)-gen-12
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Cadmium;METALS/Copper;METALS/Chromium (15%);SPECIFIED OTHER POLLUTANTS/Virus (85%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To determine how virus, host and environmental factors act to produce lymphoma in mice. (2) To better understand hemopoietic stem cells as they relate to radiation protection and lymphomagenesis. (3) To define the alteration of cell mediated immunity that occurs in preleukemic mice and to relate them to the development of lymphoma. (4) To study lipid metabolism of leukemic and preleukemic mice. (5) To study lipids of normal and leukemic human leukocytes. The overall objective is to increase our understanding of the pathogenesis of leukemia in man.
APPROACH: High incidence lymphoma strain mice when given murine leukemia virus as newborns all develop typical thymic lymphoma between 8 and 12 weeks of age. 5 week old virus inoculated animals are compared with age matched normal controls with regard to immune responses, hemopoietic stem cell function, thymus epithelial cell function and liver lipid metabolism. Studies of lipid metabolism, normal and leukemic human leukocytes from blood and bone marrow are carried out.
RESULTS: We wish to define a specific defect in cell mediated immunity (CMI), in preleukemic mice. This is important because the thymus, the organ that regulates CMI, is the target organ for lymphomagenesis. Thymic epithelial cultures will be established which will allow us to study the role of normal and murine leukemia virus infected epithelium in promoting maturation of thymus derived lymphocytes. We will study the potential for hemopoietic stem cell production in the liver of mice and expect to show that this organ has dormant stem cells left from fetal life which can be activated to protect lethally irradiated animals. Studies of liver lipid metabolism in normal and tumor bearing animals will tell us if increased membrane synthesis accompanying neoplasia is reflected in altered liver lipid metabolism. The lipid metabolism of normal and leukemic human leukocytes will be defined to determine if some therapeutically exploitable differences exist.
PROJECT MILESTONES: January 1977 completion of studies on immunity. June 1977 development of a system of in vitro transformation of normal thymocytes to lymphoma cells using epithelial cell monolayers. January 1978 initiation of studies of effects of the pollutants cadmium, copper, chromium on immune responses as co-carcinogens. Completion of studies with liver stem cells preliminary assessment of lipid metabolism of human leukemic cells and leukemic and normal mouse liver. Development of a maturation scheme using the in vitro techniques of bone marrow derived thymocyte precursors to mature immunologically competent cells under the influence of thymic epithelial cells. July 1978 A determination of the effect of infection of lymphocytes and epithelial cells with murine leukemia virus on this scheme.
KEYWORDS: LEUKEMIA;PATHOGENESIS;MICE;LYMPHOMAS;VIRUSES;LIPIDS;METABOLISM;STEM CELLS;IMMUNE REACTIONS;CADMIUM;COPPER;CHROMIUM;BIOLOGICAL EFFECTS;IMMUNOLOGY;IN VITRO;IN VIVO;NEOPLASMS

<090027>
TITLE: Dynamics of Trace Elements in Desert Environments
PROJECT NUMBER: 000650
PRINCIPAL INVESTIGATOR: Turner, F.B.
ADDRESS: 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research (ERDA)
MONITOR: Jacobson, Jay S.
TELEPHONE: F233-3664
TYPE OF FUNDING: Contract No.-EY-76-C-03-0012
77 FUNDING: Energy Research and Development Administration FY77:$95,000; Southern California Edison Co. FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (80%);WASTE MANAGEMENT (20%)
POLLUTANTS: PARTICULATES (60%);SPECIFIED OTHER POLLUTANTS/Non-metallic trace elements (40%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this study is to determine the accumulation, movement, and availability of trace elements from coal fly ash in the soil, litter, plants and rodents of a desert environment.
APPROACH: Chemical analysis of samples taken at different distances from power plants and after application of fly ash are performed. Measurements of litter fall and decomposition rate are being made.
RESULTS: Results will aid in the determination of the fate and effects of fly ash from coal burning power plants in the southwestern U.S. on desert environments.
PROJECT MILESTONES: Study plots in southern Nevada will be established by December 31, 1976. Ash application will begin during 1976 and be continued, in monthly increments, for two years. Comparisons of growth and

reproduction by treated and untreated plants during the growing season of 1977 will be completed by September 30, 1977.
KEYWORDS: DESERTS;TERRESTRIAL ECOSYSTEMS;PLANTS;PLANT GROWTH;REPRODUCTION;FLY ASH;ENVIRONMENTAL EFFECTS;SOILS;LEAVES;FOREST LITTER;RODENTS;CHEMICAL ANALYSIS;FOSSIL-FUEL POWER PLANTS;TRACE AMOUNTS;TOXICITY

<090028>
TITLE: Chemical Problems
PROJECT NUMBER: 000653
PRINCIPAL INVESTIGATOR: Wood, R.A.
ADDRESS: 900 Veteran Ave., Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(04-1)-GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$123,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives of this research are (1) to support and collaborate with researchers in those areas where specialists are needed in solving problems relative to analytical, inorganic and radiochemistry, and (2) to assist the bio-medical cyclotron facility in solving problems relative to target preparation, bombardments and final isolation of the induced radio-products in forms suitable for animal or human tracer studies.
APPROACH: The primary effort of this branch over the past fiscal year has been devoted to developing rapid analytical techniques for the determinations of stable carbon-13 oxygen-18 and nitrogen-15 as single tracers or in combination (i.e., C-13 O-18, N-15 O-18). Developmental techniques for the analysis of O-18, C-13 and N-15 have been essentially completed and manuscripts are in progress. The work dealing with O-18 analysis has been published. These methods will be used to study the fundamental processes of carbon fixation in photosynthesis as well as the fundamental studies of environmental impact upon plant and animal species from excessive exposure to CO and NO/sub 2/ pollutants.
RESULTS: This section will continue to support divisional research programs at the present level. The analytical techniques for determining C-13 O-18 and N-15 O-18/sub 2/ are essentially complete except for publication. Research will be started to develop techniques for identifying chemical species relative to toxicity studies in plant and animal systems. Studies will continue to develop methods for the identification of the inorganic and organic species of the heavy metals incorporated on plant and animal tissues.
KEYWORDS: COAL INDUSTRY;GEOTHERMAL ENERGY;LAND POLLUTION;LABELLED COMPOUNDS;RADIOACTIVATION;TRACER TECHNIQUES;RADIOCHEMICAL ANALYSIS;CARBON 13;OXYGEN 18;NITROGEN 15;QUANTITATIVE CHEMICAL ANALYSIS;QUALITATIVE CHEMICAL ANALYSIS;HEALTH HAZARDS;METALS;TOXICITY;ANIMALS;PHOTOSYNTHESIS;PLANTS;CARBON MONOXIDE;NITROGEN DIOXIDE

<090029>
TITLE: Distribution and Interrelationship to Trace Elements in Biological Systems
PROJECT NUMBER: 000657
PRINCIPAL INVESTIGATOR: Alexander, G.V.
ADDRESS: Lab. of Nuclear Medicine, 900 Veteran Ave., Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(04-1)-GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$51,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Continental;COASTS/Northwest;COASTS/Other coasts U.S. Pacific;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Near shore
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The primary research objective of this project is to study the distribution and interrelationship of the elements present in biological systems. Of fundamental importance to this goal is the development of efficient analytical methods which will produce accurate results.
APPROACH: An optical emission spectrometric system has been developed for the simultaneous determination of 29 elements important to the study of biological tissues.
RESULTS: Biological tissues are analyzed at the rate of 10 to 20 thousand per year. Eighty percent of these samples are plant tissues related to the various 'heavy metal' uptake studies of our laboratory. The remaining 20% are land and marine animal tissues related to studies of metal pollution in the environment and to studies of trace element essentiality. The relationship between trace element input, tissue levels and kidney disease are being studied in humans.
KEYWORDS: ELEMENTS;TISSUES;EMISSION SPECTROSCOPY;METALS;UPTAKE;POLLUTION;ANIMALS;MAN;PLANTS;CHEMICAL ANALYSIS

<090030>
TITLE: Ecophysiolcgy of Desert Anthropods
PROJECT NUMBER: 000682
PRINCIPAL INVESTIGATOR: Edney, E.B.
ADDRESS: 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISICN: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(04-1)-Gen-12
77 FUNDING: Energy Research and Development Administration FY77:$113,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Fly ash contents (80%);SPECIFIED OTHER POLLUTANTS/Salinity (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the nature and function of soil arthropods, their distribution and their role in degradation of detritus. To determine the environmental parameters governing population densities, including relationship to plants, soil temperature and moisture, salinity, etc. To deterine the effects of heavy metals and of fly ash and of salinity on populations. Determine possible evolutionary response to long term exposure to heavy metals and salinity from natural environment.
APPROACH: Sampling over long periods together with recording of abiotic data. Experimental manipulation of conditions including temperature, moisture, salinity and pollutants concentrations. Measurement of degradation in presence and absence of various faunal components. Field and laboratory studies on these questions.
RESULTS: Information about the significance of soil anthropods in desert ecosystems, and about the effect of pollutants from fossil fuel or geothermal sources upon them. Information about population dynamics and trophic relationships of soil anthropods.
KEYWORDS: ABIOTIC FACTORS;METALS;FLY ASH;SALINITY;ENVIRONMENTAL EFFECTS;ARTHROPODS;POPULATION DENSITY;PLANTS;SOILS;DESERTS;TERRESTRIAL ECOSYSTEMS;FOSSIL-FUEL POWER PLANTS;GEOTHERMAL POWER PLANTS;POLLUTION

<090031>
TITLE: Radionuclide and Stable Element Cycling
PROJECT NUMBER: 000683
PRINCIPAL INVESTIGATOR: Romney, E.M.
ADDRESS: Laboratory of Nuclear Medicine and Radiation Biology, 900 Veteran Ave., Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(04-1)-gen-12;Grant No.-IBP-subcontract 628;Interagency agreement-NV00
77 FUNDING: Energy Research and Development Administration FY77:$133,000; Utah State Univ.
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (40%);GEOTHERMAL/General (20%);CONSERVATION/General (20%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (40%);WASTE MANAGEMENT (60%)
POLLUTANTS: METALS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this project is to gain a better understanding of the following processes involving environmental pollutants: (1) radionuclide cycling in the desert ecosystem with emphasis on the transuranic elements Pu-239-240 and Am-241, and (2) stable element cycling in soils and vegetation with emphasis upon trace elements of concern as environmental pollutants when released in the burning of fossil fuels and in the development and application of geothermal energy resources as a source of power generation.
APPROACH: Several interacting studies form the basis of this research program. Work is proceeding along the following lines in response to mission needs of ERDA: (a) define the manner in which plants function in the vegetation-carrier transport of plutonium and other transuranic elements through the food chain from contaminated soil, (b) characterize the patterning, association and distribution of desert vegetation as influenced by nutrient gradients and other edaphic factors, (c) investigate the cycling of non-nuclear trace element pollutants in soils and vegetation, and (d) establish baseline assessments of such elements in natural ecosystems near geothermal resource areas (KGRA's) in the Imperial Valley, CA.
RESULTS: We shall continue to obtain information concerning ecosystem radionuclide cycling of the transuranic elements Pu-239-240 and Am-241. Work which has been underway in conjunction with the US/IBP Desert Biome Program shall be organized into final reports and papers for publication. Related soil-plant studies contributing basic information on the structure and function of the desert ecosystem shall be continued in order to obtain necessary information to complete several research papers and monographs in preparation for publication from these basic studies. New geothermal-related work started in FY 1976 shall be directed toward trace element surveys in natural vegetation, native animals, and key agricultural crops as part of the ecological baseline assessments work underway at KGRA sites in the Imperial Valley.
PROJECT MILESTONES: (a) Complete an estimate of the inventory and geographical distribution of transuranic elements in the vegetation of fallout areas at the Nevada Test Site. Our work in 'safety shot' sites is expected to be complete during FY 1977 and shifted to nuclear events sites for continuation during FY 1978. (b) Initiate during FY 1977 terrestrial desert ecosystem cycling studies of trace element pollutants identified from surveys of fly ash disseminated from a coal-fired power generating station. (c) Complete during FY 1977 base-line ecological studies involving producer-consumers at the East Mesa KGRA geothermal study site in the Imperial Valley, CA.
KEYWORDS: LAND;DESERTS;TERRESTRIAL ECOSYSTEMS;PLUTONIUM 239;PLUTONIUM 240;AMERICIUM 241;RADIONUCLIDE MIGRATION;SOILS;PLANTS;RADIOECOLOGICAL CONCENTRATION;FOSSIL-FUEL POWER PLANTS;GEOTHERMAL POWER PLANTS;POLLUTION;METALS;ECOLOGICAL CONCENTRATION

<090032>
TITLE: Physiology and Ecology of Desert and Other Plants
PROJECT NUMBER: 000692
PRINCIPAL INVESTIGATOR: Wallace, A.
ADDRESS: Laboratory of Nuclear Medicine and Radiation Biology, 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(04-1)-Gen-12
77 FUNDING: Energy Research and Development Administration FY77:$112,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION IN SITU (50%);STORAGE (10%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (10%)
POLLUTANTS: METALS (90%);RADIATION (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) To provide baseline data for soils and plant processes in the desert ecosystem representative of the southwestern U.S.A. These complement with other on-going studies in the division to provide a reasonably complete ecosystem approach. The information is vital to programs leading to both preservation and restoration of natural systems associated with energy generation programs. (2) To support the major objective with laboratory studies of trace metal and radionuclide effects and transport rates in the soil-plant system. (3) To respond to needs of ERDA with environmental assessments research in solving problems related to fossil fuel, nuclear, geothermal, or other technologies.
APPROACH: (1) Ecophysiolcgy of desert plants; study processes of photosynthesis, transpiration, nitrogen and mineral cycling, carbon budget, populations dynamics, and root growth and activity. (2) Laboratory and field studies of trace metal uptake and translocation rates and effects. Special emphasis is given to determination of the threshold acute and chronic toxicity levels of various trace metals in plants. These studies are supported by emission spectrography, N-15 spectrometry, and neutron activation work done in the laboratory.
RESULTS: (1) Trace metal uptake, translocation, interactions, toxicities. (2) Threshold levels of acute and chronic toxicity for trace metals. (3) Baselines for salt tolerance in desert ecosystem. (4) Transuranium element transfer in soil-plant systems. (5) Carbon cycle information and synthesis for desert ecosystems. (6) Nitrogen cycle information and synthesis for desert ecosystems.
PROJECT MILESTONES: (1) April 1976 Threshold toxicity levels for several different trace metals for lettuce plants will be developed. (2) June 1976 Plant uptake and distribution of several trace metals of concern of fossil fuel technology will be obtained. (3) June 1976 Input rates for nitrogen in the Northern Mojave Desert (Nevada Test Site) will become available. (4) January 1976 A report appeared on radiation damage to a different plant species in the Rock Valley gamma radiation study area. (5) March 1976 Am-241 uptake by a root crop growing in a contaminated soil was obtained.
KEYWORDS: DESERTS;TERRESTRIAL ECOSYSTEMS;PLANTS;PHYSIOLOGY;ECOLOGY;METALS;ROOT ABSORPTION;TOXICITY;FOSSIL-FUEL POWER PLANTS;NUCLEAR POWER PLANTS;GEOTHERMAL POWER PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;RADIOISOTOPES;SOILS;TRACE AMOUNTS

<090033>
TITLE: Vertebrate Physiological Ecology
PROJECT NUMBER: 000694
PRINCIPAL INVESTIGATOR: Nagy, K.A.
ADDRESS: 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(04-1)-GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$84,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (3%);RADIATION/Low level gamma (60%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Nevada test site
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: First, to measure the energy and material budgets of several key vertebrate species in desert ecosystems while they are living normally in the field; determine minimum dietary requirements for energy, electrolytes, minerals, nitrogen and water, and the roles of each relevant organ in maintaining balance; determine the influence of season and year to year variation in climate (rainfall primarily) on animal survival. Second, make identical measurements on animals living in polluted areas (gamma radiation, geothermal) to detect any pathological conditions.
APPROACH: Field studies involve measurements of energy and material fluxes with doubly-labeled water, diet analysis, behavior, and reproduction. Laboratory studies involve itemization of avenues of energy and material fluxes in feeding experiments, development and testing of measurement procedures, and determination of animal's minimum dietary requirements.
RESULTS: (1) Understanding of how desert vertebrates survive the rigors of their harsh environment. (2) Assess the effects of pollutants on the above abilities. (3) Pinpoint affected organs or organ systems for further detailed research.
PROJECT MILESTONES: (1) March 1976 End field portion of lizard (Uta stansburiana) studies (3). Continue lab work and write up. (2) March 1976 Begin field portion of desert tortoise study. (3) May 1976 Complete lizard (Sceloporus occidentalis) field HTO-18 study, write up. (4) May 1976 Complete review article on ''osmoregulation in Amphibians and Reptiles'' for Ann. Rev. Physiol. (5) June 1976 Complete HTO-18 analysis of errors study, write up. (6) October 1976 Complete marsupial mouse (Antechinus) study, write paper. (7) October 1976 Complete lizard (Sceloporus jarrovi) field hibernaculum study, write paper. (8) December 1976 Complete review article on doubly-labeled water. (9) January 1977 Explore possibility of initiating bird and rodent HTO-18 studies.
KEYWORDS: DESERTS;TERRESTRIAL ECOSYSTEMS;VERTEBRATES;ECOLOGY;GAMMA RADIATION;GEOTHERMAL POWER PLANTS;ENVIRONMENTAL EFFECTS;FOOD;METABOLISM;WATER

<090034>
TITLE: Oxidative Damage
PROJECT NUMBER: 002656
PRINCIPAL INVESTIGATOR: Mead;Tierney
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: CHEMICAL EFFLUENTS;SURFACE AIR;PHOTOCHEMICAL OXIDANTS;CHEMICAL REACTIONS

<090035>
TITLE: Assessment of Health Effects of Energy Systems
PROJECT NUMBER: 000898
PRINCIPAL INVESTIGATOR: Goldman, M.
ADDRESS: Radiobiology Laboratory, University of California, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA). Radiobiology Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)-472
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to analyze and assess the comparative effects of effluents associated with electrical power generation as they relate to risks to human health.
APPROACH: Data will be collected from the literature and, where possible, from investigators in order to develop mathematic models for the prediction of risks to man for scaling from animal species to humans.
RESULTS: Models for the risk to human health from power-evolved pollutants will be developed.
PROJECT MILESTONES: September 1978 Develop models for assessing risks to man from hazardous material associated with power production.
KEYWORDS: RISK ASSESSMENT;ENERGY;HEALTH HAZARDS;ELECTRIC POWER;POWER GENERATION;MATHEMATICAL MODELS;FORECASTING;MAN;ANIMALS;POLLUTION;EPIDEMIOLOGY;BIOLOGICAL MODELS;CARCINOGENS

<090036>
TITLE: Soil Chemistry of Transuranic Elements
PROJECT NUMBER: 001023
PRINCIPAL INVESTIGATOR: Nishita, H.
ADDRESS: 900 Veteran Ave., Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(04-1)-GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$167,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) To delineate the various factors that influence the solubility, precipitation, fixation, ion exchange, and colloid formation of Np, Pu, Am, and Cm. (2) To determine the chemical and biological availability of Np, Pu, Am, and Cm in soils and to correlate the chemical availability to biological availability.
APPROACH: The experiments will be done by laboratory chemical and physical measurements. The plant uptake experiments will be done in the plant growth chambers and in the greenhouse. Some field work is anticipated at the Nevada Test Site.
RESULTS: It is anticipated that the influence of various soil factors such as pH, cation exchange capacity, amount and kind of clay minerals, salinity, organic matter, lime, exchangeable cations, particle size distribution, etc. will be determined. Relative behavior of Np, Pu, Am, and Cm in soils will also be determined. Soils from different parts of the United States will be examined.
KEYWORDS: TRANSURANIUM ELEMENTS;RADIOECOLOGICAL CONCENTRATION;SOILS;LAND POLLUTION;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;NEPTUNIUM;PLUTONIUM 238;AMERICIUM;CURIUM 242;UPTAKE;CHEMICAL PROPERTIES;PLANTS;RADIONUCLIDE MIGRATION

<090037>
TITLE: Studies of Cultured Mammalian Embryos
PROJECT NUMBER: 001336
PRINCIPAL INVESTIGATOR: Pedersen, R.A.
ADDRESS: Laboratory of Radiobiology, San Francisco, CA 94143
AFFILIATION: California Univ., San Francisco (USA). Lab. of Radiobiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-AT(04-3)-1012;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$78,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (40%);PROCESSING, CONVERSION (40%)
POLLUTANTS: ORGANICS/Mutagens (40%);RADIATION/X-ray;RADIATION/UV;RADIATION/Tritium (60%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our objectives are to evaluate radiation effects on developmental processes and to

assess capabilities for repair of radiation damage in mammalian germ cells and embryos. In vitro culture of pre-implantation and early post-implantation embryos allows direct assessment of early developmental impact of radiation delivered to the parents during gametogenesis or to the embryo itself, without nterference from maternal factors. Thus, it is possible to study the mechanisms of radiation injury and epair.

...OACH: Mouse embryos are cultured from the two-cell stage to the blastocyst stage, and then to attachment and outgrowth stages that resemble post-implantation growth in utero. Experiments are designed with large numbers of embryos grown in chemically or biologically defined conditions, so that damage to germ cells or embryos can be assessed rapidly and accurately.

RESULTS: We will determine whether observed differences in UV-induced unscheduled DNA synthesis in oocytes, eggs, and embryos are due to actual changes in repair enzyme activites. We expect to measure the ability of the mouse egg to repair mutagen-and-radiation-induced damage to sperm DNA. We will also measure the cytogenetic damage that results from radiation and mutagen treatment of male parents to determine whether chromosome breakage is the specific cause of pre-implantation embryo death.

PROJECT MILESTONES: (1) September 30, 1977 Determine whether UV-repair activity in embryo cells can be used as a quantitative assessment of ability to recover from radiation damage. (2) September 30, 1977 Determine whether mouse egg can repair damage to sperm DNA. (3) September 30, 1978 Determine whether chromosome breakage is specific cause of ''dominant lethal'' embryo death.

KEYWORDS: MAMMALS;GERM CELLS;EMBRYOS;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL REPAIR;CELL CULTURES;IN VITRO;MUTAGENS;CHROMOSOMAL ABERRATIONS;MICE;REPRODUCTION;MUTAGENESIS;DNA;ANIMAL CELLS

<090040>

TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals: Toxicity of I-129

PROJECT NUMBER: 001399

PRINCIPAL INVESTIGATOR: Book, S.A.
ADDRESS: Radiobiology Laboratory, University of California, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA). Radiobiology Lab.

MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468

TYPE OF FUNDING: Contract No.-E(04-3)-472

77 FUNDING: Energy Research and Development Administration FY77:$44,000

TECHNOLOGY: NUCLEAR/General (100%)

ENERGY CYCLE: WASTE MANAGEMENT (100%)

POLLUTANTS: RADIATION/I-129 (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (90%);ANALYTICAL (10%)

REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: To test the toxicity of I-129 from chronic ingestion.

APPROACH: Rats will be fed I-129 continuously for their life span. The effects of I-129 on growth, thyroid functicn, tumorogenesis, and life span will be determined.

RESULTS: Risk to human health will be defined.

PROJECT MILESTONES: (1) September 1977 Early effects of chronic exposure to I-129 to rodents will be defined. (2) September 1978 Later effects of chronic exposure to I-129 to rodents will be defined. (3) September 1979 Termination of study. Hazards of chronic exposure to humans will be defined.

KEYWORDS: IODINE 129;BIOLOGICAL EFFECTS;DELAYED RADIATION EFFECTS;WASTE MANAGEMENT;CHRONIC INTAKE;INGESTION;RATS;HEALTH HAZARDS;ANIMAL GROWTH;THYROID;NEOPLASMS;LIFE SPAN;PHYSIOLOGY;MAN;NUCLEAR ENERGY

<090041>

TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals: Growth in Modified Tissue Culture

PROJECT NUMBER: 001402

PRINCIPAL INVESTIGATOR: Wilson, F.D.
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AFFILIATION: California Univ., Davis (USA). Radiobiology Lab.

MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468

TYPE OF FUNDING: Contract No.-E(04-3)-472

77 FUNDING: Energy Research and Development Administration FY77:$65,000

TECHNOLOGY: NUCLEAR/General (50%);NUCLEAR/Fission (50%)

POLLUTANTS: RADIATION/X-rays;RADIATION/Sv-90;RADIATION/Ra-226 (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: To determine the relative biological effects of internal emitters with respect to X-ray using bone marrow tissue culture systems that allow for the simultaneous quantitation of radiosensitive granulocyte-monocyte clonogenic progenitors and more radioresistant progenitors of bone marrow stroma. Such endpoints will be obtained for both in vitro and in vivo exposures situations.

APPROACH: (1) Bone marrow cultures will be obtained from mice receiving a series of doses of radiation of a variety of qualities. The survival or radiosensitive progenitors for granulocyte-monocyte pathways and for radioresistant marrow stromal progenitors will be determined on the basis of effects on the clonogenic growth of the two populations in a modified bone marrow tissue culture system. (2) The radiation-survival characteristics for these two clonogenic populations will also be determined for in vitro radiation of bone marrow.

RESULTS: The relative biological effects of a series of nuclides relative to X-irradiation will be determined for radiosensitive and radioresistant clonogenic bone marrow progenitors in situations of in vitro and in vivo radiation insults to the bone marrow.

ECT MILESTONES: (1) Development of bone marrow techniques for quantitation of clonogenic populations of ranulocytic (CFU-C) and fibroblastic (PFU-C) pathway, 1974. (2) Characterization of radiation survival haracteristics of marrow progenitors for CFU-C and PFU-C in mice subjected to acute whole-body X-irradiation, 1975. (3) Observations of functional changes in marrow PFU-C with respect to their ability to produce candidate granulopoietin (CSA) in response to irradiation and preliminary observation on the response of CFU-C and PFU-C in weaning beagles subjected to acute, whole-body gamma-irradiation, 1975. (4)

Preliminary studies on the response of CFU-C and PFU-C to continuous irradiation by Ra-226 and Sr-90 in beagles, 1975-76.
KEYWORDS: NUCLEAR ENERGY;HEALTH HAZARDS;BIOLOGICAL RADIATION EFFECTS;X RADIATION;BONE MARROW;MICE;PATHOLOGICAL CHANGES;PLUTONIUM;RADIUM 226;STRONTIUM 90;BEAGLES;RADIONUCLIDE KINETICS;ANIMAL GROWTH;BLOOD;IN VITRO

<090042>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals: Canine Transfer Factor
PROJECT NUMBER: 001403
PRINCIPAL INVESTIGATOR: Shifrine, M.
ADDRESS: Radiobiology Laboratory, University of California, Davis, CA 95616
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)-472
77 FUNDING: Energy Research and Development Administration FY77:$128,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Determine what in vitro immunologic test correlates best with transfer of immunologic reactivity in vivo using the dog as a model.
APPROACH: A variety of transfer factors with different immunologic specificities will be injected subcutaneously and intradermally below the popliteal lymph node of a hind leg. The contralateral popliteal lymph node will be removed, for control studies, prior to injection. Twenty-four hours post-injection the popliteal lymph node will be removed. Lymphocytes from the node will be tested with the appropriate antigens in the lymphocyte stimulation and leukocyte migration inhibition tests.
RESULTS: We plan to determine whether transfer factor, using above system, is a specific or non-specific immunologic enhancer of sensitivity in the recipients. Determine whether thymosine would react in a similar fashion, as preliminary tests suggest it might. Determine which in vitro test is best suited for measuring in vivo transfer of activity.
PROJECT MILESTONES: By July 1977 Determine mode of action of transfer factor and possible in vitro measurements of its activity.
KEYWORDS: NUCLEAR ENERGY;HEALTH HAZARDS;DOSE-RESPONSE RELATIONSHIPS;DOGS;BIOLOGICAL MODELS;IMMUNOLOGY;CHEMICAL REACTION KINETICS;SENSITIVITY;NEOPLASMS;IN VITRO;IN VIVO

<090043>
TITLE: Health Hazards Associated with Fossil Fuel Combustion in Electrical Power Generation
PROJECT NUMBER: 001592
PRINCIPAL INVESTIGATOR: Fisher, G.L.
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AFFILIATION: California Univ., Davis (USA). Radiobiology Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)-472
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (10%):FOSSIL FUEL/Coal (90%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/O/sub 3/ (20%);METALS/Cadmium;METALS/Nickel;METALS/Lead;METALS/Arsenic;METALS/Selenium;METALS/Beryllium;METALS/Antimony;METALS/Chromium;METALS/Barium;METALS/Uranium;METALS/Vanadium;METALS/Fly ash;METALS/Sulfates;METALS/Nitrates;METALS/Hydrocarbons (28%);PARTICULATES (40%);ORGANICS (10%);SPECIFIED OTHER POLLUTANTS/Fluorine (2%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this study are to develop sensitive indicators and to evaluate pathologic mechanisms of the biologic effects associated with inhalation of coal-combustion by-products. These studies will specifically elucidate the biologic mechanisms of damage including recovery and repair of energy-derived air pollutants. This information is vital for the comparison of the biological risks associated with nuclear power production to those associated with fossil fuel power production.
APPROACH: To evaluate biologic effects of coal derived effluents, animal exposure techniques will consist of using intratracheal intubation, ingestion, intravenous injection and acute and chronic inhalation in rodents, dogs and a small number of primates. Particulates of three types will be studied alone and in combination with oxides of nitrogen and sulfur: (1) soluble particulates generated from sulfate solutions, (2) insoluble, chemically inert silicate particles, and (3) actual fly ash particulates from a coal-burning electrical generating plant. Fly ash of four size classes will be studied to provide information on the biologic effects of those particles known to be efficiently deposited deep in the pulmonary region of the respiratory tract (median diameter = 2.2 mu m and 3.2 mu m) partially removed to the pharynx by cilial action (median diameter = 6.2 mu m) and completely removed by cilial action and swallowed (median diameter = 20 mu m).
RESULTS: This project will provide information regarding the biologic dose response of laboratory animals to combinations of coal-derived fly ash and oxides of sulfur and nitrogen. The subsequent pathogenesis of lung damage and potential systemic effects and their recovery and repair will be assessed. Such data will provide regulatory agencies with the information necessary for setting realistic air quality standards and designing pollution abatement technologies for coal-combustion power-generation processes.
PROJECT MILESTONES: (1) 6/30/77 Chemical and physical characterization of stack-collected fly ash will be completed. (2) 6/30/77 Design and construction of aerosol generator for small animal exposure. (3) 6/30/77 Preparation and initial distribution studies N-13 and S-38 labelled particulates, in non-human primates. (4) 6/30/77 Evaluation of Ames Salmonella test system and other cell culture systems for mutagenic and carcinogenic agents in fly ash will be completed. (5) 9/30/77 Effects of fly ash on macrophages and cell-mediated immune response will be initially evaluated in rodents. (6) 6/30/78 Initiate life-time

studies in rodents of health hazards associated with fly ash alone and in combination with SO/sub x/'s and NO/sub x/'s.
---WORDS: EFFLUENTS;FOSSIL FUELS;HEALTH HAZARDS;COAL;BIOLOGICAL INDICATORS;COMBUSTION PRODUCTS;ENERGY;CARCINOGENS;DISEASES;INHALATION;PATHOGENESIS;AEROSOLS;AIR POLLUTION;NITROGEN OXIDES;SULFUR DIOXIDE;SILICATES;FLY ASH;RATS;DOGS;ANIMALS;FOSSIL-FUEL POWER PLANTS

<090044>
TITLE: Mutagenesis: Mechanisms and a Potential Screening System
PROJECT NUMBER: 001912
PRINCIPAL INVESTIGATOR: Cleaver, J.E.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS/Carcinogens (20%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine mechanisms of mutagenesis in mammalian cells and in DNA viruses, and to evaluate potential applications of these systems to screening for potential mutagens.
APPROACH: Chinese hamster cells are exposed to DNA damaging agents and the yields of mutants resistant to 6-thioguanine and ouabain determined. DNA viruses that are temperature-sensitive will be damaged by radiation or chemicals and the yields of mutations that represent reversion to wild type will be determined.
RESULTS: The dose response curves and expression times for radiation and carcinogen-induced mutation to thioguanine and ouabain resistance will be obtained. The efficiency of ultraviolet light in causing reversion of temperature-sensitive viruses to wild type will be obtained.
PROJECT MILESTONES: (1) The dose response curves for Chinese hamster mutants produced by ultraviolet light, X rays, and some alkylating agents will be determined in FY 1977. (2) Herpes viruses suitable for reversion studies will be screened in FY 1977.
KEYWORDS: MUTAGENESIS;CARCINOGENS;DNA;MAMMALS;HAMSTERS;VIRUSES;MUTAGENS;ANIMAL CELLS;BIOLOGICAL INDICATORS;GENETICS;ULTRAVIOLET RADIATION;X RADIATION;ALKYLATING AGENTS;DOSE-RESPONSE RELATIONSHIPS;BIOLOGICAL RADIATION EFFECTS;BIOCHEMICAL REACTION KINETICS

<090045>
TITLE: Embryo Cultures and Environment
PROJECT NUMBER: 001913
PRINCIPAL INVESTIGATOR: Pedersen, R.A.;Spindle, A.I.
ADDRESS: Laboratory of Radiobiology, San Francisco, CA 94143
AFFILIATION: California Univ., San Francisco (USA). Lab. of Radiobiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-AT(04-3)-1012;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$109,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: METALS/Nickel;METALS/Lead;METALS/Mercury (10%);PARTICULATES (10%);ORGANICS/Teratogens;ORGANICS/Mutagens (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our purpose is to develop cytological and biochemical criteria for analyzing the effects of fossil-fuel and other energy-related pollutants on early differentiation of mammalian embryos. In order to investigate mechanisms of embryo toxicity under controlled conditions we aim to extend the reliable culture period for mouse blastocysts to the beginning of organogenesis, and we will study embryos perturbed by model teratogenic compounds or genetic abnormalities. The results of these studies should provide an in vitro test system for observing mechanisms of action of energy-related toxic agents, and may in addition provide a screening technique for certain teratogenic effects, particularly those that occur during early organogenesis.
APPROACH: Mouse embryos will be cultured from the 2-cell to the blastocyst stage, and then to attachment and outgrowth stages that resemble early post-implantation stages of development in utero. Embryos will be treated for brief periods (1-4 hrs), for 24 hr periods, or continuously with teratogenic compounds that act by known mechanisms; i.e., by interfering with differentiation (5-bromodeoxyuridine) RNA synthesis (Actinomycin-D) or protein synthesis. To improve culture conditions, embryos will be treated continuously with potential nutritional or growth promoting substances. All experiments carried out with replicated block and factorial designs. The treatment effects will be assessed by culturing embryos for 5-8 days beyond the blastocyst stage, and observing their morphology, cell number, and capacity for DNA, RNA and protein synthesis. In addition to measuring quantitative effects of these treatments on embryo growth, we expect to determine whether there are qualitative changes in the pattern of gene expression, by using sensitive one-dimensional and two-dimensional gel-electrophoresis techniques to study the proteins being synthesized by the embryos.
RESULTS: The known growth promoting effects of amino acids and serum on embryo growth will be analyzed by testing effects of polypeptide hormones present in serum (insulin, somatomedin) and by measuring interactions of several essential amino acids when present at high concentrations in the culture medium. We will determine the cytological and biochemical consequences of treatment with model teratogenic compounds, and determine dose-effect relationships for selected fossil fuel derivatives (benzopyrene and methylcholanthrene). From these results it should be clear whether substances that perturb early development act by common mechanisms that might be used as sensitive indicators of developmental hazards.
JECT MILESTONES: (1) September 30, 1977 Improve culture conditions to obtain 50% primary germ layer (endoderm, ectoderm, and mesoderm) formation and 10% heart formation in vitro. Complete assessment of normal development and model compounds for cytological and biochemical effects. (2) September 30, 1978 Improve culture conditions to 75% primary germ layer formation, and 25% heart formation in vitro. (3) September 30, 1978 Complete assessment of cytological and biochemical consequences of energy related compounds. (4) September 30, 1979 Complete assessment of teratogenic effect on early organogenesis stage

embryos. Define the limits of mouse embryo culture systems for analyzing mechanism of teratogenesis, and decide whether embryo culture systems will augment existing test systems in a reliable way.
KEYWORDS: EMBRYOS;FOSSIL FUELS;HEALTH HAZARDS;ANIMAL CELLS;BIOCHEMISTRY;MAMMALS;EMBRYOS;TERATOGENESIS;RNA;PROTEINS;NUTRITION;MICE;POLLUTION;BENZOPYRENE;CONDENSED AROMATICS;CELL CULTURES;TESTING;IN VITRO;REPRODUCTION

<090046>
TITLE: Plant-Environment Interactions
PROJECT NUMBER: 001915
PRINCIPAL INVESTIGATOR: Nobel, P.S.
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AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-E(04-1)-GEN-12
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Desert
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The overall objective is to understand in quantitative terms the response of desert plants to their natural environment. Understanding the ecophysiology under natural conditions will not only allow us to understand how plants survive in arid regions, but also will allow us to predict the responses to new, presumably man-made, environmental stresses.
APPROACH: Transpiration and photosynthesis are being measured with a Siemen's null-point compensating closed-circuit gas exchange system. Soil water potential, temperature, wind velocity, rainfall, and absolute humidity are being monitored. Plant morphology is being examined with a phase contrast microscope using sectioned material.
RESULTS: Using analogies to electrical circuits, the relative effects of the various anatomical components of desert plants (especially those with bluff-body profiles) are being described in unified fashion. The influence of environmental parameters on productivity can then be evaluated for these plants and the responses to environmental stresses predicted. An energy budget analysis is being used to assess data on the barrel cactus as well as selected broadleafs.
KEYWORDS: DESERTS;PLANTS;TRANSPIRATION;PHOTOSYNTHESIS;ENVIRONMENTAL EFFECTS;BIOLOGICAL STRESS;TERRESTRIAL ECOSYSTEMS

<090047>
TITLE: Pulse Radiolysis Studies
PROJECT NUMBER: 001920
PRINCIPAL INVESTIGATOR: Myers, L.S. Jr.;Vroom, D.A.
ADDRESS: Laboratory of Nuclear Medicine and Radiation Biology, 900 Veteran Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E-(04-1) GEN 12
77 FUNDING: Energy Research and Development Administration FY77:$62,000
TECHNOLOGY: FOSSIL FUEL/Coal (5%);FOSSIL FUEL/Oil and Gas (5%);NUCLEAR/Fission (90%)
POLLUTANTS: METALS (5%);ORGANICS (5%);RADIATION (90%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this work are to determine rates of reactions and properties of the highly reactive intermediate substances produced by ionizing radiation and chemical toxicants in biological materials. The substances referred to are the ones which cause critical biological damage.
APPROACH: Samples are exposed to a short intense burst of ionizing radiation (10 nanoseconds, 1000 rads) and changes in optical absorbance are determined over a period of 1 microsecond to one millisecond. Results are used to calculate rate constants, rates of reactions, and to determine reaction mechanisms.
RESULTS: In FY 1976 the mechanism of attachment of alcohols to nucleotides (AMP and TMP) under the influence of ionizing radiation should be partially understood, and in 1977 should be clarified. This reaction is probably an important reaction in the damage of DNA by radiation. Research on the project will be continued with other small molecules which in biological systems are in the neighborhood of DNA. This work will also contribute to studies of the mechanisms by which ionizing radiation modifies radiation effects of DNA. This mechanism should be understood by 1977 and applied to studies of other radiation modifiers. During 1976 procedures will be developed for studying reactions of chemical toxicants such as /sup ./O/sub 2//sup -/ and organic free radicals using radiation to generate the reactive chemical species. This work will continue into 1977 with application of the techniques developed.
PROJECT MILESTONES: Research in 1976 contributed information to the first major review of ionizing radiation-induced attachment reactions of nucleic acids. In 1977 this project will contribute to results of research in this field and to research on the mechanism of modification of the response of DNA to radiation by 5-bromouracil. In 1978 this project will contribute further information which should lead to suggestions for modifying radiation and chemical damage.
KEYWORDS: IONIZING RADIATIONS;BIOLOGICAL RADIATION EFFECTS;DNA;RADIOLYSIS;BIOCHEMICAL REACTION KINETICS;OXYGEN;RADICALS;RESPONSE MODIFYING FACTORS;DNA;NEOPLASMS;GAMMA RADIATION;RNA;TOXIC MATERIALS

<090049>
TITLE: Instrumentation Physics
PROJECT NUMBER: 002292
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$167,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: LABORATORY EQUIPMENT;DESIGN

<090050>
TITLE: Frederick Coop-Neoplasms
PROJECT NUMBER: 2792
PRINCIPAL INVESTIGATOR: Shifrine, M.
ADDRESS: University of California, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: High-risk, gamma-irradiated dogs will be typed for histocompatibility antigens. This will provide information on the relation of dog leukocyte antigens (DLA) types, radiation resistance and leukemogenesis, and will permit bone marrow (or other cell) transplantation into matched recipients. By avoiding problems of histocompatibility rejection phenomena, these studies will provide important data on such therapeutic approach and data on mechanisms of leukemic recurrence in transplantation recipients.
APPROACH: Tumor immunology hinges on the presence of tumor specific antigens (TSA) on tumor surface. The production of specific antibodies to TSA is extremely difficult. Using DLA matched dogs (one control and one which will become leukemia in the 60-Co field), we will produce chimeras. The chimeric dog will subsequently be immunized with the leukemic cells and will produce TSA in leukemic dogs by fluorescent and radioimmune assays. Each specific antibody also will be used to isolate TSA by affinity chromatography. The isolated TSA, in turn, will be used to detect circulative antibody in suspected or tumor dogs.
RESULTS: Using these reagents we will follow both humoral and cell mediated responses in high risk dogs prior to and following neoplastic development. These data will permit correlating immune reactivity to radiation-induced tumor-genicity (M. Shifrine, F.D. Wilson, and I.J. Fidler).
KEYWORDS: NEOPLASMS;GAMMA RADIATION;DOGS;BIOLOGICAL RADIATION EFFECTS;LEUKEMIA;IMMUNOLOGY;COBALT 60;RADIOINDUCTION;CARCINOGENESIS;BIOLOGICAL MODELS

<090051>
TITLE: Verification of the Carbon Dioxide Buffer Factor of Surface Ocean Water by Direct Observation
PROJECT NUMBER: 007097
PRINCIPAL INVESTIGATOR: Keeling, C.D.
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: CARBON DIOXIDE;ENVIRONMENTAL IMPACTS;SEAWATER;SURFACE WATERS;OCEANOGRAPHY

<090052>
TITLE: Methanol Metabolism--Ecological Effects
PROJECT NUMBER: 007451
PRINCIPAL INVESTIGATOR: Benson, A.A.
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$24,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: CALIFORNIA;METHANOL;METABOLISM;BIOLOGICAL EFFECTS

<090053>
TITLE: Basic Studies of the Immune Response and the Effects of Radiation on this Response
PROJECT NUMBER: 006090
PRINCIPAL INVESTIGATOR: Dixon, F.J.
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AFFILIATION: Scripps Clinic and Research Foundation, La Jolla, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wise, David
TELEPHONE: F233-4177
TYPE OF FUNDING: Contract No.-AT(04-3)410
77 FUNDING: Energy Research and Development Administration FY77:$42,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of the work carried out under the present contract is to characterize the postradiation immunological injury in precise terms as it relates to various immunocompetent cells. It is the objective of this program to identify the radiosensitive andradioresistant phase of the immune response in terms of the cellular events involved and to characterize these events. The intent of this study is also to define the effector and accessory cells involved in certain autoimmune diseases as to their sensitivity to irradiation in hope of better understanding and managing this disease. Another objective is to characterize the effect of radiation induced injury on both chronic viral infection and oncogenicity.
APPROACH: Approaches to be used to determine the immune status of lymphocytes after whole body irradiation

will involve the use of adoptive transfer techniques in the reconstitution of lethally irradiated experimental animals. Both normal and immune mice in which the immune status of T and B cells are known prior to and after irradiation will be irradiated and the exact status of the T and B cells and their subpopulations will be assessed by the ability to reconstitute the irradiated recipients with subpopulations of T and B cells with known immunological function. A similar approach will be taken to establish the immune status of T and B cell populations in experimental outoimmune thyroiditis, experimental autoimmune encephalomyelitis, and in chronic viral infections.
RESULTS: It is anticipated that the above approach will permit a characterization of T and B cells and their subpopulations which are involved in the radioresistance and susceptibility of the humoral antibody response. Furthermore, the role of radioresistance and susceptible subpopulation of cells in the induction, maintenance and termination of immunological tolerance can readily be determined and may give some insight to the cellular events involved in self-tolerance, autoimmunity, chronic viral infections and possibly some aspects of oncogenicity.
PROJECT MILESTONES: Using the above approach, it has been possible to determine the immune status of T and B cells during various phases of the tolerant state to both heterologous and self antigens. Such information has permitted a clear determination of the cellular parameters involved. in self tolerance and certain autoimmune diseases. The radiosensitivity of the various events involved in these phenomenon has also clarified the present understanding of regulatory mechanisms in the humoral immune response.
KEYWORDS: IMMUNOLOGY;BIOLOGICAL RADIATION EFFECTS;BIOCHEMICAL REACTION KINETICS;DOSE-RESPONSE RELATIONSHIPS;RADIOSENSITIVITY;ANIMALS;IN VITRO;IN VIVO;MOLECULAR BIOLOGY;ANIMAL CELLS;DISEASES;PATHOLOGICAL CHANGES;LYMPHOCYTES;MICE;GAMMA RADIATION;HEALTH HAZARDS

<090055>
TITLE: Studies in Developmental Immunogenetics
PROJECT NUMBER: 006130
PRINCIPAL INVESTIGATOR: Owen, R.D.
ADDRESS: California Institute of Technology, Pasadena, CA 91125
AFFILIATION: California Inst. of Tech., Pasadena (USA)
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
DIVISION: San Francisco Operations Office
MONITOR: Parker, Dean R.
TYPE OF FUNDING: Contract No.-AT(04-3)767 PA6
77 FUNDING: Energy Research and Development Administration FY77:$57,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: One general aim of this project is to contribure to understanding of carcinogenesis and normal development, in particular the genetic regulation of these processes and their inter-relationships. Another is to describe and interpret the genetic program for autoimmune disease.
APPROACH: The subjects of research are complex organisms, and the technology is mainly drawn from immunology, biochemistry and genetics.
RESULTS: The work is expected to produce new facts about, and insights into, the basic biological phenomena with which it deals.
PROJECT MILESTONES: Substantial understanding of how the cellular progeny of the fertilized egg, presumably genetically identical, come to be different from each other in form and function, of how it comes about that cancer cells frequently produce molecules normally characteristic of an earlier stage in development. Identifying, locating, and understanding the action of genes that control these molecules, and of genes that are involved in the development of autoimmune disease.
KEYWORDS: CARCINOEMBRYONIC;IMMUNOLOGY;LAND POLLUTION;CARCINOGENESIS;GENETICS;BIOCHEMISTRY;BIOCHEMICAL REACTION KINETICS;PATHOLOGICAL CHANGES;POLLUTION;HEALTH HAZARDS;CARCINOGENS;GENETICS

<090056>
TITLE: The Detection and Analysis of Mutagens
PROJECT NUMBER: 006131
PRINCIPAL INVESTIGATOR: Ames, B.N.
ADDRESS: University of California, Department of Biochemistry, 401 Biochemistry Building, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)-34-PA-156
77 FUNDING: Energy Research and Development Administration FY77:$64,000
TECHNOLOGY: FOSSIL FUEL/General (10%);NUCLEAR/General (10%);GEOTHERMAL/General (10%);SOLAR/General (10%);CONSERVATION/General (10%);GENERAL SCIENCE (50%)
POLLUTANTS: ORGANICS/Environmental effluents;ORGANICS/Pesticides;ORGANICS/Herbicides;ORGANICS/Flame retardants;ORGANICS/Food additives;ORGANICS/Drugs;ORGANICS/Etc. (100%)
CHARACTER OF STUDY: RESEARCH/General (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We propose to add to and improve a set of bacterial mutants that we have assembled for the detection and analysis of mutagenic agents. One objective is to have a set of strains that can be used by government agencies, and other interested parties, to screen environmental effluents, pesticides, herbicides, food additives, drugs, etc., as mutagens. Our second objective is to use these strains for investigating the mode of action of various mutagens and in particular for finding mutagens that make specific changes in the DNA.
APPROACH: We are attempting to: (1) introduce a mutation in the depurination repair system into the tester strains to see if this will magnify the errors introduced by certain alkylating agents; (2) develop a new tester strain TA92 which has normal excision repair (uvr repair) and is useful for those few mutagens, such as mitomycin, that require normal excision repair to cause mutations; (3) improve our TA1537 frameshift tester strain by introducing a string of 8C's at the point of the mutation; (4) develop a

tester strain with a string of A's at the site of a frameshift mutation; and (5) improve the metabolic activation system for chlorinated chemicals and dimethylnitrosamine.
ULTS: We hope to improve the correlation (presently 90%) between carcinogenicity and mutagenicity in the test system, to pick up the 18 carcinogens which have been negative with the present set of tester strains.
...WORDS: BACTERIA;MUTANTS;MUTAGENS;TESTING;DNA;MUTAGENESIS;MUTATIONS;IN VITRO;CARCINOGENESIS

<090057>
TITLE: Organelles and the Regulation of Plant Metabolism
PROJECT NUMBER: 006132
PRINCIPAL INVESTIGATOR: Beevers, H.
ADDRESS: Thimann Laboratories, University of California, Santa Cruz, CA 95064
AFFILIATION: California Univ., Santa Cruz (USA). Thimann Labs.
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
DIVISION: San Francisco Operations Office
TYPE OF FUNDING: Contract No.-AT(04-3)-34
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To elucidate the way in which the different organelles in cells cooperate in their metabolism. This involves showing what parts of the metabolic sequences operate in particular organelles by (1) enzymatic tests on isolated factions, (2) analysis of organelle factions for labeled metabolites following applications of C-14 and H-3-labeled intermediates. The biogenesis of the organelles during normal growth is also under study.
APPROACH: We have developed a technique which allows the excellent separation of several classes of organelles, including spherosomes, endoplasmic reticulum, mitochondria and glyoxysomes, on a single sucrose gradient. This method is the basis for our analyses as outlined in (1).
KEYWORDS: PLANTS;METABOLISM;PLANT GROWTH REGULATORS;CELL CONSTITUENTS;ENZYMES;BIOCHEMICAL REACTION KINETICS;GROWTH;PLANT CELLS;ORGANOIDS

<090058>
TITLE: Isotopic Studies on Structure-Function Relationships of Nucleic Acids and Enzymes
PROJECT NUMBER: 006134
PRINCIPAL INVESTIGATOR: Boyer, P.D.
ADDRESS: UCLA
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Elucidation of the nature of the energized state in biological membranes and the mechanisms of oxidative and photophosphorylation; development of methods for measurement of rapid labelling of phosphoryl enzymes and ATP at active sites; further assessment of the molecular integrity of parental DNA during replication. The mechanism of oxidative phosphorylation remains as one of the principal unsolved problems of biochemistry. The studies will test our new hypothesis that one mode of energy input is to bring about the release of ATP by protein conformational change. Experiments completed on the molecular integrity of DNA define the level of incorporation of P-32 and H-3-thymidine, and indicate the possibility of nuclease cleavage from O-18 probes.
APPROACH: Purified coupling factor ATPases and more complex preparation capable of partial reactions will be assessed for bound ATP, phosphoenzyme formation, and O-18 exchanges. Rapid mixing techniques will test the early events and primary acceptors in oxidative and photophosphorylation. Parental DNA integrity will be assessed using C-13 and N-15 density labelling techniques. Mitochondria and chloroplast infractions thereof, membranes of muscle, microsomes, bacterial cells and bacterial membranes.
RESULTS: Preliminary experiments indicate that AMP may be an early acceptor of P-32/sub i/ and photophosphorylation, but the ADP is the primary acceptor in oxidative phosphorylation. Isotopic exchange probes indicate that in oxidative phosphorylation bound ATP can be formed at the catalytic site but not released unless energy is present. The O-18 exchanges may result from reversible covalent bond cleavage and formation.
KEYWORDS: ANIMAL CELLS;PLANT CELLS;CELL CULTURES;BIOCHEMICAL REACTION KINETICS;CELL MEMBRANES;OXIDATION;PHOSPHORYLATION;TRACER TECHNIQUES;PROTEINS;METABOLISM;DNA;LABELLING;ATP;ENZYMES;CHEMICAL BONDS;BIOSYNTHESIS;NUCLEIC ACIDS;MAN;RADIOISOTOPES;DNA

<090059>
TITLE: Biosynthesis and Secretion of Extracellular Proteins Involved in the Formation and the Degradation of Plant Cell Walls
PROJECT NUMBER: 006137
PRINCIPAL INVESTIGATOR: Chrispeels, M.J.
ADDRESS: Department of Biology, University of California, San Diego, La Jolla, CA 92093
AFFILIATION: California Univ., San Diego, La Jolla (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomeical and Environmental Research
MONITOR: Stevens, Richard
TELEPHONE: F233-4678
PE OF FUNDING: Contract No.-E(04-3)-34 P.A. 159
FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS

PROJECT DESCRIPTION: Characterize enzymes involved in cell wall degradatios in barley.
APPROACH: (1) Isolate enzymes (beta-glucanase, xylanase) and cell walls. (2) Study interaction.
RESULTS: Elucidate hormonal control of enzyme synthesis.
KEYWORDS: PLANT CELLS;CELL WALL;PROTEINS;BIOSYNTHESIS;SECRETION;ENZYMES;BARLEY;HORMONES;BIOCHEMISTRY;METABOLISM

<090060>
TITLE: Recovery and Analysis of Mutants Affecting Developmental Processes in Drosophila Melanogaster
PROJECT NUMBER: 006139
PRINCIPAL INVESTIGATOR: Fristrom, J.W.
ADDRESS: Department of Genetics, U.C., Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Dept. of Genetics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Biomedical Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Contract No.-E04-3-34-PA186
77 FUNDING: Energy Research and Development Administration FY77:$9,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To understand the genetic, molecular and cellular mechanisms involved in morphogenesis/development of tissues in animals. This includes induction of mutations which block specific morphogenetic processes.
APPROACH: The morphogenesis of epidermal embryonic tissues to produce legs and wings in the insect Drosophila melanogaster is used as a model system. Leg/wing morphogenesis occurs in vitro in the presence of the steroid molting hormone beta-ecdysone and is inhibited by juvenile hormone. Mutants have been recovered which block morphogenesis. Studies on synthesis of macromolecules, on the movement of cells, and the assembly of supramolecular structures are being conducted.
RESULTS: Information on the basic processes involved in tissue morphogenesis will be obtained. The kinds of genetic input and the nature of the macromolecules (mainly proteins) involved will be elucidated. An understanding of the role of gene function in morphogenesis should evolve.
PROJECT MILESTONES: (1) Recovery of mutants blocking morphogenesis. (2) Understanding of the cellular basis of morphogenesis in this tissue. (3) Understanding of the mechanisms of action of insect hormones. (4) Role cf cytoskeletal/cytomusculative structures in morphogenesis of an epidermal tissue.
KEYWORDS: MUTAGENESIS;DROSOPHILA;BIOLOGICAL RECOVERY;GENETICS;BIOCHEMISTRY;CYTOLOGY;MORPHOLOGICAL CHANGES;BIOCHEMICAL REACTION KINETICS;IN VITRO;MUTATIONS;TISSUES;ANIMAL CELLS

<090061>
TITLE: Metabolic Control of Transport in Plant Tissues
PROJECT NUMBER: 006141
PRINCIPAL INVESTIGATOR: Laties, G.G.
ADDRESS: Department of Biology, UCLA, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Richland, Wash. (USA). Richland Operations Office
DIVISION: San Francisco Operations
MONITOR: Magliano, Vito A.
TELEPHONE: C(415)273 4111
TYPE OF FUNDING: Contract No.-E(04-3)-34PA No. 61
77 FUNDING: Energy Research and Development Administration FY77:$33,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To understand the developmental and physiological events in plant cells and tissues in terms of biochemical and physicochemical mechanisms. In particular to understand the sequence of events in maturation and aging in fruits and to delineate and characterize the epigenetic influences in development and differentiation.
APPROACH: (1) To relate the commonality of structure in those compounds which serve as triggering agents in the resperatory burst which attends maturation and ripening in fruits to their mechanism of action. (2) To interfere with the natural sequence of maturation changes in a way which illuminates the causative elements in the maturation process. (3) To develop a theoretical base for triggering action which can be tested experimentally.
RESULTS: (1) An ability to simulate the natural triggering hormone's effects by compounds of our choice which allow mechanistic interpretations. (2) To be able to distinguish between causative events and consequential events in relation to discrete and basic developmental changes. (3) To develop means of sustaining plant tissues, especially fruits and fibers, through extended periods which are normally associated with deterioration.
PROJECT MILESTONES: The discovery that the ripening hormone, ethylene, operates only in tissues which have an operative cyanide-insensitive path of elecyron transport, and that the normal ripening hormone is in fact instrumental in engaging or unplementing the activity of the alternate, or cyande-insensitive path. Further, that the operation of the cyanide-insensitive path is central to the biochemical changes which attend maturation and ripening.
KEYWORDS: PLANT CELLS;PLANT TISSUES;PHYSIOLOGY;BIOCHEMICAL REACTION KINETICS;BIOCHEMISTRY;METABOLISM;BIOLOGICAL MODELS;AGE DEPENDENCE;FRUITS;PLANT GROWTH;NUTRIENTS

<090062>
TITLE: Genetic Control of Gametogenesis in Drosophila Melanogaster
PROJECT NUMBER: 006142
PRINCIPAL INVESTIGATOR: Lindsley, D.L.
ADDRESS: University of California, LaJolla, CA
AFFILIATION: California Univ., San Diego, La Jolla (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468

TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$69,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The primary thrust of this research program is the study of the genetic control of gametogenesis. Two broad aspects of gametogenesis have been selected for intensive investigation; these are spermatogenesis and meiosis. The genetic requirements for the normal discharge of these functions are being defined by identifying and understanding genotypic perturbations that interfere with them. Mutations allow us to perturb the individual proteins (of which we estimate there are over 500 for spermatogenesis) necessary for these functions; chromosome rearrangements allow us to upset and thus to identify control of gene activity at the chromosomal level; synthetic aneuploids allow us to investigate the importance of the relative doses of the various genes involved in these processes. Effects of abnormal genotypes in meiosis are assessed by monitoring recombination (both meiotic and mitotic) and disjunction (both sex chromosomes and autosomes) in both males and females. Effects on spermatogenesis are detected by reductions in fertility; the testes of sterile males are examined morphologically at the level of both the light microscope and the electron microscope.
KEYWORDS: DROSOPHILA;GAMETOGENESIS;GENETIC CONTROL

<090063>
TITLE: Endonucleases Involved in Repair and Recombination of DNA
PROJECT NUMBER: 006143
PRINCIPAL INVESTIGATOR: Linn, S.M.
ADDRESS: University of California, Department of Biochemistry, 401 Biochemistry Building, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-ERDA E(04-3)-34 PA 190
77 FUNDING: Energy Research and Development Administration FY77:$38,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study the process of DNA repair in human cells and in bacteria.
APPROACH: Enzymes and other factors will be isolated from human culture cells as well as from bacteria, and their mechanism of action in repairing damage brought about by radiation and environmental mutagens will be studied. In addition, enzyme defects associated with diseased states of humans and mutations of bacteria will be described.
RESULTS: In this way we hope to catagorize which types of DNA damage might be most mutagenic or carcinogenic, and how such responses might be prevented. In addition, we hope to find the molecular basis of several diseases in order to learn how to treat these diseases.
KEYWORDS: DNA;BIOLOGICAL REPAIR;BIOCHEMISTRY;BIOLOGICAL RADIATION EFFECTS;ANIMAL CELLS;BACTERIA;MAN;MUTAGENS;CARCINOGENS;PREVENTIVE MEDICINE;ENVIRONMENT;POLLUTION;HEALTH HAZARDS;AGE DEPENDENCE;BIOCHEMISTRY;DISEASES;NEOPLASMS;MUTAGENESIS

<090065>
TITLE: Radiation Damage and Its Repair in Human Lymphocytes
PROJECT NUMBER: 006146
PRINCIPAL INVESTIGATOR: Norman, A.
ADDRESS: University of California, Department of Radiological Sciences, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Dept. of Radiological Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Maki, George
TYPE OF FUNDING: Grant No.-E(04-3)-34, Project 118
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/Smog (33%);ORGANICS/Alkylating agents (33%);RADIATION/Ionizing and uv (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: To develop methods for determining environmental damage in the man or woman who has been exposed to carcinogens.
APPROACH: Characterization of human lymphocyte populations. We are studying the changes that are produced directly in the lymphocytes as the result of exposure to radiation and other carcinogens and we are studying the changes that occur in lymphocytes as the result of the presence of a cancer in the host. The studies involve the use of a multiparameter cell sorter and various fluorescent agents.
RESULTS: Specific changes in the lymphocyte populations associated with exposure to radiation and other carcinogens and specific changes associated with the development of a cancer will be used to assess the health of individuals.
PROJECT MILESTONES: Assembly of the multiparameter cell sorter and associated equipment and the applications to characterization of lymphocyte populations obtained from peripheral blood of human subjects was begun in the 75-76 contract year.
KEYWORDS: INSTRUMENTATION;LYMPHOCYTES;RADIATION INJURIES;BIOLOGICAL REPAIR;CARCINOGENS;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL EFFECTS;NEOPLASMS;MAN;RADIOINDUCTION;BLOOD;ANIMAL CELLS;IMMUNOLOGY

<090066>
TITLE: Function of Chloroplast
PROJECT NUMBER: 006148
PRINCIPAL INVESTIGATOR: Wildman, S.G.
ADDRESS: UCLA, Los Angeles, CA
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)34
77 FUNDING: Energy Research and Development Administration FY77:$37,000
TECHNOLOGY: SOLAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The aim of this proposal is to ascertain the precise function of chloroplast DNA in determining chloroplast proteins. A variety of approaches are taken including microscopy and model building, peptide analysis, biochemical and genetic experiments. Much of the work is given added breath by being put into an evolutionary contact. Work in progress and some recent results can be summarized as follows: (1) Three dimensional structure of higher plant chloroplasts: A three-dimensional computer model of the chloroplast was constructed which allows one to observe the consequences of sectioning the hypothetical chloroplasts at different angles. This resolved an apparent conflict between Wildman's light microscopy studies and previously published electron micrographs of chloroplasts. Another computer model visualizes the thylakoid membrane system of chloroplasts as a continuous chain of beads folded into a flat spiral and embedded in a translucent matrix of stroma. The beads represent the grana and the chain the connections between the grana. The chain is continuous and the flat spiral is stabilized by occasional cross links. (2) Body Inheritance of Chloroplast DNA: It is largely a matter of faith rather than experimental fact that mitochondrial and chloroplast DNA are transmitted exclusively by the maternal line. Experiments using tobacco species that have chloroplast DNA's of different
KEYWORDS: PLANTS;CHLOROPLASTS;DNA;PROTEINS;BIOSYNTHESIS;BIOLOGICAL EFFECTS;MITOCHONDRIA;GENETIC CONTROL;NICOTIANA

<090067>
TITLE: Research on Dynamics of Tundra Ecosystems and Their Potential Response to Energy Resource Development
PROJECT NUMBER: 007563
PRINCIPAL INVESTIGATOR: Miller, P.
AFFILIATION: California State Univ., San Diego (USA)
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
KEYWORDS: TUNDRA;ARCTIC REGIONS;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL IMPACTS;BIOLOGICAL MODELS;TERRESTRIAL ECOSYSTEMS;BIOLOGICAL EFFECTS

<090068>
TITLE: ESR Studies of Thiyl Free Radicals in Relation to Biological Effects of Radiation
PROJECT NUMBER: 006284
PRINCIPAL INVESTIGATOR: Wolf, W.
ADDRESS: University of Southern California, Los Angeles, CA
AFFILIATION: University of Southern California, Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We propose to direct our specific efforts in 1975/76 toward the following three specific aims: (1) To reevaluate whether the assignment of the ESR signal at g-2.0106 to the RS. free radical is indeed correct, and if not, then to both determine the correct assignment of that signal and to determine the ESR characteristics of the true RS. free radical. (2) To continue the identification and characterization of the nature and structure of the disulfide and related radical cations, and of the possible participation of these charged radical species in radiobiological processes. (3) To complete, insofar as possible, experiments relating to the alternating line width effect, the testing of the variable temperature flow cell, and other problems related to thiyl free radicals, as defined in the overall proposal.
KEYWORDS: THIYL RADICALS;ELECTRON SPIN RESONANCE;SULFIDES;CATIONS;RADIOBIOLOGY;RADICALS

<090069>
TITLE: Studies on the Repair of Damaged DNA in Bacteriophage, Bacterial and Mammalian Systems
PROJECT NUMBER: 006287
PRINCIPAL INVESTIGATOR: Friedberg, E.C.
ADDRESS: Stanford University Medical Center, Dept. of Pathology, Stanford, CA 94305
AFFILIATION: Stanford Univ., Calif. (USA). Dept. of Pathology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-E(04-3)326 PA 32
77 FUNDING: Energy Research and Development Administration FY77:$34,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (20%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The study of the molecular mechanisms of DNA damage caused by physicochemical environmental agents and the repair of such damage is being studied using bacteriophage, bacterial and mammalian cell systems. The objective of the project is to isolate and characterize enzymes and nonenzyme cofactors involved in various DNA repair modes and to identify the biochemical basis for defects in DNA in a number of human diseases characterized by an increased frequency of chromosomal aberrations and/or cancer.
APPROACH: Both in vivo and in vitro (cell-free) systems are established using substrate models in the form of DNA damaged by UV and a variety of chemicals.
RESULTS: A detailed understanding of the molecular biology of DNA damage and its repair.
PROJECT MILESTONES: (1) Isolation and characterization of pyrimidine dimer specific endonuclease from extracts of normal human cells. (2) Demonstration of identifiable molecular defect in extracts of xeroderma pigmentosum cells. (3) Isolation and characterization of defective protein from xeroderma cells.
KEYWORDS: DNA;BACTERIOPHAGES;BACTERIA;MAMMALS;ANIMAL CELLS;BIOLOGICAL REPAIR;ENZYMES;BIOCHEMISTRY;NEOPLASMS;CHROMOSOMAL ABERRATIONS;ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL MODELS;MOLECULAR BIOLOGY

<090070>
TITLE: Repair of Damaged DNA in vivo
PROJECT NUMBER: 006289
PRINCIPAL INVESTIGATOR: Hanawalt, P.C.
ADDRESS: Department of Biological Science, Herrin Laboratories, Stanford, CA 94305
AFFILIATION: Stanford Univ., Calif. (USA). Dept. of Biological Sciences
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Contract No.-AT(04-3)326-7
77 FUNDING: Energy Research and Development Administration FY77:$48,000; American Cancer Society FY77:$47,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (10%);ORGANICS (20%);RADIATION (70%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To understand the nature of the enzymatic repair mechanisms that operate in living systems to repair damage in the genetic material, DNA. Additionally, to determine whether physiological conditions can be imposed to improve or increase the efficiency of DNA repair processes in man.
APPROACH: We use principally the method that was developed in our laboratory;the combined use of density labeling and radioactive labeling of DNA to detect the nonconservative mode of repair replication. We first demonstrated repair replication in bacteria and our continuing studies utilize bacteria as model systems while additionally exploring repair in eucaryotes such as yeast and human cells in culture. Repair pathways are characterized by analysis of mutant cell lines deficient in different enzymatic steps.
RESULTS: A clear description of the systems that enable living cells (e.g., human) to survive in the presence of noxious agents (e.g., chemical carcinogens and radiation) in the environment.
PROJECT MILESTONES: The demonstration of ''inducible'' DNA repair in humans. The restoration of DNA repair capability in cells of Xeroderma pigmentosum patients (genetically defective in repair) by the incorporation of a virus carrying the appropriate genes.
KEYWORDS: DNA;INJURIES;BIOLOGICAL REPAIR;ENZYMES;LABELLING;RADIOISOTOPES;BACTERIA;BIOLOGICAL MODELS;MUTANTS;IN VIVO;CARCINOGENS;MAN;ULTRAVIOLET RADIATION;ANIMAL CELLS;BIOCHEMICAL REACTION KINETICS

<090071>
TITLE: Micro-Zooplankters in the Marine Food Chain
PROJECT NUMBER: 006329
PRINCIPAL INVESTIGATOR: Beers, J.R.
ADDRESS: Institute of Marine Resources, A-018; University of California, San Diego, La Jolla, CA 92093
AFFILIATION: California Univ., San Diego, La Jolla (USA). Inst. of Marine Resources
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H. Jr.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-ERDA E(11-1)GEN 10, PA 20
77 FUNDING: Energy Research and Development Administration FY77:$655,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Copper in seawater (1%);SPECIFIED OTHER POLLUTANTS/Chlorine in seawater (5%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Far West;COASTS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas S. Calif. Borderland
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To measure the standing stocks, growth and activities of planktonic organisms of the coastal waters of the Southern California Borderland, the significance of the plankton in marine food webs, spatial and temporal variations of plankton, and the modulation by both physical and biological processes, including human activities, of plankton stocks. In part, we view as our charge the definition and assessment of potential effects on plankton of the use of seawater for cooling by coastal power stations in this region. Studies of microbial activities in surface sediments will be added in 1976-77.
APPROACH: A program of quarterly cruises has been carried out since September 1974 in support of these objectives. The shipboard measurements, using the methods of modern biological oceanography, are supported by laboratory studies of processes of interest carried out with cultures of bacteria, phytoplankton and zooplankton.
RESULTS: The program is expected to reveal seasonal and spatial variations in plankton stocks that will provide insight and hypotheses for the study of their regulation. Acute effects of chlorine releases from the San Onofre generating station on phytoplankton photosynthesis, bacterial activity, and the halogenation of organic matter are being evaluated. Measures of the ecological health of the planktonic ecosystem are being defined.
OJECT MILESTONES: Publication of integrated observations constitute milestones in this work. A few examples are: (a) acute effects of chlorine on phytoplankton photosynthesis and chlorine reactions with seawater constituents (1976); (b) spatial and temporal distribution of phytoplankton in the region; (c) a partial nitrogen budget for the region; (d) separation and characterization of free-living and attached bacteria in the water column; (e) relation of the depth distribution of herbivorous zooplankton to that of

phytoplankton; (f) a physical explanation for the presence of a phytoplankton maximum at mid-depth in the euphotic zcne; (g) development of adequate methods for calculating surface circulation in nearshore areas; (h) definition of the spatial and seasonal variation in the California undercurrent; (i) clarification of the rcle of breaking internal waves and tides in nutrient input to the euphotic zone; etc.
KEYWORDS: PLANKTON;FOOD CHAINS;BIOMASS;SEAS;COASTAL WATERS;POWER PLANTS;COOLING;BACTERIA;SEASONAL VARIATICNS;CHLORINE;PHOTOSYNTHESIS;BIOLOGICAL EFFECTS;POLLUTION;THERMAL POLLUTION;AQUATIC ECOSYSTEMS;THERMAL EFFLUENTS;CALIFORNIA

<090072>
TITLE: The Study of Dynamic Features Controlling the Coastal Environment Near the San Onofre Power Plant
PROJECT NUMBER: 6330
PRINCIPAL INVESTIGATOR: Folsom, T.R.
ADDRESS: Mt. Soledad Laboratory of Marine Radioactivity Studies, Scripps Institute of Oceanography, Universiry of California, San Diego, La Jolla, CA 92093
AFFILIATION: California Univ., San Diego, La Jolla (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(04-3)-34;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southwest;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: It now appears that the ultimate capacity for waste disposal of a coastal environment like that near the San Onofre Nuclear Power Plant depends strongly upon hydrodynamic and chemical parameters that have been little explored. Recent experimental studies of the behavior of plutonium on algal and cther surfaces suggests that ultimate dispersal of many of the trace metals that come from coastal power plants may be influenced, and in some instances controlled, by their ratio of transfer to surfaces through aqueous boundary layers. there is evidence that surfaces of inorganic particulates as well as surfaces of microalgae must be included in any dynamic disposal model. Inevitably studies must be made of transfer properties of all hazardous nuclides that might escape at San Onofre. However, the principal investigator, having reached University retirement status, must propose only some limited investigations that will add to the information needed for assessing impacts of coastal power plants.
RESULTS: During the first month, four alpha spectrometers and accessory equipment have been modified to make more reliable measurements of rates of deposition of heavy metals out of sea water into algal and other surfaces. Preliminary studies have uncovered aging changes in behavior of plutonium, americium and polonium in sea water.
KEYWORDS: FATE;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;SAN ONOFRE-1 REACTOR;SAN ONOFRE-2 REACTOR;SAN ONOFRE-3 REACTOR;COASTAL REGIONS;PLUTONIUM;RADIOACTIVITY;RADIONUCLIDE MIGRATION;RADIATION MONITORING;ALGAE;AMERICIUM;POLONIUM;SEAWATER;TRACE AMOUNTS;WATER POLLUTION;AGE DEPENDENCE;DEPOSITION;RADIONUCLIDE KINETICS;NUCLEAR POWER PLANTS;RADIOACTIVE WASTE DISPOSAL;OCEANOGRAPHY

<090073>
TITLE: Marine Geochemistry Research
PROJECT NUMBER: 006331
PRINCIPAL INVESTIGATOR: Goldberg, E.D.
ADDRESS: La Jolla, CA 92093
AFFILIATION: Scripps Institution of Oceanography, La Jolla, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biology and Medicine, Environmental Sciences Branch
MONITOR: Jcseph, Arnold B.
TELEPHONE: C(301)353-3035
TYPE OF FUNDING: Contract No.-AT(04-3)-34, P.A. 84
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (25%);SPECIFIED OTHER POLLUTANTS/Transuranics (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Far West;COASTS/Northeast;COASTS/Southeast;COASTS/Far West;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To understand the geochemical and geophysical behaviors of elements in sea water and the consequences of such activities to general earth science problems and to the management of industrial wastes. Emphasis has been placed upon the transfer processes of elements introduced into the oceans either from the continents, atmosphere or sea floor and to the time relationships of such reactions. The development of new geochronological techniques has formed an important part of our efforts. We have been concerned with the construction of new instruments and with the devising of new methods to further these goals. Over the past years we hve been studying the mobilization of transuranics and heavy metals from fuel cycles into the coastal environment.
APPROACH: We utilize the fluxes of transuranics and heavy metals to anoxic sediments, either estuarine or coastal marine, to obtain pollution histories. Time frames are introduced into the sediments usually with radiometric geochronological techniques and sometimes with natural varving. To ascertain the amounts of materials transported atmospherically from the continents to the oceans we have collected and measured pollutants in airborne dusts and in glaciers (which can have their strata dated by radiometric techniques). We have also developed coring techniques to recover relatively undisturbed samples from both coastal and deep sea sites.
RESULTS: (1) Pollution histories, both transuranic and fossil fuel metals, as recorded in coastal, estuarine and glacial sediments, for a variety of U.S. sites. (2) Monitoring strategies for transuranic and heavy metals released during fuel cycles with respect to the coastal marine environment. (3) Detailed geochemical behaviors to transuranic elementsand heavy metals in the atmosphere and in the coastal marine environment. (4) New geochronological techniques applicable to a variety of sedimentary environments. (5) Novel chemical analytical techniques applicable to transuranics and to heavy metal analyses in a variety of environmental samples.

PROJECT MILESTONES: (1) Development of novel geochronologies, Ra-226, Pb-210 and Th-228/Th-232 for coastal marine zones. (2) Development of the concept that remobilized soil debris is an important vehicle for mobilizing transuranics and heavy metal pollutants to the coastal marine environment. (3) development of the use of coastal marine sediments, lake sediments and glaciers for recording pollution histories. (4) Development of the importance of atmospheric transport in moving pollutants from nuclear and fossil fuel cycles to the marine environment.
KEYWORDS: FATE;SEAWATER;GEOCHEMISTRY;GEOPHYSICS;FUEL CYCLE;WASTE DISPOSAL;COASTAL WATERS;METALS;TRANSURANIUM ELEMENTS;WATER POLLUTION;ESTUARIES;RADIOMETRIC ANALYSIS;AEROSOLS;PLUTONIUM;SOILS;SEDIMENTS;RADIOACTIVITY

<090074>
TITLE: Distribution and Fate of Biogenic and Petroleum-Derived Substances in Marine Substances
PROJECT NUMBER: 6334
PRINCIPAL INVESTIGATOR: Kaplan, I.R.
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AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: C(301)353-5549
TYPE OF FUNDING: Contract No.-E(04-3)-34 P.A. 134
77 FUNDING: Energy Research and Development Administration FY77:$101,000; Bureau of Land Management FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Oil and Gas (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (70%);WASTE MANAGEMENT (30%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: This project will look for the causes to explain the distribution of organic substances in marine sediment, particularly the hydrocarbons. The depth distribution of hydrocarbons in relation to total carbon will be studied to determine whether enrichment or depletion at any one time interval is the result of climatic events related to erosion from land, or whether it reflects change of productivity in the water column. A number of trace metals will be studied to better ascertain the relationship between carbon compounds and the metals. Content of metals in sediments will be studied with a view toward determining whether the enrichment process is the result of allocthonous or in situ processes.
APPROACH: The following studies will be undertaken: (1) Evaluation and differentiation of marine and terrestrial contributions of carbon compounds to ocean sediments. (2) Fluxes of carbon, nitrogen, phosphorus and sulfur at the sediment-water interface. (3) Evaluation of carbon and nitrogen fluxes into marine sediment as a function of climatic changes. (4) Differentiation of marine biogenic and petrochemical hydrocarbons. (5) Fate of hydrocarbons in the sediment column. (6) Role of sediment organic matter in mobilization and removal of trace metals. (7) Distribution of trace metals in sediment as a function of climatic changes.
RESULTS: In order to differentiate hydrocarbons originating from naturally occurring sources, from those introduced into the ocean by anthropogenic processes, a very broad approach must be considered. First, one must be able to predict with confidence that certain classes of compounds are not normally synthesized by marine organisms. Second, it must be shown that the hydrocarbons are not introduced from land by rivers or natural drainage systems. Third, it must be demonstrated that anthropogenic hydrocarbons in any specific location in the ocean can be differentiated from petroleum typesubstances either produced in natural seeps, or from oil shales cropping out on the ocean floor.
PROJECT MILESTONES: (1) The use of N-15/N-14 and S-34/S-32 stable isoope ratios in crude oils and petroleums have proved to be an effective method to differentiate their origin and source. (2) Gas chromatography and gas chromatography-mass spectrometry methods are able to establish compound recognition of petroleum products in marine sediments. (3) Trace metal concentrations, such as uranium, fluctuate with climatic changes, as evidenced by the depth distribution of uranium in marine sediments.
KEYWORDS: PETROLEUM INDUSTRY;OIL SPILLS;WATER POLLUTION;METALS;ORGANIC COMPOUNDS;PETROLEUM;HYDROCARBONS;BIOCHEMICAL REACTION KINETICS;ENVIRONMENTAL EFFECTS;TOXICITY;SEDIMENTS;CARBON;NITROGEN;PHOSPHORUS;SULFUR;SYNERGISM;CLIMATES;DIFFUSION;TRACER TECHNIQUES;NITROGEN 15;NITROGEN 14;SULFUR 34;SULFUR 32;SEWAGE

<090075>
TITLE: Investigations of Physical Processes Affecting Leaf Temperature Profiles and Primary Production in the Red Mangrove Ecosystem and Research on the Dynamics of Arctic Tundra Ecosystems
PROJECT NUMBER: 6400
PRINCIPAL INVESTIGATOR: Miller, P.C.
ADDRESS: San Diego State University Foundation, San Diego, CA 92182
AFFILIATION: San Diego State Univ., Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osburn, W.S. Jr.
TELEPHONE: C(301)353-4903
TYPE OF FUNDING: Contract No.-E(04-3)807;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$33,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Arctic tundra
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The underlying objective of the research is to develop the conceptual understanding of Arctic tundra dynamics through an interplay of field investigations, simulation modeling, and laboratory experimentation. The broad hypotheses to be tested is that the models developed to express the dynamics of the coastal, wet meadow tundra can predict the dynamics of inland tundra ecosystem types, given values for the parameters in the model which define the new ecosystems. The specific hypothesis are the values of parameters and relationships between variables currently being used. Some of the research needed to establish these will be carried forward in an on-going field study, sponsored by the NSF, of the grazer-vegetation interactions in inland tundra. More will be carried out as part of this proposal.

RESULTS: Existing models have been used to guide the 1975 summer field research funded under the NSF RATE program. Data from the summer field program is being used to validate existing models for the diverse vegetation types found at Meade River, Alaska. Models of grazer-vegetation interactions are being developed.
KEYWORDS: ECOSYSTEM DYNAMICS;ECOSYSTEM MODELING;ARCTIC REGIONS;TUNDRA;TERRESTRIAL ECOSYSTEMS;SIMULATION

<090079>
TITLE: Processes of Energy Deposition by Heavy Particle Impact
PROJECT NUMBER: 006483
PRINCIPAL INVESTIGATOR: Smith, F.T.
AFFILIATION: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
MONITORING AGENCY: Stanford Research Inst., Menlo Park, Calif. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$36,000
TECHNOLOGY: NUCLEAR/Fission (100%)

<090080>
TITLE: Mutation Rates and Mutational Loads in Man
PROJECT NUMBER: 006496
PRINCIPAL INVESTIGATOR: Cavalli-Sforza, L.L.
ADDRESS: Stanford University School of Medicine, Department of Genetics, Stanford, CA 94305
AFFILIATION: Stanford Univ., Calif. (USA). Dept. of Genetics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.-AT(04-3)-326, P.A. 33
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);NUCLEAR/Fission (50%)
POLLUTANTS: RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Study of evolution in humans with special reference to mutation rates, selection rates, drift, and effects of cultural changes.
APPROACH: (1) Mathematical study of population changes under mutation, selection, drift. (2) Analysis of new methods for detection of mutations in human proteins for an improvement of the estimates of mutation rates.
RESULTS: (1) We have developed a new technique for detection of specific protein after electrophoresis with which we have detected new genetic polymorphisms in man and hope it can be applied to the estimation of mutation rates. (2) We continue our analysis of human migrations as a basic information for the understanding of the spread of mutations.
PROJECT MILESTONES: Automation of present techniques for detection of mutations. Theoretical analysis of human evolution: the creation of models that can be satisfactorily applied and allow estimation of the basic parameters of human evolution.
KEYWORDS: MAN;MUTAGENESIS;HEALTH HAZARDS;MUTATIONS;GENETIC VARIABILITY;MUTATION FREQUENCY;MATHEMATICAL MODELS;MEASURING METHODS;FORECASTING;AUTOMATION;SOCIOLOGY;RADIATIONS;ENVIRONMENT;GENETIC EFFECTS

<090081>
TITLE: Genetic Structure of Natural Populations
PROJECT NUMBER: 006587
PRINCIPAL INVESTIGATOR: Ayala, F.J.
ADDRESS: Department of Genetics, University of California, Davis, CA 95616
AFFILIATION: California Univ., Davis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E(04-3)34, No. 200:Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$26,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To measure genetic loads in natural populations, and their relationships to natural selection and evolution; (2) to ascertain the role of natural selection and of random processes on the maintenance of genetic variation in natural populations; (3) to ascertain the role of genetic factors in determining certain behavioral traits, and the feasibility of modifying such genetic factors; (4) to ascertain the amount of genetic variation underlying protein variation in populations of animals. It has recently become established that a great deal of genetic variation exists in natural populations of most kinds of organisms. The various aspects of the project are concerned with more precise measures of the amounts of genetic variation, and with the natural processes by which the polymorphisms are maintained, as well as their role in the adaptation and evolution of populations. Special attention is paid to certain behavioral traits, like phototaxis and geotaxis. The research is conducted for the most part on populations of *Drosophila* flies.
RESULTS: Perhaps more than 50% of all gene loci are polymorphic in a given natural population. The variation is adaptively significant, since individuals homozygous for a whole chromosome have very low fitness (less than 15% of normal individuals). Genetically controlled protein variants affect various fitness components, such as fertility, viability, longevity, and the like.
KEYWORDS: POPULATIONS;GENETICS;BIOLOGICAL EVOLUTION;GENETIC VARIABILITY;PROTEINS;BEHAVIOR

<090083>
TITLE: Studies of the Repair of Radiation-Induced Genetic Damage in Drosophila
PROJECT NUMBER: 006673
PRINCIPAL INVESTIGATOR: Boyd, J.B.
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AFFILIATION: California Univ., Davis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C. E.

TELEPHONE: P233-5468
TYPE OF FUNDING: Contract No.-(04-3)-34, P.A. 210
77 FUNDING: Energy Research and Development Administration FY77:$45,000
ECHNOLOGY: NUCLEAR/General (100%)
NERGY CYCLE: WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Our principal aim is to achieve a more thorough understanding of the mechanisms employed by higher organisms to repair radiation and chemical damage in DNA. To achieve this end we are performing a combined genetic, biochemical, and cytological investigation of DNA repair mechanisms in Drosophila.
APPROACH: (1) Mutant Isolation. (2) Genetic Characterization. (3) Physiological Characterization. (4) Chemical Characterization of DNA Repair. (5) Enzymology. (6) Repair in Isolated Nuclei. (7) Mutagen Testing.
RESULTS: (1) A more thorough understanding of the DNA repair mechanisms employed by eukaryotes to respond to environmentally induced damage. (2) Development of more sensitive strains for detecting environmental mutagens.
KEYWORDS: IONIZING RADIATIONS;GENETIC RADIATION EFFECTS;DNA;DROSOPHILA;BIOLOGICAL REPAIR;MUTAGENS;TESTING;ULTRAVIOLET RADIATION;CARCINOGENS;BIOCHEMISTRY

<090088>
TITLE: Physical Mechanism of Action of the Photoreactivating Enzyme
PROJECT NUMBER: 006934
PRINCIPAL INVESTIGATOR: Sutherland, J.C.
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AFFILIATION: California Univ., Irvine (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C. E.
TELEPHONE: P233-5468
TYPE OF FUNDING: Contract No.-E(04-3)-34
77 FUNDING: Energy Research and Development Administration FY77:$18,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION/Ultraviolet (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Determination of the Mechanism of Action of the Photoreactivating Enzyme. Ultraviolet light (wavelengths between 240 and 320 nm) causes death and mutations in procaryotic and eucaryotic organisms. In man, ultraviolet light can produce skin cancers. The primary molecular lesion responsible for these biological effects are thought to be photochemical modifications of the organisms DNA. Cells of organisms throughout the phytogenetic tree have developed enzymatic mechanisms to repair damage produced in their DNA by ultraviolet light. We are studying the molecular mechanism of action of one of these enzymatic repair systems, the photorectivating enzyme. The photoreactivating enzyme (PRE) uses visible or near ultraviolet light (300 < lambda < 600 nm) to monomerize pyrimidine dimers (cyclobutyl-dipyrimidines). Thus the PRE has two unique and valuable properties: (1) It uses a 3eV photon to remove damage produced by a 5eV photon and (2) It is specific for the major class of ultraviolet induced molecular lesions. Thus if an effect can be reversed by photoreactivation, then the effect is caused by pyrimidine dimers.
APPROACH: The PRE uses visible and near ultraviolet light to repair DNA damaged by far ultraviolet light. We are studying the PRE using a variety of spectroscopic techniques using the same weavelengths (i.e., 240-600 nm). The spectroscopic techniques which have been used to study the PRE include: absorption and absorption difference spectroscopy, fluorescence, phosphorescence, circular dichroism, magnetic circular dichroism and action spectroscopy.
RESULTS: We expect to determine which of several theoretical mechanisms correctly describes the mechanism of action of the PRE. We also will characterize the human PRE and compare it with PRE from other sources (bacterial, plant, insect). We are developing new spectroscopic techniques for studying biological materials.
PROJECT MILESTONES: (1) We were first to measure the action spectrum of the human PRE. We discovered that the human PRE can use wavelengths greater than 500 nm. Thus yellow ''safe lights'' widely used in PRE experiments are in fact ''unsafe'' for the human PRE. (2) We have detected new absorption resulting from complex formation between PRE and dimer containing DNA. This observation explains the mysterious lack of absorption greater than 300 nm of the purified PRE and also suggests that the mechanism of action involves formation of a ground state complex between PRE and dimer containing DNA. (3) New Spectroscopic Techniques: We have measured the degree of circular polarization of fluorescent light induced by an external magnetic field. Ours was the frst demonstration of this technique at physiological (non-cryogenic) temperatures. We were also first to demonstrate fluorescence detected magnetic circular dichroism of both fluorescent and nonfluorescent compounds.
KEYWORDS: ULTRAVIOLET RADIATION;BIOLOGICAL RADIATION EFFECTS;DNA;PHOTOREACTIVATION;VISIBLE RADIATION;BIOCHEMICAL REACTION KINETICS;NEOPLASMS;MUTAGENESIS;ENZYMES;MOLECULAR BIOLOGY;BIOLOGICAL REPAIR

<090093>
TITLE: Chronic Irradiation and Brain Development
PROJECT NUMBER: 008012
PRINCIPAL INVESTIGATOR: Zamenhof, S.
ADDRESS: Department of Microbiology and Immunology, UCLA School of Medicine, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: P233-5468
YPE OF FUNDING: Contract No.-E(04-3)-34, P.A. 230
7 FUNDING: Energy Research and Development Administration FY77:$44,000
TECHNOLOGY: NUCLEAR/Fusion (100%)
POLLUTANTS: RADIATION/Tritium (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of the project is to study the effect of low level of chronic radiation

(radioactive pollutants) on mammalian (rat) brain development over several generations, emphasizing the dose-effect relationships.
APPROACH: First approach: (1) The pregnant rats (F/sub 0/) and their fetuses will be exposed to chronic low level radiation that does not produce sterility. (2) Some of the newborns (F/sub 1/) will be examined for first generation effects on brain development. (3) The remaining F/sub 1/ females will be raised without further addition of radioisotopes, mated with non-irradiated males, and their offspring F/sub 2/ examined for cerebral parameters. Second approach: The possibility of cumulative effect of radiation over generations will be investigated by continuous (chronic exposure of pregnant mothers and of their progeny to low (non-sterilizing) level of radiation (radioisotopes), and examination of the brains in consecutive generations (first through fifth) as described above.
RESULTS: One aim in this proposed study will be a precise and direct administration of a low dose of radioactive material to the developing fetal brain. Another aim will be an attempt to mimic the more natural exposure type such as ''hidden'' irradiation, due to ingestion of foods containing weakly radioactive materials. It is very likely that even low doses of radioactive material reaching the developing fetus directly will cause an irreversible change in the brain histology and anatomy. It is also expected that other fetal organs, especially sensitive ones such as the endocrine glands, will suffer lasting alterations after in utero exposure to radioactive materials, and subsequent exposure due to residual label in DNA.
PROJECT MILESTONES: Initiate studies to establish a dose of radiochemicals (H-3 thymidine, H-3 leucine, H-3 glucose) which still allows sufficient fertility and viability for the long-range maintenance of the chronically irradiated rat colony. Monitor the status of all animals (placental and body weights, fertility and mortality rates). Initiate similar studies on rat population that has been malnourished (protein and/or calorie deficiency). Initiate the studies of the effects on brain development. Finish the study of chronic radiation on brain development in first generation as outlined above. Continue the studies, now on second and third generation: (1) under continued low dose radiation (study of cumulative effects and (2) with radiation discontinued after first generation (study of non-mendelian inheritance and study of recovery).
KEYWORDS: IONIZING RADIATIONS;LOW DOSE IRRADIATION;CHRONIC IRRADIATION;RATS;CUMULATIVE RADIATION EFFECTS;BRAIN;FETUSES;TRITIUM COMPOUNDS;DNA;INGESTION;IN VIVO;NEUROLOGY;PREGNANCY

<090096>
TITLE: Atmospheric Effects Caused by Waste Heat Rejection from Large Electrical Power Generating Facilities
PROJECT NUMBER: 007042
PRINCIPAL INVESTIGATOR: Koenig, L.R.
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AFFILIATION: Rand Corp., Santa Monica, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Moses, Harry
TELEPHONE: F233-5572;C(301)353-5572
TYPE OF FUNDING: Contract No.-E(04-3)-1191
77 FUNDING: Energy Research and Development Administration FY77:$74,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
ENERGY CYCLE: COMBUSTION IN SITU (80%);ELECTRICITY GENERATION (20%)
POLLUTANTS: HEAT, THERMAL (50%);SPECIFIED OTHER POLLUTANTS/Moisture (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Energy centers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of this study is to develop the means for predicting the effects on the atmosphere resulting from the injection of large amounts of heat and moisture.
APPROACH: One approach is to develop numerical models to simulate the physical processes leading to possible weather changes. A second approach is to identify analogs such as heat islands and to study their atmospheric effects.
RESULTS: One result expected is the development of a simulation model to predict the effects on the atmosphere of the operation of large power generation complex. The second is the assessment of analogs simulating power station operation.
PROJECT MILESTONES: Several R and D reports resulting from this work may be considered as milestones: (1) Koenig, L. Randall, 1976, Application of Analogs to the Assessment of Waste Heat Dissipation Effects on the Atmosphere, WN-9550-ERDA; (2) Murray, Francis W., 1976, The Role of the Perturbation in the Modeling of Atmospheric Thermal Convection, WN-9549-ERDA.
KEYWORDS: ENERGY PARKS;ENVIRONMENTAL EFFECTS;WASTE HEAT;SURFACE AIR;CLIMATES;METEOROLOGY;WEATHER;THERMAL POWER PLANTS;MATHEMATICAL MODELS;SIMULATION;WEATHER

<090097>
TITLE: Effect of Habitat Conditions on Spatial Parameters of Shorebird Population
PROJECT NUMBER: 007223
PRINCIPAL INVESTIGATOR: Pitelka, F.A.
ADDRESS: Department of Zoology, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: C(301)353-4905
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$63,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (70%);TRANSPORTATION (30%)
POLLUTANTS: ORGANICS (30%);NOISE, VIBRATION (30%);VISUAL AESTHETICS (30%);SPECIFIED OTHER POLLUTANTS/Dust (10%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to use shorebirds as indicators of environmental quality based on the fact that shorebird species differ in their habitat use strategies. Each is finely tuned to a distinct pattern of resources, and each, therefore, is differently susceptible to a given perturbation.
APPROACH: Variability in the arctic ecosystem and energy activity dictates a comparative approach. Shorebird

communities will be examined at three locations on the Arctic coast: Barrow, Wainwright, and Prudhoe Bay to determine the abundances and habitat-use patterns of each species and the species-typical patterns of space utilization. Species will be studied along an array of kilometer-long transects and in large (17 to 25 ha) census plots.
RESULTS: Patterns in habitat use and fluctuations in density of a given species should reflect the conditions of their specific habitat. Thus, shorebird distribution and population fluctuations should serve as indicators of habitat disturbances and change resulting from energy extraction and transportation which otherwise might not be readily apparent.
PROJECT MILESTONES: Study areas and transects established, 1977; completion of collection of first year's data on species populations and behavior.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;COASTAL REGIONS;SHORES;BIRDS;POPULATION DYNAMICS;ARCTIC REGIONS;BIOLOGICAL VARIABILITY;NOISE;TUNDRA;OIL SPILLS;BIOLOGICAL EFFECTS;ENVIRONMENT

<090100>
TITLE: D and D of Snap Facilities
PROJECT NUMBER: 800030
PRINCIPAL INVESTIGATOR: Kittinger, W.D.
ADDRESS: Atomics International, Canoga Park, CA 91304
AFFILIATION: Atomics International Div., Canoga Park, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-0701;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The partially dismantled SNAP reactor facilities (Buildings 010, 024, 028, and 059), and the Radioactive Materials Disposal Facility (RMDF), all of which are located at the Santa Susana Nuclear Development Field Laboratory, contain extensive radioactive materials in the form of activated or contaminated structures and components. All of these facilities, with the exception of portions of the RMDF, are inactive and ''stored in plane.'' The RMDF is used in support of the surveillance and dismantling of the inactive SNAP reactor facilities and the SRE. The irradiated fuel from SRE Cores I and II is stored in a below-grade storage vault at the RMDF. The SNAP reactor facilities have been inactive and stored in place for varying periods of time ranging up to more than 10 years.
APPROACH: Priorities for the sequence of the dismantling of these facilities have been established on the basis of (1) degree of hazard potential, (2) program capabilities, (3) cost effectiveness, (4) funding limitations, and (5) special planning and tooling development requirements. The planning in all cases assumes the complete dismantling and burial of all activated structures or components, and the dismantling or decontamination of all contaminated structures or components.
RESULTS: Continue to complete planned dismantling of surplus SNAP facilities.
KEYWORDS: SNAP REACTORS;REACTOR DECOMMISSIONING;DECONTAMINATION;RADIOACTIVE WASTE DISPOSAL;RADIOISOTOPES

<090101>
TITLE: D and D of SRE Facilities
PROJECT NUMBER: 800031
PRINCIPAL INVESTIGATOR: Kittinger, W.D.
ADDRESS: Canoga Park, Atomics International, Canoga Park, CA 91304
AFFILIATION: Atomics International Div., Canoga Park, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
TYPE OF FUNDING: Contract No.-0701
77 FUNDING: Energy Research and Development Administration FY77:$2,682,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
RESULTS: The SRE Core II declad operations will be completed, as will the cell cleanup, waste disposal, and preparations for shipping of the declad and repackaged fuel from Core I to Savannah River.
PROJECT MILESTONES: During FY 1977 (1) Dismantle Na service. (2) Remove support services. (3) Remove reactor components. (4) Clean and dispose sodium.
KEYWORDS: DEMONSTRATION;SRE REACTOR;REACTOR DECOMMISSIONING;DECLADDING;RADIOACTIVE WASTE DISPOSAL;DECONTAMINATION;SODIUM

<090103>
TITLE: Energy Facility Siting Studies
PROJECT NUMBER: 007565
PRINCIPAL INVESTIGATOR: Morell, D.
ADDRESS: Princeton University, School of Engineering/Applied Sciences, 0332 Engineering Quadrangle Center for Environmental Studies, Princeton, NJ 08540
AFFILIATION: Princeton Univ., N.J. (USA). School of Engineering and Applied Science
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Wellborn, Suzanne M.
TELEPHONE: F233-3030
TYPE OF FUNDING: Contract No.-E-03-77-0444
77 FUNDING: Energy Research and Development Administration FY77:$92,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: STORAGE (75%);PROCESSING, CONVERSION (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (20%);ANALYTICAL (80%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far

West;COASTS/Northeast;COASTS/Gulf;COASTS/Par West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Energy facility siting: development of alternative energy facility siting strategies in urban coastal areas.
APPROACH: Prepare a conceptual framework to assist in identification of suitable approaches to energy facility siting decisions. Conduct a case study analysis of a northern New Jersey urban coastal area. Identify a clear set of possible energy facility siting approaches based on the conceptual framework and case study. Conduct a conference to review and critique the derived siting strategies.
RESULTS: Final report Fall, 1978.
KEYWORDS: ENERGY FACILITIES;SITE SELECTION;LAND USE;COASTAL REGIONS;URBAN AREAS;COST BENEFIT ANALYSIS;SOCIO-ECONOMIC FACTORS;ENVIRONMENT

<090104>
TITLE: Solving Social and Economic Problems Related to Energy Development
PROJECT NUMBER: 7471
PRINCIPAL INVESTIGATOR: Jensen, B.
ADDRESS: Dept. of Economics, Utah State University, Logan, UT 84332
AFFILIATION: Utah State Univ., Logan (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-EE-77-S-03-1484
77 FUNDING: Energy Research and Development Administration FY77:$225,000
TECHNOLOGY: FOSSIL FUEL/General (75%);GEOTHERMAL/General (10%);SOLAR/General (15%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Utah
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To provide social science-based research inputs to Utah energy and environmental planning and policy-making processes by improving the quality of relevant information on social, environmental, and economic consequences of energy development options open to Utah. These options include several coal alternatives as well as geothermal, solar and oil shale.
APPROACH: Develop a State energy/environmental decision model which would consider social, economic, and environmental factors.
RESULTS: Identification of options and their related costs, risks, and benefits.
PROJECT MILESTONES: Final report September 1978.
KEYWORDS: UTAH;ENERGY SOURCES;SOCIO-ECONOMIC FACTORS;DECISION MAKING;COST BENEFIT ANALYSIS;ENVIRONMENTAL EFFECTS

<090105>
TITLE: Studies of Biomedically Relevant Properties of Particulate and Gaseous Products of Energy Technologies
PROJECT NUMBER: 002410
PRINCIPAL INVESTIGATOR: Raabe, O.G.;Fisher, G.L.
ADDRESS: Radiobiology Lab., University of California, Davis, CA
AFFILIATION: California Univ., Davis (USA). Radiobiology Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: NOXIOUS GAS/SOx;NOXIOUS GAS/NOx;NOXIOUS GAS/O3 (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: These investigations are aimed at providing pertinent and useful information concerning aerosol and gas characteristics that will contribute to understanding the potential biological effects of particulate and gaseous products of energy technologies. This research also provides essential supporting information for current and planned inhalation studies with respect to choice and generation of suitable exposure atmospheres. In addition, these studies may provide suggestions for technology development for effluent abatement and point to new areas for prevention and therapy research.
APPROACH: These studies encompass six different areas of scientific research, although not necessarily simultaneously. (1) Field studies to evaluate specific characteristics of particulate and gaseous products of energy technologies. (2) Generation of aerosols and gases as required for biological studies. (3) Delivery and exposure systems for inhalation studies. (4) Characterization of atmospheres containing aerosols and gases. (5) Behavior of aerosols and aerosol-gas mixtures. (6) Fundamental studies directed to providing needed physical-chemical information related to the deposition and clearance of inhaled aerosols and/or potentially toxic gases.
RESULTS: Important information will be developed concerning the physical-chemical character and behavior of aerosols and gaseous products of energy technologies. Needed physics-chemical information will also be provided related to the deposition and clearance of inhaled aerosols and potentially toxic gases. New methods will be developed for the generation and delivery to experimental animals of aerosols and gases and for the characterization of atmospheres containing aerosols and gases.
PROJECT MILESTONES: (1) 11/15/76 Operational system for acute exposure of individual nonhuman primates to test aerosols with respiratory measurements. (2) 12/15/76 Installation and calibration of spiral-duct aerosol centrifuges. (3) 1/1/77 Fly ash aerodynamic characterization and submicrometer fractionation begun. (4) 4/15/77 Initial aerodynamic characterization and behavior measurements of fly ash completed. (5) 10/15/77 Completion of analysis of aerodynamic shape-factors for fly ash aerosol particles. (6) 12/1/77 Completion of initial phase of in vitro dissolution studies of chemical components. (7) 1/1/78 Initiation of fly ash surface interaction studies.
KEYWORDS: ENERGY FACILITIES;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;BIOLOGICAL EFFECTS;AEROSOLS;GASEOUS WASTES;PARTICLE SIZE;SULFUR COMPOUNDS;NITROGEN COMPOUNDS

<090106>
TITLE: The Influence of Late Radiation Effects on the Immunologic Parameters of Aging
OJECT NUMBER: 7591
INCIPAI INVESTIGATOR: Makinodan, T.
ADDRESS: 405 Hilgard Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). School of Medicine
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
DIVISION: San Francisco Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$174,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this research project are: (1) to develop the methodology for the longitudinal assessment of immunologic competence at the cellular level in relationship to radiation and aging; and (2) to ultimately apply the methods and to collaborate in a study of the influence of late radiation effects in the A-bomb survivors of Hiroshima and Nagasaki.
APPROACH: Special emphasis will be placed on the development of methods which can be applied to the study of monozygotic and dizygotic twins where both were exposed, where neither were exposed, and where only one was exposed to radiation. Preliminary studies will be carried out with Hiroshima immigrants who immigrated to the U.S. before 1940 and their Japanese-American descendants in the Los Angeles area. This proposal includes provisions for assisting in the development of competent investigators and laboratory facilities at the Radiation Effects Research Foundation (RERF) in Hiroshima and Nagasaki.
KEYWORDS: ANIMAL CELLS;BIOLOGICAL RADIATION EFFECTS;IMMUNE REACTIONS;MUTATIONS;A-BOMB SURVIVORS;DELAYED RADIATION EFFECTS;AGE DEPENDENCE;HIROSHIMA;NAGASAKI;HUMAN POPULATIONS;GENETIC RADIATION EFFECTS;TESTING

<090107>
TITLE: Bio/toxicological Consequences of Utilizing Exhaustible and Inexhaustible Reserves
PROJECT NUMBER: 7592
ADDRESS: Menlo Park, CA
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
DIVISION: San Francisco Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GEOTHERMAL/General (10%);SOLAR/General (10%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: RADIATION (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of this task is to identify and evaluate the health hazard potential of toxic agents released into the general environment and the work environment during energy-producing processes. The societal consequences must be evaluated in terms of potential chemical and radiation hazards to the industrial worker and to the general population at risk to low-level chronic exposure. When dealing with the complex substances produced by utilization of fossil fuel, nuclear, or other energy technologies, synergism among different chemical substances and the relationship to the production of tumors cannot be ignored.
APPROACH: This task will be accomplished through a comprehensive scientific literature survey. If sufficient biologic/toxicologic information is not available in the immediately accessible literature, then appropriate research needs will be recommended to ERDA.
RESULTS: A final summary report will be prepared covering all work under this task. The expected products of this task will include working papers, briefing materials, visual aids, and supporting data that can be integrated by ERDA with the outputs of other tasks into a report on energy futures.
PROJECT MILESTONES: (1) Start work 12 May 1977. (2) Complete on 2 June 1977. (3) Summary report required no later than June 15.
KEYWORDS: ENERGY SOURCES;CHEMICAL EFFLUENTS;RADIOACTIVE EFFLUENTS;ENVIRONMENT;PERSONNEL;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL EFFECTS;HEALTH HAZARDS;COMPARATIVE EVALUATIONS;CHRONIC IRRADIATION;TOXICITY;CARCINOGENESIS;REVIEWS

<090108>
TITLE: Organizational Relationships Between Coastal Energy Facility Siting (EFS) and CZM Programs
PROJECT NUMBER: 7597
PRINCIPAL INVESTIGATOR: Sorenson, J.
ADDRESS: Institute of Urban and Regional Development, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA)
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
DIVISION: San Francisco Operations Office
MONITOR: Reardon, E.
TYPE OF FUNDING: Grant No.-E-03-77-0480
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: PARTICULATES (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Site specific off-shore;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
SEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
OJECT DESCRIPTION: (1) To analyze the types of organizational relationships that may occur in the development of a coastal energy facility siting plan. (2) To identify a number of the major institutional, legal, and political problems that may occur among state agencies and between state agencies and local units of government in the development and implementation of an energy facilities siting plan. (3) To recommend various procedures, policies, and institutional arrangements to resolve or minimize the problems identified in Objective Two.

APPROACH: A telephone survey would be first conducted among the 30 coastal states to determine, if in fact, there are four basic arrangements for siting and planning energy facilities. The telephone survey could also seek to obtain copies of laws, regulations, and documents that relate coastal zone management to energy facility siting, as well as to establish a list of key contacts in each of the coastal states. The telephone survey should also serve to focus and refine the analytic approach to be used in the four states.
RESULTS: The final product will be a report that ERDA could distribute to coastal states in order to provide them with guidance on developing and implementing coastal energy facility plans. The report would also be expected to identify areas of requiring further research work and therefore assist ERDA in citing research priorities.
PROJECT MILESTONES: It is anticipated that work would commence July 1, 1977 and terminate on or before October 1, 1977.
KEYWORDS: COASTAL REGIONS;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL EFFECTS;POLLUTION LAWS;POLLUTION REGULATIONS;DATA COMPILATION;ENERGY SOURCES;SITE SELECTION;PLANNING;OFFSHORE SITES

<090113>
TITLE: Environmental Control Technology Aspects of Coal Slurry Transportation
PROJECT NUMBER: 800241
PRINCIPAL INVESTIGATOR: Anderson, O.L.
ADDRESS: University of California (UCLA), Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environment Division of Environmental Control Technology
MONITOR: Grua, Charles
TELEPHONE: F233-5516;C(301)353-5516
TYPE OF FUNDING: Contract No.-EY-76-5-03-0034
77 FUNDING: Energy Research and Development Administration FY77:$67,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Identify pollutants (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: (1) Identify and determine the significance of all potential interactions between coal slurry and/or recovered slurry water and the environment; (2) Assess water pollution control and water treatment strategies used for existing and proposed coal slurry pipeline systems; (3) Assess current and developing technologies for control of suspended particles, trace elements and trace organics in waste waters; and (4) Determine the feasibility of using saline water or partially treated sewage effluent as the carrier medium, and the resulting interactions between the liquid and solid phases. (5) Analyses of actual or laboratory-prepared coal slurries for: transfer of inorganic species (including trace metals) from solid to liquid phase; leaching of organic species; analysis will be by gas chromatography/mass spectrometry; effects of slurry exposure upon wastewater characteristics; analysis will include determination of biochemical oxygen demand and coliform bacteria.
PROJECT MILESTONES: Final report draft 15 March 1978.
KEYWORDS: COAL;SLURRIES;SLURRY PIPELINES;ENVIRONMENTAL IMPACTS;WATER POLLUTION CONTROL;WATER TREATMENT

<090114>
TITLE: Planning for D/D of Facilities
PROJECT NUMBER: 800269
PRINCIPAL INVESTIGATOR: Kittinger, W.D.
ADDRESS: 8900 DeSoto Avenue, Canoga Park, CA 91304
AFFILIATION: Atomics International Div., Canoga Park, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-EY-76-C-03-0701;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$26,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To identify, categorize and develop a disposition plan for surplus radioactively contaminated facilities.
APPROACH: Establish a working group to compile a computerized data base and apply a methodology for prioritizing projects and developing cost estimates, manpower requirements, waste volumes and time schedules.
RESULTS: (1) Computerized data base. (2) Plan for D/D of surplus nuclear facilities.
PROJECT MILESTONES: (1) Computerized data base Aug. 1978. (2) D/D plan Aug. 1979.
KEYWORDS: NUCLEAR FACILITIES;DECONTAMINATION;DECOMMISSIONING;REACTOR DECOMMISSIONING;DATA COMPILATION;PLANNING;RADIOACTIVE WASTE DISPOSAL;RADIOACTIVE WASTE MANAGEMENT

<090115>
TITLE: Environmental Control Technology Requirements for Future AC, HV Overhead Transmission Facilities
PROJECT NUMBER: 800189
PRINCIPAL INVESTIGATOR: Walton, B.L.
ADDRESS: SRI International, 333 Ravenswood, Menlo Park, CA 94025
AFFILIATION: SRI International, Menlo Park, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas
TELEPHONE: F233-5511
TYPE OF FUNDING: Contract No.-EY-76-C-03-0115, PA No. 120
77 FUNDING: Energy Research and Development Administration FY77:$33,000
TECHNOLOGY: GENERAL SCIENCE (100%)

ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: NOXIOUS GAS/Ozone (20%);RADIATION/ELF electromagnetic (45%);NOISE, VIBRATION/Audible noise (30%);VISUAL AESTHETICS (5%)
RACTER OF STUDY: ANALYTICAL (100%)
...IONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This project will provide the Energy Research and Development Administration (ERDA) an overview of the current status of the understanding of the environmental impacts of high-voltage transmission. Also, the study will aid ERDA in defining needed environmental control technologies to mitigate any significant effects of high-voltage transmission.
APPROACH: This project will use a multidisciplinary team to review recent literature.
RESULTS: A final report will summarize the current understanding of the environmental effects of overhead transmission using alternating current. Recommendations on needed environmental control technology will also be made.
PROJECT MILESTONES: Monthly reports, mid-project report, final report.
KEYWORDS: ENVIRONMENT;CONTROL;OVERHEAD POWER TRANSMISSION;ENVIRONMENTAL EFFECTS;RECOMMENDATIONS;HVAC SYSTEMS;ENVIRONMENTAL IMPACTS;US ERDA;ELECTROMAGNETIC FIELDS;NOISE POLLUTION

<090116>
TITLE: LNG Wind Tunnel and Instrumentation Assessments
PROJECT NUMBER: 800154
PRINCIPAL INVESTIGATOR: Carpenter, H.J.
ADDRESS: P.O. Box 9695, Marina del Rey, CA 90291
AFFILIATION: R and D Associates, Marina del Rey, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Mott, William E.
TELEPHONE: F233-5225
TYPE OF FUNDING: Contract No.-EE-77-C-03-1364
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);STORAGE (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (20%);ANALYTICAL (80%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To compile and assess pertinent existing data about LNG fires; to review thoroughly the capabilities, deficiencies, characteristics, and costs of various devices used to measure pertinent parameters of LNG tests (e.g., liquid depth, gas concentration, temperature, radiation); to prepare a list of criteria for use in selecting sites of future LNG experiments; to assess the usefulness of wind tunnel modeling studies in evaluating the effects on vapor dispersion of facility-control measures and terrain.
APPROACH: To survey available records and current research to obtain data, then to draw on expertise within RDA for analysis and assessment.
RESULTS: A significant data base exists only for pool fires on confined land areas; some data is becoming available on pool fires on water. Radiosity is dependent upon vertical position within the flame. Desirable properties of a test site, in addition to nearness of LNG supply, are a relatively level area where both land and water spills can be studied and a range of wind speeds, temperatures, and humidity. Wind tunnel modeling of gravitational effects of LNG clouds is well established as an economical and convenient technique. A major limitation to existing meteorological wind tunnels is the smallness of the working areas. Wind tunnels can be useful in planning instrumentation layouts. Flow visualization tests show that simulated LNG vapor can flow significant distances upwind down a 2% slope; in the presence of a slope the vapor cloud structure shows large variability. No available methane concentration sensors have the required time resolution and insensitivity to atmospheric water vapor, water droplets, and dust needed for field tests. A dual-film aspirated probe appears likely to satisfy technical test requirements. infrared analyzers, Raman scattering devices, and thermocouples all show promise as concentration sensors, but require further investigation to define their capabilities and costs. No adequate testing apparatus suitable for establishing the dynamic response of sensors in an LNG vapor environment are known to exist.
PROJECT MILESTONES: (1) Begun 1 Jan 1977. (2) Draft report 15 April 1977. (3) Final report 31 Aug 1977.
KEYWORDS: LIQUEFIED NATURAL GAS;FIRES;MEASURING INSTRUMENTS;COST;DATA ANALYSIS;WATER;TESTING;WIND TUNNELS;METHANE;WATER VAPOR;DUSTS;SPECIFICATIONS;HAZARDS

Energy Research and Development Administration/Savannah River Operations Office

<090502>
TITLE: Thermal Effects Program
PROJECT NUMBER: 669
PRINCIPAL INVESTIGATOR: Tilly, L.J.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-AT(07-2)-1
77 FUNDING: Energy Research and Development Administration FY77:$185,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
LUTANTS: HEAT, THERMAL (100%)
RACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
...IONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;COASTS/Other coasts Unspecified;HYDROGRAPHIC AREAS/Other hydrographic areas Lakes and streams coastal plain
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Measure the effects of power plant type thermal discharges on dominant food-chain components of representative aquatic systems.

APPROACH: Utilize existing thermal effluents in streams and a cooling lake to quantify correlative observations about relationships between thermal effluents and crop, survivorship and metabolism of dominant aquatic organisms. Use these same streams experimentally to separate site-specific from general effects. Utilize experimental stream system to examine component response to once-through cooling treatment covering temperatures from ambient to + 12.5C.
RESULTS: Predictive statements about species and community response to temperature elevation and other aspects of reactor operations including crop, species composition, metabolic rate and ecological processes such as predation, grazing primary production, and substrate utilization.
PROJECT MILESTONES: (1) Quantification of alterations in producer, bacteria and primary consumer crops as a function of temperature. (2) Quantification of the effect of temperature elevation upon metabolic processes: respiration, heterotrophic utilization of substrates and primary productivity. (3) Comparison of the effects of comparable effluent temperature upon ecologically equivalent components of once through vs recirculatory effluent systems. (4) Preparation of a review document summarizing the ecological effects of 20 years of cooling pond operation.
KEYWORDS: THERMAL POWER PLANTS;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;FOOD CHAINS;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;PRODUCTIVITY;TEMPERATURE DEPENDENCE;METABOLISM;PHOTOSYNTHESIS;RESPIRATION

<090503>
TITLE: Dose-To-Man
PROJECT NUMBER: 672
PRINCIPAL INVESTIGATOR: Crawford, T.V.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3763
TYPE OF FUNDING: Contract No.-AT(07-2)-1
77 FUNDING: Energy Research and Development Administration FY77:$280,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: NOXIOUS GAS (20%);PARTICULATES (10%);RADIATION (70%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (90%);ANALYTICAL (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The major objective of this program is to develop (or adapt), test, and apply comprehensive mathematical models to calculate the dose-to-man from the release of radionuclides from one or more sources via atmospheric and aqueous vectors.
APPROACH: Preliminary work indicates that atmospheric transport processes are the primary means by which radionuclides are transported beyond the SRP site boundary, so initial efforts are focused in the atmospheric sciences. Because of the distribution of population that is affected by SRP and commercial facilities being built in the area the scale of primary interest will be from one to hundreds of kilometers. The meteorological aspects of the study take advantage of the unique opportunity which exists at the SRP site for atmospheric related research because of the existing instrumented 1200 ft TV tower, a mesoscale wind measurement network, and a network of Kr-85 samples which can provide a data base for applying atmospheric transport, diffusion, and deposition models in a geographical area containing a large nuclear complex.
RESULTS: (1) Develop (or adapt) models of transport, dispersion, and depletion phenomena out to distances of 1000 km. (2) Develop a data base for TV tower, seven tower system, routine monitoring and planned experiments which can be used to test atmospheric and other transport models. (3) Develop methodology for air quality assessment for the Southeastern United States. (4) Develop and apply competance in aqueous and terrestrial transport mechanisms and integrate models in these areas to atmospheric transport models. (5) Develop and apply competence in environmental effects of releases, incorporating in the models work on pathways and biological effects (using dosimetry values developed by others) of radioactive and non-radioactive materials released.
PROJECT MILESTONES: FY 76: (1) An extensive climatology of the top of the mixed layer has been prepared using an acoustical sounder; this work revealed a ''momentum burst'' phenomenon in the boundary layer. (2) Atmospheric diffusion estimates were improved by publication of a comparison of differing methods for categorizing diffusion, improving numerical solution of the advection-diffusion equation, improving methods for calculating atmospheric diffusivities and improving methods of calculating fluxes of pollutants to the surface. (3) Energy and water balance experiments were begun with the installation of soil-water instrumentation and implementation of data acquisition system. (4) Comparisons of calculated dose from drinking water and fish down stream from SRP and monitoring data indicate models are adequate for chronic release condition. Linkage of this model with stream transport code for estimates of accidental releases also accomplished. FY 77: (1) Incorporate acoustic sounder into WIND minicomputer system. (2) Make extensive comparison of diffusion calculations from models using tower data as inputs and Kr-85 concentatons from the sampling network. (3) Incorporate improved estimates of eddy diffusivity from TV and 7-tower system, and surface heat flux and sink source terms from energy balance work into diffusion models. (4) Begin acquisition and use of regional balloon trajectory experimental
KEYWORDS: MAN;RADIATION DOSES;RADIOISOTOPES;MATHEMATICAL MODELS;EARTH ATMOSPHERE;DIFFUSION;AQUATIC ECOSYSTEMS;RADIONUCLIDE MIGRATION;COMPUTER CODES;METEOROLOGY;PLANTS;SOILS;WATER

<090505>
TITLE: Forest Management
PROJECT NUMBER: 000979
PRINCIPAL INVESTIGATOR: Irwin, J.
ADDRESS: U.S. Forest Service, P.O. Box A, Aiken, SC 29801
AFFILIATION: Forest Service, Aiken, S.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: F233-4155;C(301)353-4155
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$489,000
TECHNOLOGY: SOLAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Timber management. Since 1952, over 100 million pine trees have been planted on the SRP site, and there are now approximately 118,000 acres of pine and 48,000 acres of hardwood under Forest Service management. Reforestation, timber stand improvement, preparation and supervision of timber sales, maintenance of woods, roads, and prescribed burning are carried out on the SRP site. Wildlife management and research. Key wildlife habitats are maintained, primarily for birds. The endangered red-cockaded woodpecker colonies have been censused and are under study. The deer herd on the SRP is managed, and a public hunt is administered each year.
KEYWORDS: FORESTS;MANAGEMENT;SAVANNAH RIVER PLANT;ECOLOGY;TERRESTRIAL ECOSYSTEMS;WILD ANIMALS;BIRDS;ENDANGERED SPECIES

<090506>
TITLE: Forest Management (979)
PROJECT NUMBER: 989
PRINCIPAL INVESTIGATOR: Irwin, J.
ADDRESS: U.S. Forest Service, P.O. Box A, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$127,000
TECHNOLOGY: SOLAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Logistics support is provided for the U.S. Forest Service management program, particularly fire suppression, road construction and road maintenance.
KEYWORDS: FORESTS;MANAGEMENT;SOLAR FLUX;FIRE PREVENTION;TERRESTRIAL ECOSYSTEMS;FIRES;ROADS;CONSTRUCTION;MAINTENANCE

<090508>
TITLE: Pu and H-3 Cycling in Coastal Waters
PROJECT NUMBER: 001301
PRINCIPAL INVESTIGATOR: Hayes, D.W.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Contract No.-AT(07-2)-1
77 FUNDING: Energy Research and Development Administration FY77:$139,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION/Tritium and plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To improve our understanding of how tritium and transuranics are transported and cycled into and through the estuary regions and to estimate their ultimate dose to man.
APPROACH: To employ a multidiscipline-cooperative approach to measure the concentrations of these radionuclides present in the biota, sediment and water, to quantify these results with coefficients for models, and to measure the environmental variables responsible for transport.
RESULTS: (1) Determine tritium and plutonium concentrations in fresh water and marine organisms. (2) Evaluate the important cycling-transport mechanisms for tritium and plutonium in estuary systems. (3) Evaluate dose-to-man models to estimate the impacts of these radionuclides.
PROJECT MILESTONES: 1976: (1) Developed field and laboratory procedures for plutonium analysis and employed these procedures to determine plutonium levels in 3 estuaries of the southeastern U.S. and in seafood. (2) Designed a station capable of measuring and recording ocean and meteorological conditions near the mouth of the Savannah River estuary. 1977: (1) Determine the cycling and transport modes for transuranics and tritium in estuarine and salt marsh systems in the southeast. (2) Install a mass spectrometer (cooperatively with other program) to identify plutonium isotopic source terms for aquatic systems. (3) Develop a code to calculate dose commitment from seafood. (4) Collect environmental data necessary to support above. 1978: (1) Initiate studies on food chain relationships for plutonium and tritium. (2) Based on data, construct models to describe transport of radionuclides in the coastal area.
KEYWORDS: FATE;PLUTONIUM;TRITIUM;RADIONUCLIDE MIGRATION;ESTUARIES;MAN;RADIATION DOSES;COASTAL WATERS;SEDIMENTS;BIOMASS;RADIOECOLOGICAL CONCENTRATION;MATHEMATICAL MODELS;AQUATIC ECOSYSTEMS

<090509>
TITLE: Atmospheric Release Advisory Capabilities - S.E.U.S.
PROJECT NUMBER: 001337 5T
PRINCIPAL INVESTIGATOR: Kern, C.D.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3763
TYPE OF FUNDING: Contract No.-AT(07-2)-1
77 FUNDING: Energy Research and Development Administration FY77:$225,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: NOXIOUS GAS (15%);PARTICULATES (5%);RADIATION (80%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);DEVELOPMENT/Pilot plant (60%);FULL SCALE DEMONSTRATION (20%)

REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this program is to develop and evaluate methodology of predicting the consequences of accidental releases to the atmosphere of the Southeastern United States. This information will be of major input to decision makers who must take consequence limiting actions in case of accidental atmospheric releases. Associated with this objective is the development of tools and communications in order to permit the information to be developed and presented in a timely fashion.
APPROACH: Develop or adapt computer models to predict the path and concentrations from accidental releases of materials to the atmosphere. Develop simple displays for immediate use by operating personnel. Conduct field tests of the ability to calculate paths and concentrations in real time. Conduct these tests in conjunction with the Lawrence Livermore Laboratory's (LLL) evaluation of their Atmospheric Release Advisory Capability (ARAC) concept. Incorporate dose calculations into predictive models.
RESULTS: Install a minicomputer system to acquire meteorological data in and around the Savannah River Plant (SRP) and use this as input into predictive models which will display the path and concentrations from postulated or accidental atmospheric releases. These displays will be available within the Emergency Operating Center (EOC) of the SRP. Validate the computer models used at the Savannah River Plant and those developed by the Lawrence Livermore Laboratory in their ARAC concept using routine releases of radioactive nuclides from production activity at the SRP. Demonstrate both the feasibility and the validity of the LLL ARAC concept and establish a realtime support to the decision makers at the SRP.
PROJECT MILESTONES: Complete installation of the minicomputer system with real time displays in the SRP Emergency Operating Center- July 1976. Complete report of joint Savannah River Laboratory (SRL)/LLL aircraft tests performed December 1975 which demonstrates the feasibility and the validity of the ARAC concept - 4Q FY 77. Conduct additional aircraft tests in FY 78. Develop, adapt, verify and evaluate very fine mesh prediction mesoscale and regional scale models for support to ARAC - FY 77. Connect minicomputer system to SRL's IBM-360/195 in order to run more advanced computational models - FY 77. Continue cooperative efforts with LLL in development of real time atmospheric release prediction capability as an aid to the SRP EOC - through FY 78. Take steps such that SRL can serve as an alternative center to LLL for ARAC capability for the entire United States - beyond FY 78.
KEYWORDS: GASEOUS WASTES;FORECASTING;EARTH ATMOSPHERE;DIFFUSION;MATHEMATICAL MODELS;SAVANNAH RIVER PLANT;METEOROLOGY;COMPUTER CODES;PLUMES;SAFETY

<090510>
TITLE: Radioecology of Transuranic Elements
PROJECT NUMBER: 001338
PRINCIPAL INVESTIGATOR: Smith, M.H.
ADDRESS: Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29801
AFFILIATION: Georgia Univ., Athens (USA). Inst. of Ecology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-AT(38-1)-819
77 FUNDING: Energy Research and Development Administration FY77:$363,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the level of plutonium contamination of various ecosystems which are in close proximity to a nuclear fuel-reprocessing plant and to evaluate the importance of the various modes of contamination (i.e., foliar deposition, root uptake). The systems include agricultural (wheat and soybean), old-field, and fresh water aquatic ecosystems.
APPROACH: To sample the various ecosystems with respect to time of exposure to transuranic input and distance relative to the source of the transuranic input. For example, the agricultural crops are sampled periodically over the growing season to evaluate the concentration level with respect to maturity of the plant and time of exposure of the plant organ. The spatial sampling evaluates the effect of a gradient in atmospheric and soil transuranic concentration which decreases with distance from the source.
RESULTS: The old-field, wheat and soybean ecosystem sampling has been completed. Analysis of the Pu concentration of the old-field and wheat samples are very near completion, manucript are in preparation reporting this data. Research is continuing in the fresh water aquatic ecosystem as well as several other systems.
PROJECT MILESTONES: (1) Fall 1974 Oil-field sampling complete, agricultural fields prepared and planted with wheat. (2) Spring 1975 Wheat harvest, soybean crop planted. (3) Fall 1975 Soybean crop harvested. (4) Winter 1975 Pu analysis of old-field samples complete. (5) Spring 1976 Corn crop planted, Pu analysis of wheat samples complete.
KEYWORDS: FATE;FUEL REPROCESSING PLANTS;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;PLUTONIUM;RADIOECOLOGICAL CONCENTRATION;RADIONUCLIDE MIGRATION;ANIMALS;PLANTS;SOILS

<090511>
TITLE: Transuranics in Environment Systems
PROJECT NUMBER: 001339
PRINCIPAL INVESTIGATOR: Corey, J.C.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: A-AT(07-2)-1
77 FUNDING: Energy Research and Development Administration FY77:$270,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES/Plutonium (50%);RADIATION/Plutonium;RADIATION/Americium;RADIATION/Curium (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND

MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop new and improved data on plutonium transport through, and change within, the environmental systems of the southeastern United States.
APPROACH: Multidisciplined and cooperative research to evaluate the transport, cycling, distribution, redistribution and radiation dose of transuranics in the environment.
RESULTS: (1) Determine under field conditions adjacent to an operating fuel reprocessing plant the plutonium transport to man from eating wheat, soybeans, corn, leafy vegetables, and root crops. (2) Evaluate the influence of environmental releases of plutonium to dose-to-man through the drinking water pathway. (3) Evaluate the physical and chemical characteristics of the source term for a reprocessing plant. (4) Examine the contribution of the aquatic foodchain to the dose-to-man. (5) Evaluate the importance of resuspension of Pu particles in the dose-to-man.
PROJECT MILESTONES: (1) 1976 Effect of water treatment operations on the removal of plutonium from the water supply. (2) Determine plutonium content of soybeans and wheat grown on field that has received plutonium (3 mCi) from operating nuclear fuel reprocessing plant. (3) 1977 Evaluate importance of resuspension of plutonium-bearing soil under agricultural and non-agricultural conditions using field studies. (4) 1977 Evaluate aquatic transport of plutonium in streams under southeastern U.S. conditions. (5) Install and operate mass spectrometer for differentiating plutonium isotopes. (6) 1978 Determine transuranic source term particulate characteristics. (7) Refine modeling capabilities for transuranic transport to man through foodstuffs typical of the southeastern United States.
KEYWORDS: PLUTONIUM;AMERICIUM;CURIUM;RADIONUCLIDE MIGRATION;RADIOECOLOGICAL CONCENTRATION;FUEL REPROCESSING PLANTS;TERRESTRIAL ECOSYSTEMS;DRINKING WATER;MAN;RADIATION DOSES;FOOD;INHALATION;PLANTS;SOILS

<090512>
TITLE: Krypton-85 and Tritiated Methane Measurements
PROJECT NUMBER: 001059
PRINCIPAL INVESTIGATOR: Pendergast, M.M.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: P233-3600
TYPE OF FUNDING: Contract No.-AT(07-2)-1
77 FUNDING: Energy Research and Development Administration FY77:$136,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Obtain Kr-85 data and associated meteorological data with which to evaluate various methods of calculating transport and dispersion of gaseous effluents to distances of 25-150 km.
APPROACH: Collect air samples at 13 cryogenic samplers at varying distances encircling the SRP. Determine hourly emission data from SRP. Archive pertinent meteorological data. Use above to test various meteorological models.
RESULTS: Compile 2 years of weekly Kr-85 samples at 13 sites. Compile 2 months of daily Kr-85 samples at 13 sites. Compile hourly source rate for SRP's two fuel reprocessing plants. Compile meteorological data base consisting of wind, temperature and inversion height at SRP and surface and upper level weather data from the National Weather Service in the Southeastern U.S. Compile all of above on magnetic tape in computer compatible format. These tapes containing source, meteorology and observations will be a unique data set which will be extremely useful to the meteorological community in evaluating calculational techniques over distances of 25-150 km.
PROJECT MILESTONES: (1) Verify Kr-85 hourly release rate for SRP's two fuel processing plants with stack measurements FY 76. (2) Prepare computer compatible archives of meteorological measurements for the Southeastern U.S. for period of study FY 77. (3) Deactivate the Kr-85 samplers FY 77. (4) Utilize data base to test simple diffusion models for short and long sampling times FY 77.
KEYWORDS: SAVANNAH RIVER PLANT;RADIOACTIVE EFFLUENTS;KRYPTON 85;RADIATION MONITORING;METEOROLOGY;FUEL REPROCESSING PLANTS;GASEOUS WASTES;PLUMES

<090515>
TITLE: Management of Natural Resources
PROJECT NUMBER: 001905
PRINCIPAL INVESTIGATOR: Smith, M.H.
ADDRESS: Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29801
AFFILIATION: Georgia Univ., Athens (USA). Inst. of Ecology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-AT(38-1)-819
77 FUNDING: Energy Research and Development Administration FY77:$49,000
TECHNOLOGY: SOLAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To evaluate management techniques of forests, pine plantations, animals, and watersheds on the Savannah River Plant.
APPROACH: The effects of prescribed burning and litter removal on the cycling of nutrient element is being determined.
RESULTS: The results of this study will provide a basis for managing the Savannah River forest for optimum productivity of all resources with minimum alteration of wildlife habitats.
KEYWORDS: FORESTS;MANAGEMENT;NUTRIENTS;BIOLOGICAL ACCUMULATION;SAVANNAH RIVER PLANT;ANIMALS;BIOMASS;ECOSYSTEMS;PLANTS

<090516>
TITLE: Cycling of Heavy Metals and Other Stable Elements
PROJECT NUMBER: 001906
PRINCIPAL INVESTIGATOR: Smith, M.H.
ADDRESS: Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29801
AFFILIATION: Georgia Univ., Athens (USA). Inst. of Ecology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Haugh, John R.
TELEPHONE: C(301)353-4905
TYPE OF FUNDING: Contract No.-AT(38-1)-819;Grant No.-R 800510-02-5;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$210,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS:
METALS/Lead;METALS/Cadmium;METALS/Arsenic;METALS/Selenium;METALS/Cobalt;METALS/Zinc;METALS/Nickel;METALS/Molybdenum;METALS/Chromium (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Our research program to investigate the cycling processes of the southeastern coastal plain is designed to determine: (1) the availability of stable elements to the biota; (2) the role of primary producers, consumers and detritivores in cycling processes; (3) which factors are limiting to rate processes; (4) the importance of interactions among energy flow, thermal environments and cycling processes upon the rate of biomass accumulation and transfer; (5) the extent to which transfer coefficients are modified by population processes that influence the temporal or spatial turnover to compartmental standing crops; and (6) validate models of these cycling processes at various sites on the southeastern coastal plain. Emphasis in our program is directed toward the derivation of predictive relationships that can be used in the solution of local and regional problems and in land use planning on a regional scale.
APPROACH: The SRP provides numerous opportunities to study the interaction of heavy metal and other stable element cycling between the biotic and abiotic components of the environment. The broad variety of available habits includes reservoirs, ponds, streams, abandoned agricultural land, forest plantations and several forest types. Some of these have received various production reactor and industrial pollutants from plant operations for many years. This region receives high rainfall but possesses little organically-enriched soil. The rapid leaching rates from the porous sandy soil have resulted in relatively tightly closed mineral loops in the biota which reduce nutrient loss. Many minerals which are normally held in the organic or clay fraction of the soil are concentrated in the biota, establishing a unique aspect of minearl cycling which cannot be investigated in other geographica regions.
PROJECT MILESTONES: Studies will continue in the following areas of research: (1) Transport and mobilization of stable and radioactive metals in SRP streams and swamps. (2) Fate of cadmium in stream microcosms. (3) Availability of heavy metal associated with humic acids to algae and higher plants. (4) Uptake of heavy metals and trace contaminants by fish. (5) Frequency distributions of minerals in ecosystem components. (6) Elemental concentrations in southeastern coastal plain vegetation; investigations into seasonal and microgeographic variation. (7) Mineral cycling in social insects.
KEYWORDS: FATE;METALS;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;TERRESTRIAL ECOSYSTEMS;NUTRIENTS;BIOLOGICAL MODELS;LAND USE;PLANNING;REGIONAL ANALYSIS;ENVIRONMENTAL EXPOSURE PATHWAY;CADMIUM;RADIOISOTOPES;FISHES;LAND POLLUTION;RADIOECOLOGICAL CONCENTRATION;CHEMICAL EFFLUENTS;NITROGEN COMPOUNDS;SOILS;WATER

<090517>
TITLE: Cycling of Radioisotopes
PROJECT NUMBER: 001907
PRINCIPAL INVESTIGATOR: Smith, M.H.
ADDRESS: Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29801
AFFILIATION: Georgia Univ., Athens (USA). Inst. of Ecology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-AT(38-1)-819
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To study the movement of radionuclides, primarily radiocesium, in aquatic and adjacent terrestrial ecosystems. To study the dispersal and transport of radionuclides from the contaminated areas.
APPROACH: The emphasis of this laboratory has been placed on three basic types of radionuclide movement: (1) the distribution and cycling within the aquatic ecosystem into which the radionuclides were released; (2) the uptake and lateral movement from the aquatic to the adjacent terrestrial ecosystem; and (3) the transport and dispersal of the radionuclides away from the contaminated areas. These studies are of basic importance to the understanding of transport of radionuclides in the southeastern United States.
RESULTS: Recent studies have investigated the distributional patterns of radiocesium in stream channel sediments and its incorporation into plant and arthropod communities of the stream. In the past year studies have been directed toward cycling mechanisms within aquatic food webs. Past research has investigated the movement of radiocesium into emergent aquatic and streamside terrestrial plants and thence to terrestrial insects. Studies document that plant uptake is not necessarily correlated to radionuclide concentration in the root area. Research also shows Ce movement into trees and its return to the streambed with leaf fall. Past studies have indicated that overwintering migrant waterfowl export statistically significant amounts of radiocesium from SRP, potentially into the human food chain.
PROJECT MILESTONES: (1) Fall 1976 Data analysis of almost 1500 samples will be completed and correlations between cesium uptake and the trophic level, food habits, specific habitat, and the size and age of the fish will be determined. (2) Spring 1976 Evaluate factors affecting the soil-plant relationship in a

variety of aquatic habitats resulting in predictable models for plant uptake; and evaluate uptake, retention, and elimination of radiocesium by small mammals and aquatic waterfowl living under natural conditions. (3) Summer 1976 Investigate transport of radionuclides from contaminated seepage basins.
KEYWORDS: RADIONUCLIDE MIGRATION;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;FOOD CHAINS;RADIOECOLOGICAL CONCENTRATION;CESIUM 137;RADIOACTIVE EFFLUENTS;ANIMALS;PLANTS;SOILS;RADIOISOTOPES

<090518>
TITLE: Ecology of Moderate Thermal Regions
PROJECT NUMBER: 001908
PRINCIPAL INVESTIGATOR: Gibbons, J.W.
ADDRESS: Savannah River Ecology, Drawer E, Aiken, SC 29801
AFFILIATION: Georgia Univ., Athens (USA). Inst. of Ecology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-AT(38-1)-819
77 FUNDING: Energy Research and Development Administration FY77:$161,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Our fundamental objective has been to examine both thermal and natural temperature systems at all levels of biological organization from the individual to the community, with emphasis on those parameters which reflect thermal alteration of an environment. Studies in extreme temperature systems and many of those in thermally unaltered areas are considered separately but strongly complement the studies in areas of moderate thermal elevation.
APPROACH: In addition to monitoring the ecological effects of established thermal effluents under field conditions and conducting laboratory experiments on thermal stress, SREL will be utilizing field facilities to manipulate thermal regimes in natural aquatic ecosystems, both lotic and lentic. The effects of these controlled perturbations on trophic relationships, species diversity, genetic diversity, population dynamics, spacial organization and movements, biomass, productivity, and nutrient and energy flow will complement and broaden the interpretive base on more conventional studies. These studies will include investigations of chronic and other sub-lethal stressors in addition to conventional documentation of tolerance and lethality.
RESULTS: Studies conducted in the thermally influenced areas are coordinated when appropriate with studies in control habitats where temperatures have never been artificially altered. The availability of post-thermal environments allows us to examine ecosystem responses following removal of the heat input. We utilize the opportunity provided on the SRP to examine both short- and long-term thermal effects and recovery patterns. Field research at SREL will continue to be complemented with thermal experimentation in the laboratory. Information learned will allow us to understand ecological responses to anthropomorphic perturbations, and to make intelligent decisions in assessing the impact of thermal pollution.
PROJECT MILESTONES: (a) SREL, in conjunction with ERDA, has sponsored, organized, and published two symposia on thermal ecology. Future plans include additional symposia incorporating other environmental stresses in conjunction with thermal effects. (b) SREL has embarked upon a special study the Castor Creek Project, which will allow controlled perturbations of thermal regime in a natural stream ecosystem. (c) Future plans include additional facilities for manipulating a thermal environment in a series of small ponds. The Cassel's Pond project will complement the Castor Creek project and other field and laboratory studies. (1) Castor Creek-Experimental Stream Facility, January 1, 1977: Expected completion of pipeline construction by DuPont. (2) Cassels' Pond-Experimental Facility, September 1, 1977: Scheduled beginning of conceptual design study (by DuPont).
KEYWORDS: SAVANNAH RIVER PLANT;ENVIRONMENT;ECOLOGY;AQUATIC ECOSYSTEMS;AQUATIC ORGANISMS;PLANTS;ANIMALS;ECOSYSTEMS;PHYSIOLOGY;BEHAVIOR;TEMPERATURE EFFECTS;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;BIOLOGICAL RECOVERY;POPULATION DYNAMICS;BIOLOGICAL STRESS;ANIMALS;PLANTS;WATER

<090519>
TITLE: Ecology of Natural Thermal Regions
PROJECT NUMBER: 1909
PRINCIPAL INVESTIGATOR: Gibbons, J.W.
ADDRESS: Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29801
AFFILIATION: Georgia Univ., Athens (USA). Inst. of Ecology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-AT(38-1)-819
77 FUNDING: Energy Research and Development Administration FY77:$113,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Studies described within this project focus on temperature as one of several key environmental factors that influence biological phenomena. By establishing the relationships among major ecological parameters under natural conditions, we hope to identify and quantify responses created by thermal modification. Response of biological systems to ecological perturbations provide bases for determining which levels of pollution are ''acceptable''. In many instances, predictable relationships can be established between a factor that influences natural temperature and particular physiological, population, or community characteristics.
PPROACH: Studies proposed here seek to characterize the alterations in the physiology, behavior, life history phenomena and community structure among organisms and populations living in thermally affected habitats. Studies involving cattails, fish, alligators and turtles are designed to provide baseline data from natural areas with which to compare information from a variety of heated streams and reservoirs. A variety of individual, population, and community parameters will be measured to compare habitats ranging from ambient temperature to +20 C above ambient.

RESULTS: Natural temperature shifts occur as a result of seasonal, diel, meteorological, latitudinal and elevational factors. Results of these studies will compare artificial thermal alteration in terms of these interacting variables. The ultimate result will be to establish a predictive relationship between temperature regimes and a variety of other environmental variables. It is anticipated that specific thermal regimes will prove to enhance selected biological processes; doubtless some will be unaffected and others will be impaired. A determination of these key levels of thermal input will contribute to a functional interpretation of thermal ecology.
PROJECT MILESTONES: During FY 1977 this project will deal mainly with biological interactions and thermal stress. By September 1, 1977, however, we intend to deal with multiple environmental stresses (e.g., thermal and heavy metal pollution) acting in concert with biological interactions such as competition, predation, and parasitism.
KEYWORDS: AQUATIC ECOSYSTEMS;ENVIRONMENT;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;AQUATIC ORGANISMS;PLANTS;FISHES;TURTLES;REPTILES;ECOSYSTEMS;TEMPERATURE EFFECTS;PHYSIOLOGY;POPULATION DYNAMICS;TEMPERATURE MEASUREMENT;VARIATIONS;SEASONAL VARIATIONS

<090520>
TITLE: Ecology of High Thermal Regimes
PROJECT NUMBER: 1910
PRINCIPAL INVESTIGATOR: Gibbons, J.W.
ADDRESS: Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29801
AFFILIATION: Georgia Univ., Athens (USA). Inst. of Ecology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-AT(38-1)-819
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To examine the physiological, population and community strategies used by plants and animals to cope with an environmental stress; in this case, thermal effluent from nuclear reactors.
APPROACH: The studies are designed to take advantage of the thermal and post-thermal aquatic habitats of the area. Studies are designed to determine the effects of thermal effluent upon the life cycles, physiology, thermal tolerance, movements, growth and host-parasite relationships in plants and animals.
RESULTS: Data will have been collected and manuscripts prepared in (1) productivity of thermal areas, (2) physiological, behavioral and genetic responses in fish, (3) ecology of plant communities exposed to various effluents, (4) heated effluents and limiting nutrients, (5) germination success of plants in thermal and non-thermal reservoirs, and others.
PROJECT MILESTONES: (a) By FY-77 we hope to have in operation a full-scale experimental system which will involve the controlled addition of effluent from a thermal canal to a natural stream system. Such an in-the-field experimental situation will allow testing of hypotheses which have resulted from earlier studies. (b) Establishment of a series of experimental ponds receiving effluent from a thermal stream (FY 78).
KEYWORDS: NUCLEAR POWER PLANTS;THERMAL EFFLUENTS;ENVIRONMENTAL EFFECTS;ECOLOGY;PLANTS;ANIMALS;AQUATIC ECOSYSTEMS;WATER

<090521>
TITLE: National Environmental Research Park
PROJECT NUMBER: 002148
PRINCIPAL INVESTIGATOR: Cahoon, E.J.
ADDRESS: Savannah River Operations Office, P.O. Box A, Aiken, SC 29801
AFFILIATION: Energy Research and Development Administration, Aiken, S.C. (USA). Savannah River Operations Office
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, R.L.
TELEPHONE: F233-4155;C(301)353-4155
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Encourage coordinated environmental research at the Savannah River Plant site, principally to address these general objectives: (a) to develop methods to assess and monitor the environmental impact of man's activities; (b) to develop methods to estimate and predict the environmental response to proposed and ongoing activities; and (c) to demonstrate the impact of various activities and evaluate methods to minimize adverse impacts. (2) Provide administrative and facility support to offsite researchers engaging in environmental research on ERDA sites. (3) Thoroughly characterize the Savannah River Plant site, to provide basic information, to support environmental assessments, land use plans and environmental research programs.
APPROACH: The NERP program at Savannah River is administered primarily by the Operations Office, with some work performed by contractors: the U.S. Forest Service, the University of Georgia, and the duPont Savannah River Laboratory.
RESULTS: (1) Regional universities and the public will be informed of ongoing research and opportunities for research on the site. This may include preparing and disseminating a brochure, surveying universities for their interest in using the site, sponsoring a symposium, and setting up a speakers corps made up of site researchers. (2) Funds may be available for equipping field facilities, establishing public demonstration areas, and reimbursing some researchers for travel costs to the site.

PROJECT MILESTONES: The Savannah River Plant site was designated as a National Environmental Research Park in 1972.
KEYWORDS: ENVIRONMENT;SAVANNAH RIVER PLANT;BIOLOGICAL MODELS;ECOLOGY;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;MANAGEMENT;WATER POLLUTION ABATEMENT;AIR POLLUTION ABATEMENT;LAND POLLUTION ABATEMENT;TECHNOLOGY ASSESSMENT;PLANNING;MONITORING;MEASURING METHODS;FORESTS;WATER

<090522>
TITLE: Physical Oceanography Modeling
PROJECT NUMBER: 2154
PRINCIPAL INVESTIGATOR: Suich, J.E.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold
TELEPHONE: F233-4155
TYPE OF FUNDING: Contract No.-AT(07-2)-1
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: METALS (25%);ORGANICS (25%);RADIATION (25%);HEAT, THERMAL (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide a basic capability for numerical modeling of physical transport mechanisms on the continental shelf of the southeastern United States. Develop an integrative and evaluative framework for theoretical and experimental marine science efforts in the South Atlantic Bight.
APPROACH: (1) Obtain existing data for this oceanographic area and convert to usable form. (2) Develop computer system for the evaluation, summarization, and display of these data. (3) Adapt existing hydrodynamical numerical models to the geography and boundary conditions of the South Atlantic Bight. (4) Develop framework within which chemical and biological studies can be evaluated and converted to ecosystem models.
RESULTS: (1) State-of-the-art oceanographic and marine ecosystem data base. (2) Integrated system of physical transport, chemical and biological computer simulation models. (3) Capability for environmental impact assessment of energy related activities on the continental shelf of the southeastern United States.
PROJECT MILESTONES: Strongly dependent upon funding. At present level, only existing data collection and overall system planning will be completed in FY 1976. Given sufficient funding, data base and physical transport model will be applied to determine tidal and seasonal movement patterns of water column on the shelf. Models of nutrient and pollutant input, transport and consumption will be integrated into the system.
KEYWORDS: ATLANTIC OCEAN;CONTINENTAL SHELF;OCEANOGRAPHY;DATA ACQUISITION;MATHEMATICAL MODELS;AQUATIC ECOSYSTEMS;COMPUTER CODES;FISHES;OIL SPILLS;RADIOISOTOPES;WATER

<090523>
TITLE: Body Studies (NOAA)
PROJECT NUMBER: 002534
PRINCIPAL INVESTIGATOR: Crawford, M.
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Aiken, S.C. (USA). Savannah River Operations Office
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)

<090525>
TITLE: National Environmental Research Park (NERP) Support
PROJECT NUMBER: 002217
PRINCIPAL INVESTIGATOR: none
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA)
MONITORING AGENCY: Georgia Univ., Athens (USA)
77 FUNDING: Energy Research and Development Administration FY77:$32,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<090528>
TITLE: Development of New Techniques of Using Irradiation in the Genetic Improvement of Warm Season Grasses and an Assessment of TH
PROJECT NUMBER: 006190
PRINCIPAL INVESTIGATOR: Burton, G.W.
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA)
MONITORING AGENCY: Georgia Univ., Athens (USA)
77 FUNDING: Energy Research and Development Administration FY77:$21,000
TECHNOLOGY: SOLAR/Biomass (100%)

<090529>
TITLE: Mechanism of Energy Transfer and Conversion in Bioluminescence
PROJECT NUMBER: 006191
PRINCIPAL INVESTIGATOR: Cormier, M.J.
ADDRESS: Department of Biochemistry, University of Georgia, Athens, GA 30602
AFFILIATION: Georgia Univ., Athens (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duda, George
TELEPHONE: C(301)353-5037
TYPE OF FUNDING: Contract No.-E(38-1)-635

77 FUNDING: Energy Research and Development Administration FY77:$31,000
TECHNOLOGY: SOLAR/Biomass (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
PROJECT DESCRIPTION: We are studying the chemistry and enzymology of the efficient conversion of chemical energy into light by the sea pansy (Renilla). There are three proteins involved in light emission; one is catalytic, one is involved in changing the color of the light from blue to green by an energy transfer process and one is involved in the nerve-linked control of the bioluminescent flash. All three proteins have been purified to homogeneity and their chemical and physical characteristics are being studied. We have recently quantitated the in vitro transfer of energy from luciferase-product excited state to the green fluorescent protein. This process is approximately 100% efficient although the phenomenon occurs at protein concentrations of 10/sup -6/ M. Highly specific protein-protein interaction is involved. Advances in the nature of calcium activated photoproteins have also been made with the discovery that the native chromophore in three different photoproteins (aequorin, mnemiopsin and berovin) is Renilla luciferin. We are attempting to elucidate the nature of an oxygenated species in photoproteins which we feel must reside at a site on the protein and not on the chromophore (luciferin).
KEYWORDS: BIOCHEMISTRY;ENZYMES;ENERGY CONVERSION;VISIBLE RADIATION;BIOSYNTHESIS;LUMINESCENCE;ENERGY TRANSFER;INVERTEBRATES;MOLECULAR BIOLOGY;NEUROLOGY;OXIDATION

<090530>
TITLE: Nucleic Acid Metabolism During Seed Embryogenesis
PROJECT NUMBER: 006192
PRINCIPAL INVESTIGATOR: Dure, L.S. III
ADDRESS: Biochemistry Dept., University of Georgia, Athens, GA 30602
AFFILIATION: Georgia Univ., Athens (USA). Dept. of Biochemistry
MONITORING AGENCY: Energy Research and Development Administration, Aiken, S.C. (USA). Savannah River Operations Office
DIVISION: Savannah River Operations Office
MONITOR: McPeely, R.A.
TELEPHONE: C(803)824-6331
TYPE OF FUNDING: Contract No.-E(38-1)-638
77 FUNDING: Energy Research and Development Administration FY77:$21,000
TECHNOLOGY: SOLAR/Biomass (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Objective: To study the regulation of gene expression in cotton seed embryogenesis and germination. Scientific Background: Messenger RNA for the enzymes that bring about germination in cotton cotyledons is biosynthesized in embryogenesis, but not utilized until germination begins. The plant growth regulator, abscisic acid, is involved in the inhibition of the translation of this mRNA during the late stages of embryogenesis when this mRNA is present but not utilized. Proposed Procedures: Investigate the effects of cordycepin on the appearance of the germination enzymes; study poly A addition in vivo to preexisting, non ribosomal RNA during germination; isolate informosomes from embryos in the last stages of embryogenesis to determine their poly A content. Test Objects and Agents: Cotton cotyledons at various stages of embryogenesis and germination.
KEYWORDS: COTTON
PLANTS;SEEDS;GERMINATION;EMBRYOS;MESSENGER-RNA;BIOSYNTHESIS;BIOCHEMISTRY;DNA;HORMONES;MOLECULAR BIOLOGY;RNA

<090531>
TITLE: RNA Metabolism in the Regulation of Protein Synthesis in Plants
PROJECT NUMBER: 006193
PRINCIPAL INVESTIGATOR: Key, J.L.
ADDRESS: Botany Department, University of Georgia, Athens, GA 30602
AFFILIATION: Georgia Univ., Athens (USA). Dept. of Botany
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Duda, George
TELEPHONE: C(301)353-5037
TYPE OF FUNDING: Contract No.-AT(38-1)-643
77 FUNDING: Energy Research and Development Administration FY77:$23,000
TECHNOLOGY: SOLAR/Biomass (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To characterize soybean DNA including organization of the different DNA components into the genome. (2) To characterize the mRNA of soybean including kinetic properties and physicochemical parameters. (3) To study the RNA complexity under different growth conditions representative of very different levels of protein synthesis.
APPROACH: (1) Study DNA organization of plant genomes. (2) Characterize RNA components associated with protein synthesis. (3) Study ribosome function and utilization of RNAs in protein synthesis.
RESULTS: Understanding of regulation of protein synthesis in plants. Hope to be able to manipulate protein synthesis so as to be able to increase protein content and to improve nutritional quality of plant proteins.
KEYWORDS: REGULATION;RNA;METABOLISM;PLANTS;PROTEINS;BIOSYNTHESIS;SOYBEANS;NUTRITION;BIOCHEMISTRY;DNA

<090532>
TITLE: A Study of the Non-Histone Chromatin Proteins with High Affinity for DNA
PROJECT NUMBER: 006194
PRINCIPAL INVESTIGATOR: Patel, G.L.
ADDRESS: Department of Zoology, University of Georgia, Athens, GA 30602
AFFILIATION: Georgia Univ., Athens (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Shepherd, George
TELEPHONE: F233-5037
TYPE OF FUNDING: Contract No.-E(38-1)-644
77 FUNDING: Energy Research and Development Administration FY77:$1,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To characterize the nonhistone chromosomal proteins by biochemical and physicochemical methods. (2) To characterize the subclass of the nonhistones that show very high affinity for DNA with respect to its effect on the DNA structure and possible role in gene regulation.
PROACH: Chromatographic, electrophoretic and sedimentation procedures are employed for the characterization of the protein. DNA-binding methods are employed in examining the DNA-protein interaction. The effects of the binding proteins on the DNA structure are examined by physical changes in the DNA structure by spectrophotometric and centrifugation methods.
RESULTS: We have to date fractionated this complex class of chromosomal proteins into subclasses that are characterized. We expect to identify those proteins that may play an important role in the regulation of genes in higher organisms. We also expect to elucidate some aspects of the mechanism of molecular events in regulation.
PROJECT MILESTONES: We have isolated a protein fraction that unwinds DNA under physiological conditions. This, we feel, is a valuable contribution in elucidating some of the functions of the nonhistone proteins. We hope to provide further proof for a regulatory role for these unwinding proteins by demonstrating their enrichment at chromosomal sites of genetic activity such as chromosomal puffs, by using fluorescent antibodies.
KEYWORDS: DNA;PROTEINS;BIOCHEMISTRY;PHYSIOLOGY;CHROMOSOMES;CHROMATIN;RNA;GENETICS;MOLECULAR BIOLOGY

<090534>
TITLE: Radioactive Tracer Studies of Soil and Litter Arthropod Food Chains
PROJECT NUMBER: 006353
PRINCIPAL INVESTIGATOR: Crossley, D.A. Jr.
ADDRESS: Department of Entomology, University of Georgia, Athens, GA 30602
AFFILIATION: Georgia Univ., Athens (USA). Dept. of Entomology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: EY-76-S-09-641
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: (1) Develop further the application of radioactive tracer techniques for the analysis of trophic functions in soil-litter arthropod food chains. (2) Develop and test experimental models which will estimate assimilation of nutrient elements by soil-litter arthropods. (3) Evaluate the ability of current techniques and models for estimating input fluxes from nutrient element contents.
APPROACH: Determine fungal-arthropod interactions and how nutrient elements are thereby released from litter and soil for availability as slant nutrients. Radiotracer studies determine the excretion curves for nutrient elements in arthropods and these data can be used to develop models of accumulation, mobilization and transfer in the cycling process.
RESULTS: Publications in scientific journals and topical reports.
KEYWORDS: SOILS;LEAVES;DECOMPOSITION;ARTHROPODS;MICROORGANISMS;TRACER TECHNIQUES;FOOD CHAINS;BIOLOGICAL ACCUMULATION;BIOLOGICAL MODELS;TERRESTRIAL ECOSYSTEMS;PLANTS;ANIMALS;ENVIRONMENTAL TRANSPORT;CALCIUM;POTASSIUM;RADIOISOTOPES;RADIONUCLIDE MIGRATION

<090536>
TITLE: Flux of Energy and Essential Elements Through the Continental Shelf Ecosystem
PROJECT NUMBER: 006355
PRINCIPAL INVESTIGATOR: Pomeroy, L.R.;Wiebe, W.J.
ADDRESS: Institute of Ecology, University of Georgia, Athens, GA 30602
AFFILIATION: Georgia Univ., Athens (USA). Dept. of Zoology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George W.
TELEPHONE: F233-5548
TYPE OF FUNDING: Contract No.-E(38-1)-639
77 FUNDING: Energy Research and Development Administration FY77:$131,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/South;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Characterization of the metabolic condition and rates of the microbial components of the continental shelf ecosystem. Development of indices of condition that may be used to detect stress of changes introduced by energy-related technology on the continental shelf ecosystem.
APPROACH: Development of continuously or frequently measured parameters of such rate processes as photosynthesis and respiration. Development of biochemical indices of condition, such as adenylate energy charge ratio.
RESULTS: Basic information about the natural rate processes and condition of the continental shelf ecosystem. Rapid methods of monitoring effects of stress on the ecosystem, some of which may be useful in detecting stress before it has reached lethal proportions. Development of methods suitable for evaluation of extensive areas, such as continental shelves.
PROJECT MILESTONES: Application of Adenylate energy charge method to whole microbial communities. Measurement of phytoplankton release of dissolved organic matter as a substrate for marine bacteria.
KEYWORDS: CONTINENTAL SHELF;ENERGY SOURCES;MICROORGANISMS;METABOLISM;PHOTOSYNTHESIS;RESPIRATION;BIOCHEMISTRY;AQUATIC ECOSYSTEMS;ENVIRONMENTAL EFFECTS;WATER;PLANTS;PHYTOPLANKTON

<090538>
TITLE: The Response of Estuarine Fish Embryos to Environmental Temperature Shock
PROJECT NUMBER: 006938
PRINCIPAL INVESTIGATOR: Dean, J.M.
ADDRESS: Baruch Institute, University of South Carolina, Columbia, SC 29208
AFFILIATION: South Carolina Univ., Columbia (USA)
MONITORING AGENCY: Energy Research and Development Administration, Aiken, S.C. (USA). Savannah River Operations Office
DIVISION: Savannah River Operations Office
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-AT(38-1)-869
77 FUNDING: Energy Research and Development Administration FY77:$14,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives of this study were to determine the effect of acute temperature shock on: defined developmental stages of the mummichog, Fundulus heteroclitus; the period of starvation death; and feeding and growth of larvae. In addition, we measured the interaction of temperature shock/developmental stage and chlorine exposure and whether the effect on hatching was a function of the acute exposure or the duration of exposure.
APPROACH: Embryos of the mummichog Fundulus heteroclitus were subjected to acute thermal shock at defined developmental stages. Fish embryos could be subjected to acute exposures by entrainment in cooling systems or by effluents from power plants. The response of the embryos could be quite different than that of the adults. Embryos and larvae were exposed to acute thermal shock for different durations. An experiment also tested the response of embryos and larvae to differing levels of chlorine at differing temperatures for varying periods of time.
RESULTS: The most sensitive stages to acute thermal shock were the 1-2 and 2-4 cell stages of periods of cell division and late embryos and larvae were more tolerant of temperature and chemical stress than were juveniles or adults. The level and duration of exposure was not critical at less than 40 deg C for 24 deg C acclimated fish. Increased incubation temperatures shortened the time to hatching and fish reared at high but non-lethal temperatures had higher feeding rates than those reared below an apparently sensitive environmental level of 24 deg C. The result of the exposure of different developmental stages to chlorine and temperature at different levels and for different durations are still undergoing analysis but preliminary interpretation showed the 0 and 7 day larvae stage were more sensitive than were embryos.
PROJECT MILESTONES: Determination of sensitive stages of fish.
KEYWORDS: THERMAL SHOCK;FISHES;EMBRYOS;LARVAE;CHLORINE;ENTRAINMENT;POWER PLANTS;THERMAL EFFLUENTS;COOLING SYSTEMS;CELL CYCLE;CELL DIVISION;TEMPERATURE EFFECTS;BIOLOGICAL EFFECTS

<090539>
TITLE: A Multidisciplinary Research Program Directed Toward Utilization of Solar Energy through Bioconversion of Renewable Resources
PROJECT NUMBER: 006996
PRINCIPAL INVESTIGATOR: Finnerty, W.R.
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA)
MONITORING AGENCY: Georgia Univ., Athens (USA)
77 FUNDING: Energy Research and Development Administration FY77:$230,000
TECHNOLOGY: FOSSIL FUEL/Biomass - pyrolysis (100%)

<090540>
TITLE: Continental Shelf Processes Affecting the Oceanography of the South Atlantic Bight
PROJECT NUMBER: 007000
PRINCIPAL INVESTIGATOR: Atkinson, L.P.
ADDRESS: Skidaway Institute of Oceanography, P.O. Box 13687, Savannah, GA 31406
AFFILIATION: Skidaway Inst. of Oceanography, Savannah, Ga. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035;C(301)353-3035
TYPE OF FUNDING: Contract No.-E(38-1)889
77 FUNDING: Energy Research and Development Administration FY77:$153,000
TECHNOLOGY: FOSSIL FUEL/General (60%);NUCLEAR/General (20%);SOLAR/General (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The overall goal of this project is to determine the principal physical processes controlling the flux of nutrients onto the southeast continental shelf of the United States. The initial goal is to test the hypothesis that intrusions of nutrient-rich subsurface Gulf Stream water are the principal source of new nitrogen and phosphorus.
APPROACH: The methods involve the cooperative efforts of North Carolina State University deploying current meter arrays and Skidaway Institute running space and time intense sampling. Onslow Bay, North Carolina, is the site of the 1976 experiment. Five arrays of 2 or 3 meter (Aanderaa) each will be deployed by NCSU in late June. Skidaway will run a continuous survey in July and August using CTD, XBT and Rosette Samplers. The sampling will be coordinated wth biological sampling by Drs. Dunstan and Paffenhofer (Skidaway) and trace metal sampling by Dr. Windom (Skidaway). The variable field observations are compared with velocity field distributions providing estimates of the advective nutrient flux. Salinity, temperature, and nutrients are used for water mass analysis and confirmation of the current meter record. Equipment acquisition, testing and software development have consumed much of the first year's effort. A Plessey 9400 CTD/Data Logger system will be used with data processing by a CDC Cyber 70 computer.
RESULTS: Observations in Onslow Bay revealed the stranding of an intrusion and subsequent assimilation into

the water column by wind induced vertical mixing. Data analysis reconfirms our hypothesis that intrusions are a significant nutrient source for the shelf waters.
PROJECT MILESTONES: Understanding of the effect of Gulf Stream on continental shelf waters.
KEYWORDS: CONTINENTAL SHELF;OCEANOGRAPHY;NUTRIENTS;NITROGEN;PHOSPHORUS;SAMPLING;METALS;TRACE AMOUNTS;SEAWATER;SALINITY;TEMPERATURE MEASUREMENT;MONITORING;AQUATIC ECOSYSTEMS;ATLANTIC OCEAN

<090541>
TITLE: Trace Element Geochemistry of the South Atlantic Bight
PROJECT NUMBER: 007001
PRINCIPAL INVESTIGATOR: Windom, H.L.
ADDRESS: Box 13687, Savannah, GA 31406
AFFILIATION: Skidaway Inst. of Oceanography, Savannah, Ga. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: C(301)353-3035
TYPE OF FUNDING: Grant No.-E(38-1)-890
77 FUNDING: Energy Research and Development Administration FY77:$58,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (75%);NUCLEAR/General (25%)
ENERGY CYCLE: EXTRACTION (20%);WASTE MANAGEMENT (80%)
POLLUTANTS: METALS/Copper;METALS/Nickel;METALS/Zinc;METALS/Arsenic;METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine the rate and modes of input of trace elements to the Georgia Bight continental shelf environment, and their residence time there.
APPROACH: Seasonal sampling of major rivers and the air for the trace element of importance to determine input rates. Temporal and geographic sampling of continental shelf waters for the same elements.
PROJECT MILESTONES: First year determine rate of inputs of Cu via rivers and its concentration in shelf waters. Second year rate of inputs of Ni and Zn and their concentrations in shelf waters. Third year determination of residence times of these and other elements in continental shelf waters.
KEYWORDS: ATLANTIC OCEAN;CONTINENTAL SHELF;COASTAL WATERS;GEORGIA;SEAWATER;CHEMICAL COMPOSITION;SAMPLING;TRACE AMOUNTS;COPPER;ZINC;RETENTION FUNCTIONS;RIVERS;DIFFUSION;WATER POLLUTION;QUANTITATIVE CHEMICAL ANALYSIS;OCEANOGRAPHY;GEOCHEMICAL SURVEYS;AIR;NICKEL;ARSENIC;MERCURY

<090542>
TITLE: Impact of Thermal Loading and Other Water Quality Parameters on the Epizootiology of Epistylis and Aeromonas Infections in Centrarchids
PROJECT NUMBER: 007058
PRINCIPAL INVESTIGATOR: Esch, G.W.
ADDRESS: Department of Biology, Wake Forest University, Winston-Salem, NC 27109
AFFILIATION: Wake Forest Univ., Winston-Salem, N.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, Heyward
TELEPHONE: F233-5324
TYPE OF FUNDING: Contract No.-E(38-1)-900
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (50%);HEAT, THERMAL (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Other hydrographic areas Lakes and reservoirs
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this project is to examine the impact of thermal and organic loading on the epizooticlcgy of Aeromonas hydrophila and Epistylis sp. among centrarchid fish in a southestern U.S. cooling reservoir. Ultimately, the study will provide a baseline for either preventing or minimizing the epizootic outbreak of disease among these and other gamefishes within reservoirs in the southeast.
APPROACH: The extent and incidence of disease in bass from thermal and ambient locations in the reservoir will te monitored seasonally. Bacterial cell counts will be made seasonally at selected sites in the reservoir. Laboratory studies will differentially characterize strains of Aeromonas isolated from the water column, sediments and surface lesions on bass. Water quality parameters such as pH, temperature, dissolved oxygen, redox potential, conductivity and organic loading, will be measured at selected sites in the reservcir.
RESULTS: These studies should permit the identification of the water quality parameter(s) associated with creating conditions which would lead to epizootic outbreak of the disease among gamefish. In essence, the complete epizootiology of the disease will be studied.
PROJECT MILESTONES: The prevention or minimization of 'red-sore' disease in reservoirs in the southeastern United States.
KEYWORDS: THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;FISHES;POWER PLANTS;COOLING SYSTEMS;WATER RESERVOIRS;AQUATIC ECOSYSTEMS;INFECTIOUS DISEASES;BACTERIA;INFECTIVITY;TEMPERATURE DEPENDENCE;WATER QUALITY;EPIDEMIOLOGY;PATHOGENESIS;WATER

<090544>
TITLE: Continental Shelf Processes Affecting the Oceanography of the South Atlantic Bight
PROJECT NUMBER: 007076
PRINCIPAL INVESTIGATOR: Pietrafesa, L.J.
ADDRESS: Department of Geosciences, North Carolina State University, Raleigh, NC 27607
AFFILIATION: North Carolina State Univ., Raleigh (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jcseph, Arnold B.
TELEPHONE: F233-3035

TYPE OF FUNDING: Contract No.-E(38-1)-902
77 FUNDING: Energy Research and Development Administration FY77:$132,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (10%);PARTICULATES (10%);ORGANICS (50%);RADIATION (10%);HEAT, THERMAL (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The overall long range objective is the determination of physical/dynamical processes controlling/affecting the flux of nutrients onto and their subsequent distribution on the continental shelf. The purpose of the physical dynamics part of the overall program is to describe the physical oceanographic nature of the South Atlantic Bight.
APPROACH: The development of lateral and vertical plane circulations, current shear and sea level and hydrographic parameter changes and the time scales involved in their persistence and decay are being studied. Currents, temperature, conductivity, wind and sea level have been monitored in a time series fashion by North Carolina State University and hydrographic surveys will be directed by Skidaway with the help of N.C.S.U. The hydrographic surveys offer a comprehensive attack on the surface and subsurface density character in Onslow Bay. The CTD-Rosette and XBT stations are gridded to maximize the information, given the hardware, shiptime and numbers of personnel involved, necessary to sense and monitor intrusions and other phenomena. The hydrographic surveys complement and necessarily enhance the current meter observations.
RESULTS: A description (ultimately, a predictive capability) of the physical/oceanographic nature of the continental shelf of the South Atlantic Bight and the determination of physical/dynamical processes controlling/affecting the flux of nutrients onto and their subsequent distribution on the continental shelf.
PROJECT MILESTONES: During the initial 25 day experiment the grid was sampled over a period of two days followed by a third day of biological sampling. During the third day the physical and chemical data were examined to determine the portion of the grid that would be sampled during the next two days. During August of 1975 two current meter moorings, consisting of two Endeco current meters per mooring, were established in the midshelf region of Onslow Bay. This initial array was removed in mid-September 1975 giving us approximately 1-1/2 months of data sampled at 20 minute intervals. This data transcended the ''established'' to ''degradated'' modes of several intrusions. During the late fall 1975 and early spring 1976, currents, temperature and salinity were continuously monitored over 60 day periods in Onslow Bay. The individual arrays consisted of two thermographs and two Endeco current meters per mid-shelf station. Station data was taken using XTB's. This data should help in an understanding of the relative order of the horizontal and vertical eddy momentum convergences on the shelf as well as fill in part of the gap in our knowledge of what the horizontal and vertical time scale energetics are at the edge of and across the continental shelf.
KEYWORDS: OCEAN CULTIVATION;ATLANTIC OCEAN;CONTINENTAL SHELF;OCEANOGRAPHY;NUTRIENTS;DISTRIBUTION;COASTAL WATERS

<090548>
TITLE: Biological Processes in the Water Column of the South Atlantic Bight
PROJECT NUMBER: 007153
PRINCIPAL INVESTIGATOR: Dunstan, W.M.
ADDRESS: Skidaway Institute of Oceanography, Savannah, GA
AFFILIATION: Skidaway Inst. of Oceanography, Savannah, Ga. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Contract No.-E38-1-936
77 FUNDING: Energy Research and Development Administration FY77:$89,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Depending upon the latitude and season, either solar radiation or the availability of inorganic nutrients appear to control the productivity of marine phytoplankton. Nutrients are probably the limiting factor through much of the year along the SE coast. There are two major sources of these nutrients in this area: (1) Runoff and exchange from rivers and estuaries, (2) intrusions of nutrient rich water from mid-depths of the Gulf Stream. There are at least three other minor or unevaluated nutrient sources: (1) direct rainfall, (2) regeneration, (3) N/sub 2/-fixation by blue-green algae. These authors propose an intensive study of the impact of Gulf Stream intrusions on changes in the phytoplankton production and the resulting changes in the zooplankton densities and species composition. In conjunction with Atkinson's nutrient determinations, they will make a series of biological measurements (chlorophyll-a, particulate spectrum analysis and light profile) on a grid of stations in Onslow Bay. From these determinations they will have a measure of the phytoplankton standing crop and the food available for zooplankton. On each cruise, three stations will be selected for intensive and additional measurements. The latter would include phytoplankton species composition, phytosynthetic rates, particulate organic carbon analyses, particulate organic nitrogen analyses, and zooplankton
KEYWORDS: STANDING CROP;INTRUSION;ATLANTIC OCEAN;OCEANOGRAPHY;PLANKTON;POPULATION DYNAMICS;AQUATIC ECOSYSTEMS;NUTRIENTS;SOLAR FLUX;BIOLOGICAL MODELS;SEASONAL VARIATIONS;SEAWATER;PRODUCTIVITY

<090550>
TITLE: Surplus Facility Surveillance (HWCTR Stand-By)
PROJECT NUMBER: 800009
PRINCIPAL INVESTIGATOR: Hilley, J.R.
ADDRESS: P.O. Box A, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Ramsey, Robert W.
TELEPHONE: F233-3025
TYPE OF FUNDING: Contract No.-RU-040100;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$5,000

TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Power generation (100%)
CHARACTER OF STUDY: PRODUCTION (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The principal continuing objective of this project is to maintain the HWCTR facility in sufficiently good physical condition to ensure its safety, so that it can eventually be decommissioned with a minimum expenditure of time and money.
APPROACH: The physical facilities of the fuel will be maintained in the same condition, as described earlier, until decommissioning begins.
RESULTS: The principal objective during this period was to maintain the HWCTR facility in ''abandoned in plane'' status. The area was patrolled and inspected to ensure that protective measures were adequately maintained. Power was provided for minimum ventilation and lighting of the HWCTR containment building, control house, and administrative building.
KEYWORDS: SURPLUS FACILITY;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;REACTOR DECOMMISSIONING;INSPECTION;RADIATION MONITORING;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;SAFEGUARDS;MAINTENANCE;HWCTR REACTOR;DECOMMISSIONING;SAFETY

<090551>
TITLE: Environmental Studies--T-3 as Tracer
PROJECT NUMBER: 002533
PRINCIPAL INVESTIGATOR: Hayes, D.W.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-AT(07-2)-1
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To test, evaluate, and compare tritium and other natural riverine tracers for determining movements and mixing of Savannah River water and other river outputs in the South Atlantic Bight coastal waters.
APPROACH: Obtain samples of river and coastal waters and measure tritium and other constituents such as silicates.
RESULTS: Determination of seasonal dilution factors in sounds near the Savannah River and assessment of residence times and water movement patterns in the nearshore regions.
KEYWORDS: TRITIUM;SAVANNAH RIVER;COASTAL WATERS;SAMPLING;SEASONAL VARIATIONS;ENVIRONMENTAL EFFECTS;CONTAMINATION;ENVIRONMENTAL TRANSPORT;OCEANOGRAPHY;RADIOACTIVE EFFLUENTS;LABELLED COMPOUNDS;PLUMES;WATER

<090552>
TITLE: Research Aircraft Program
PROJECT NUMBER: 000976
PRINCIPAL INVESTIGATOR: Kern, C.D.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballantine, David S.
TELEPHONE: F233-3600
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$134,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: There are two objectives. One is to conduct measurement programs centered around the use of an aircraft measurement program. The primary measurements are air concentrations over or near the Savannah River Plant as the result of routine and controlled releases of material to the atmosphere. The other objective is to combine the data generated from the first objective with data collected under several other programs at the Savannah River Laboratory.
RESULTS: The combined data base will be used to validate models which are used to calculate dose-to-man from routine releases to the atmosphere, and those used to support the Atmospheric Release Advisory Capability--Development Support Studies (ARAC-DSS) Program and the Emergency Operating Center of the SRP. Field tests conducted under this program will be to test SRL's ability to calculate paths and concentrations in real time. These tests will be conducted in conjunction with the Lawrence Livermore Laboratory evaluation of their ARAC concept.
KEYWORDS: AIRCRAFT;RESEARCH PROGRAMS;MEASURING METHODS;SAVANNAH RIVER PLANT;AIR POLLUTION;DATA COMPILATION;MEASURING INSTRUMENTS;RADIATION DOSES

<090553>
TITLE: Cooperative Forest Management Research
PROJECT NUMBER: 002150
ADDRESS: Aiken, SC 29801
AFFILIATION: Forest Service, Aiken, S.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-EY-76-A-09-0056;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: SOLAR/Biomass (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to investigate the symbiotic and pathogenic associations between fungi and forest trees.
APPROACH: Field studies of tree mycorrhize and occurrence of southern fusiform rust and root rot will be performed.
RESULTS: The results will materially aid efforts at land reclamation and forest management in the Savannah River Forest.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;FORESTS;TREES;BIOMASS;FUNGI;INFECTIVITY;ROOTS;MANAGEMENT;SAVANNAH RIVER PLANT;ECONOMICS

<090554>
TITLE: Fuel Plantation Research
PROJECT NUMBER: 001636
PRINCIPAL INVESTIGATOR: Stubbs, J.
ADDRESS: Southeastern Forest Experiment Station, Savannah River Plant, Aiken, SC 29801
AFFILIATION: Forest Service, Aiken, S.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-EY-76-A-09-0056;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: SOLAR/Biomass (100%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The purpose of this study is to determine the feasibility of treating pile trees with the herbicide, paraquat, to stimulate oleoresin formation.
APPROACH: Laboratory and field experiments will be employed to determine the best techniques for increasing oleoresin yield during the treatment and processing stages.
RESULTS: Results will prove whether this technique is economically and technologically feasible as a means of increasing the yield of oleoresin from southeastern pile forecasts.
KEYWORDS: OLEORESINS;FEASIBILITY STUDIES;PINES;HERBICIDES;BIOMASS;ECONOMICS;BIOLOGICAL EFFECTS;RESINS;BIOSYNTHESIS;BIOMASS PLANTATIONS

<090555>
TITLE: Management: Southeast Continental Shelf Studies
PROJECT NUMBER: 007061
PRINCIPAL INVESTIGATOR: Menzel, D.
ADDRESS: Skidaway Institute of Oceanography, Savannah, GA 31406
AFFILIATION: Skidaway Inst. of Oceanography, Savannah, Ga. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-E(38-1)-901
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This is an effort to coordinate the research funded by Division of Biomedical and Environmental Research in the South Atlantic Bight. This broad geographic, four state, coastal area encompasses the Carolina Capes and Florida Narrow Shelf areas that could contain future offshore nuclear power plants. Future outer-continental shelf oil-gas exploration is also possible off the Georgia embayments. With such energy related facilities it is important to focus our oceanographic research program on these applied problems. This contract does that by holding workshops among contractors, arranging for sharing of large pieces of equipment and maximizing the available shiptime in the area.
KEYWORDS: AQUATIC ECOSYSTEMS;COASTAL WATERS;ATLANTIC OCEAN;CONTINENTAL SHELF;NORTH CAROLINA;SOUTH CAROLINA;GEORGIA;FLORIDA;RESEARCH PROGRAMS;WATER QUALITY;MANAGEMENT;TECHNOLOGY TRANSFER

<090560>
TITLE: Aeromonas Hydrophila as an Agent of Infection in Alligators
PROJECT NUMBER: 007372
PRINCIPAL INVESTIGATOR: Esch, G.W.
ADDRESS: Wake Forest University, Department of Biology, Winston-Salem, NC 27109
AFFILIATION: Wake Forest Univ., Winston-Salem, N.C. (USA). Dept. of Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-EY-76-S-09-0965
77 FUNDING: Energy Research and Development Administration FY77:$49,000

TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Study to determine if Aeromonas Hydrophila is prime agent in causing disease and subsequent death of Par Pond alligators; to evaluate the effects of A. hydrophila infections on a seasonal basis; develop techniques and procedures to minimize risk of mortality; and, devise long-term plan of management to ensure continued existence of Par Pond alligators.
KEYWORDS: ALLIGATORS;RESPIRATORY SYSTEM DISEASES;INFECTIOUS DISEASES;AEROBACTER;INFECTIVITY;ETIOLOGY;AQUATIC ECOSYSTEMS

Energy Research and Development Administration/Headquarters

<091001>
TITLE: Basic Radiation Estimates and Evaluations
PROJECT NUMBER: 000420
ADDRESS: RERF, Japan, Hiroshima, JP
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma;RADIATION/Neutron (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Japan
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To establish reliable radiation dose estimates for the A-bomb exposed survivors of Hiroshima and Nagasaki. Studies include exposure to atomic bomb radiation, other possible radiation contaminants, and to medical and dental radiation procedures.
APPROACH: Radiation dose is estimated from (1) the spatial distribution of gamma and neutron radiation at the times of the bombs, (2) calculations of dose and linear energy transfer inside anthropomorphic phantoms exposed to model radiation fields, (3) subject exposure to fission products deposited by fallout, (4) subject exposure to induced radiation, and (5) subject exposure to medical diagnostic and therapeutic radiation.
RESULTS: Results: (1) Dose response curves for leukemia and chromosome aberration have been constructed for the Hiroshima and Nagasaki exposed populations March 31, 1977; and (2) calculations of tissue dose for specific organ sites will be made March 31, 1977.
PROJECT MILESTONES: A prospective survey of medical and dental x-ray examinations in representative Hiroshima and Nagasaki hospitals will be completed September 30, 1978.
KEYWORDS: GAMMA RADIATION;NEUTRONS;DOSIMETRY;EPIDEMIOLOGY;MAN;A-BOMB SURVIVORS;RADIATION DOSES

<091002>
TITLE: Genetic and Cytogenetic Studies
PROJECT NUMBER: 000422
ADDRESS: Japan/RERF, Hiroshima, JP
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$700,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma;RADIATION/Neutrons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Japan
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine whether or not there are any measurable genetic effects in children born of A-bomb exposed parents in Hiroshima and Nagasaki.
APPROACH: Surveys are conducted of children from parents who were proximally exposed, distally exposed and non-exposed. Four different areas of effects are being looked at: (1) mortality, (2) cytogenetics, genetics, and (3) growth and development.
RESULTS: Mortality survey and cytogenetics survey--no clearly significant effect of parental exposure on survival of the children or frequency in chromosome anomalies has been seen. The study of growth and development of high school students has been completed and a report on stature is under final review.
PROJECT MILESTONES: (1) An analysis of the mortality data will be made, updating the previous report to 1976, Sept. 30, 1978. (2) Increase the genetics sampling rate up to full laboratory capacity of 400 per month from the current level of 250 per month, Sept. 30, 1978.
KEYWORDS: GENETICS;CYTOLOGY;EPIDEMIOLOGY;NUCLEAR ENERGY;GENETIC RADIATION EFFECTS;GAMMA RADIATION;NEUTRONS;HEALTH HAZARDS;HUMAN POPULATIONS;A-BOMB SURVIVORS;ANIMAL CELLS;CHROMOSOMAL ABERRATIONS

<091003>
TITLE: Aging and Mortality Studies
PROJECT NUMBER: 000424
ADDRESS: Japan/RERF, Hiroshima, JP
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.

77 FUNDING: Energy Research and Development Administration FY77:$400,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma;RADIATION/Neutron (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Japan
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Determination of possible late radiation effects on the lifespan of A-bomb survivors.
APPROACH: Biennial medical examinations of heavily exposed survivors in both cities, autopsies, pathological studies and examination of death certificates are used to determine types of illnesses and abnormalities which have occurred as a consequence of exposure to ionizing radiation.
RESULTS: The 8th mortality report has been completed and indicated that the relasionship between dose and cancer, other than leukemia, especially lung cancer and breast cancer, is stronger than previously reported. Pathology studies of breast cancer, brain tumors and Hashimoto's thyroiditis were completed.
PROJECT MILESTONES: Complete an intensive analysis of the results of early cancer testing, Sept. 30, 1979.
KEYWORDS: HUMAN POPULATIONS;BIOLOGICAL RADIATION EFFECTS;GAMMA RADIATION;NEUTRONS;MORTALITY;LIFE CYCLE;LIFE SPAN;EPIDEMIOLOGY;JAPAN;MEDICAL SURVEILLANCE;A-BOMB SURVIVORS;RADIATION EFFECTS;DISEASES;MEDICINE

<091004>
TITLE: Epidemiological Studies of Specific Diseases, Development and Metabolic Processes and Other Physiologic Phenomena
PROJECT NUMBER: 000426
ADDRESS: Japan/RERF, Hiroshima, JP
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$2,100,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma;RADIATION/Neutron (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Japan
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine whether there are specific diseases, processes or physiologic phenomena related to A-bomb survivors.
APPROACH: Tumor and tissue registries are active in Hiroshima and Nagasaki. A-bomb survivors are examined for ophthalmologic effects, immunologic competence, and chromosomal aberrations. Prospective epidemiological study of coronary heart diseases and stroke in a migrant Japanese population in Hawaii and California.
RESULTS: Several thousands of A-bomb survivors have been studied for the presence of chromosomal aberrations in their peripheral lymphocytes. These studies have shown a strong relationship between dose and the presence of aberrations. These individuals will continue to be watched closely for the development of neoplastic disease.
PROJECT MILESTONES: Complete studies of ophthalmologic effects in A-bomb-exposed individuals, Sept. 30, 1978.
KEYWORDS: METABOLISM;PHYSIOLOGY;DISEASES;EPIDEMIOLOGY;NUCLEAR MEDICINE;GAMMA RADIATION;NUCLEAR ENERGY;HEALTH HAZARDS;NUCLEAR WEAPONS;NUCLEAR EXPLOSIONS;NEUTRONS;BIOLOGICAL RADIATION EFFECTS;HUMAN POPULATIONS;MEDICAL SURVEILLANCE;JAPAN;PATHOLOGICAL CHANGES;DELAYED RADIATION EFFECTS;A-BOMB SURVIVORS

<091005>
TITLE: Neoplasia Studies; Late Effects of Radiation on the Populations of Hiroshima and Nagasaki
PROJECT NUMBER: 000485
ADDRESS: Japan/RERF, Hiroshima, JP
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$2,200,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma;RADIATION/Neutrons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Japan
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Definition of radiation related factors for various specific cancer sites.
APPROACH: As radiation related tumors are identified in A-bomb survivors, they are subjected to intensive studies to confirm or disprove the radiation effects.
RESULTS: Radiation relationships have been established for cancers of the breast, thyroid, lung and stomach. Differences in the dose response curves for leukemia incidence in Hiroshima and Nagasaki suggests a much greater leukemogenic effect for neutrons than for gammas. Preliminary reports have been prepared on aplastic anemia, multiple myeloma and the development of leukemia in women treated for breast cancer.
PROJECT MILESTONES: (1) Summary of the results of the study of tumor development in exposed children, Sept. 30, 1978. (2) Complete a retrospective study of A-bomb exposed survivors to study the relationship between cancer frequency by histological type and A-bomb radiation dose, and relationship between liver cancer and liver cirrhosis.
KEYWORDS: HUMAN POPULATIONS;DELAYED RADIATION EFFECTS;HIROSHIMA;BIOLOGICAL RADIATION EFFECTS;NUCLEAR ENERGY;HEALTH HAZARDS;A-BOMB SURVIVORS;NUCLEAR EXPLOSIONS;NUCLEAR WEAPONS;NEOPLASMS;NAGASAKI;MEDICAL SURVEILLANCE;PATHOLOGICAL CHANGES

<091006>
TITLE: Biochemical Genetics Studies
PROJECT NUMBER: 000486
ADDRESS: RERF, Japan, Hiroshima, JP
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA).
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Gamma;RADIATION/Neutrons (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Japan
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of the biochemical variability study is to search for variants in the protein systems among the children of the exposed and nonexposed, to determine whether exposure has resulted in an increase in mutations measurable at the biochemical level in offspring.
APPROACH: Conduct laboratory studies to detect biochemical variability in a number of enzyme and protein systems in the red blood cells and cerum.
RESULTS: The number of samples being processed and studied for biochemical variance has been expanded to the present laboratory capacity of around 250 per month.
PROJECT MILESTONES: (1) A preliminary analysis of the data collected will be completed Sept. 30, 1979.
KEYWORDS: NEOPLASMS;EPIDEMIOLOGY;MAN;MEDICINE;MUTAGENESIS;GENETICS;A-BOMB SURVIVORS;PROTEINS;ENZYMES;ERYTHROCYTES;BLOOD SERUM;GENETIC VARIABILITY

<091007>
TITLE: Radioactivity on the Earth's Surface
PROJECT NUMBER: 000528
PRINCIPAL INVESTIGATOR: Hardy, E.P. Jr.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$236,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objective of these projects is to document the deposition rate and accumulation of initially airborne particles on the surface of the earth. This information is used to develop mechanisms and models for predicting contamination patterns following a release of radioactive debris to the atmosphere.
APPROACH: The monthly strontium-90 fallout rate is measured by sampling total deposition at 100 land stations using high-walled stainless steel pots or funnel-ion exchange column collectors. Soils are collected in selected geographical areas for determining the lateral and vertical distribution of natural and artificial radionuclides. Wet and dry fallout are sampled on a monthly basis at a regional station 35 miles due west of lower Manhattan, and at two remote baseline stations, Mauna Loa, Hawaii and American Samoa.
RESULTS: The distribution of strontium-90 fallout and the annual inventory is obtained based on the monthly samples received from the global network stations. Soil sampling and analysis provide data on the effects of topography and climatology on the cumulative deposition of radioactive particulates. The information can be applied to models for predicting the long-term behavior of nuclides in the environment. Separating wet and dry fallout provides information on the source of various nuclides.
KEYWORDS: LAND POLLUTION;WATER POLLUTION;RADIOACTIVE AEROSOLS;RADIOECOLOGICAL CONCENTRATION;RADIONUCLIDE KINETICS;CONTAMINATION;FISSION PRODUCTS;AIR POLLUTION;DEPOSITION;RADIONUCLIDE MIGRATION;STRONTIUM 90;SOILS;REGIONAL ANALYSIS;HAWAII;NEW YORK;ISLANDS;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;PLUTONIUM

<091008>
TITLE: Radioactivity in Surface Air
PROJECT NUMBER: 000529
PRINCIPAL INVESTIGATOR: Hardy, E.P. Jr.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$284,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The HASL Surface Air Sampling Program provides data on the latitudinal distribution of nuclear weapons debris, arrival times of fresh debris, and transfer of this debris between hemispheres. These radionuclide concentrations in surface air are related to measurements of deposition on the earth's surface. Lesser efforts are devoted to releases from nuclear facilities.
APPROACH: Particulates in surface air are sampled continuously on Microsorban filters at about twenty sites covering the latitude spread from 77 degrees N to the South Pole. The samples are combined into monthly

composites and split; half for non-destructive assay by germanium diode gamma spectrometry and half for radiochemical analysis. The routine program involves analyses for beryllium-7, strontium-90, zirconium-95, cesium-137, cerium-144, lead-210 and plutonium-239. Air concentrations and dispersion of plutonium-239 in the vicinity of Rocky Flats, Colo. are being observed on a routine basis at three downwind locations from the plant.
RESULTS: The surface air sampling network covers a wide geographical latitude and provides an early indicator of fresh nuclear test debris and delineates the tropospheric dispersion of radioactivity from French and Chinese nuclear tests. Air concentrations of plutonium at Rocky Flats are being related to wind statistics and accumulated disposition measurements for studying the phenomena of resuspension and redepcsition.
KEYWORDS: SURFACE AIR;RADIOACTIVITY;SAMPLING;FALLOUT;FISSION PRODUCTS;RADIOECOLOGICAL CONCENTRATION;DEPOSITION;RADIOCHEMICAL ANALYSIS;RADIONUCLIDE MIGRATION;TRANSLOCATION;BERYLLIUM 7;STRONTIUM 90;ZIRCONIUM 95;CESIUM 137;CERIUM 144;LEAD 210;PLUTONIUM 239;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;RADIOACTIVE AEROSOLS

<091009>
TITLE: Radioactivity in Stratospheric Air
PROJECT NUMBER: 000530
PRINCIPAL INVESTIGATOR: Hardy, E.P. Jr.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$291,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objectives of this program are: to document the concentrations of radioactivity in the stratosphere as a function of latitude, altitude and season; to compute stratospheric burdens of critical tracers; to develop and test stratospheric transport models; and to provide basic data for other scientific programs in studying the ultimate deposition of these tracers in the environment.
APPROACH: This program is comprised of two separate projects: the High Altitude Balloon Sampling Program and Project Airstream involving aircraft sampling. The balloon program provides samples from 20 to 27 km at 65 degrees N, 33 degrees N and 9 degrees N several times a year. The aircraft sampling extends from 75 degrees N to 10 degrees S in the western hemisphere and ranges in altitude from 12 to 19 km. At least three aircraft missions are flown per year. The filters are analyzed for long-lived fission products, plutonium isotopes and radon daughter products.
RESULTS: The fission product data reflect the patterns of recent atmospheric nuclear weapons testing. The plutonium mass isotopic composition aids in characterizing the stratospheric debris. Lead and polonium-210 in the stratosphere are natural tracers of tropospheric origin and are useful in assessing the extent of stratosphere-troposphere interchange.
KEYWORDS: RADIOACTIVITY;STRATOSPHERE;AIR POLLUTION;MATHEMATICAL MODELS;DIFFUSION;TRACER TECHNIQUES;RADIATION MONITORING;AERIAL MONITORING;AEROSOLS;FISSION PRODUCTS;PLUTONIUM ISOTOPES;DAUGHTER PRODUCTS;LEAD;POLONIUM 210

<091010>
TITLE: Evaluation and Development of Sampling Systems
PROJECT NUMBER: 002481
PRINCIPAL INVESTIGATOR: Breslin, A.J.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$111,000
TECHNOLOGY: FOSSIL FUEL/General (75%);GEOTHERMAL/General (25%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Aerosols (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Methods are sought to improve air sampling sensitivity for particulates in very low concentrations, such as tropospheric background aerosols, stratospheric aerosols, and for trace constituents in urban and industrial areas. Substantially better sensitivity than presently available is required fcr measuring the concentrations of substances that may be hazardous even in low concentrations and for determining baseline concentrations of various atmospheric constituents.
APPROACH: Means are developed to improve sample air volume, collection efficiency, background of the collection medium, and contamination or loss of sample during handling subsequent to collection individually and on an integrated basis to produce optimized sampling systems. Existing sampling systems are examined for possible adaption to meet ERDA's specific needs.
RESULTS: A current study of filter loading phenomena should yield information on increase of resistance of a variety of commonly used sample filters under typical conditions of environmental monitoring. This will be useful in selecting filters for specific monitoring applications. A study on electrically-augmented particle collection in fibrous filters may enable the collection efficiency of inherently low-efficiency filters to be increased substantially without increase in pressure drop. The production of extraneous particles in electrostatic samplers by gas-to-particle conversion and corona wire ablation will be assessed to determine its potential as a source of sample contamination.
KEYWORDS: AEROSOLS;SAMPLING;AIR SAMPLERS;TROPOSPHERE;STRATOSPHERE;SENSITIVITY;TRACE AMOUNTS;HEALTH HAZARDS;TECHNOLOGY ASSESSMENT;AIR FILTERS;AIR POLLUTION;INHALATION

<091011>
TITLE: Radioactivity in the Biosphere
PROJECT NUMBER: 000684
PRINCIPAL INVESTIGATOR: Hardy, E.P. Jr.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$520,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Several programs involving sampling and analysis of biological materials are carried out in order to investigate the transfer to man of radionuclides. Primary objectives are to correlate human body burdens with intake levels, to evaluate the long-term behavior of radionuclides in the environment and in man, and to determine the dose commitments from nuclear power production.
APPROACH: Radionuclides from nuclear weapons testing provide the major tool for our studies. The nuclides investigated include plutonium, americium, strontium-90, cesium-137, and tritium. Quarterly estimates of strontium-90 intake in total diet in New York City and San Francisco are determined from analyses of nineteen representative food items purchased every three months. Since 1961, specimens of human vertebrae have been obtained in the New York and San Francisco areas, while daily milk and tapwater sampling in New York City has been carried out since 1954.
RESULTS: The diet sampling provides a continuing record of the changes in radionuclide dietary intake. The long-term variations and the significance of the accumulated deposit in soil relative to the current rate of deposition are evaluated. The human bone sample strontium-90 concentrations are related to the dietary intake, and the absorption and retention properties for both adults and children can be inferred. Results have been useful in predicting future strontium-90 concentrations in diet and bone.
KEYWORDS: BIOSPHERE;LAND POLLUTION;WATER POLLUTION;BIOLOGICAL MATERIALS;RADIOCHEMICAL ANALYSIS;RADIOECOLOGICAL CONCENTRATION;ENVIRONMENTAL EXPOSURE PATHWAY;RADIOISOTOPES;RADIONUCLIDE MIGRATION;MAN;BODY BURDEN;NUCLEAR ENERGY;HEALTH HAZARDS;PLUTONIUM;AMERICIUM;STRONTIUM 90;CESIUM 137;TRITIUM;FORECASTING;FISSION PRODUCTS;RADIOACTIVITY;SKELETON;FOOD;INGESTION;DIET;SOILS

<091012>
TITLE: Radiochemical Development Studies
PROJECT NUMBER: 000685
PRINCIPAL INVESTIGATOR: Welford, G.A.
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AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$105,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is the development of improved radiochemical, radiometric and analytical procedures to determine the levels of radionuclides, particularly the transuranium elements, in biological and environmental matrices. These analyses must be capable of isolating and determining these transuranic nuclides in large quantities of soil, water, tissue, food and excreta samples. The method once developed must withstand extensive evaluation by analyzing actual samples over extended periods of time so that reliable accuracy and precision statements are possible.
APPROACH: We will investigate and apply both classical and new analytical techniques to radioanalytical problems.
RESULTS: Methods will be provided for determination of plutonium and americium in large environmental samples. Matrices such as urine (20 liters), soil (kilograms), sea water (55 liters), food ash (100 grams), and bone ash (100 grams) will be handled. Comparable procedures for environmental tritium determinations in soil, water, food, tissue and precipitation samples will be provided.
KEYWORDS: RADIOCHEMICAL ANALYSIS;RADIOECOLOGICAL CONCENTRATION;TRANSURANIUM ELEMENTS;BIOLOGICAL MATERIALS;ECOSYSTEMS;MEASURING METHODS;PLUTONIUM;AMERICIUM;URINE;SOILS;SEAWATER;FOOD;SKELETON;TRITIUM

<091013>
TITLE: Analysis of Samples of Ocean Water
PROJECT NUMBER: 000686
PRINCIPAL INVESTIGATOR: Volchok, H.L.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION/Strontium 90;Cesium 137;Plutonium (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING

PROJECT DESCRIPTION: Woods Hole Oceanographic Institution (WHOI) is funded by ERDA to carry out extensive research utilizing strontium-90, cesium-137 and plutonium in sea water and ocean sediments. HASL arranges contracts with commercial laboratories for the radiochemical analyses of the sea water. Recently, additicnal samples generated under the GEOSECS program (funded by the National Science Foundation) have been combined with the routine WHOI project.
APPROACH: Commercial laboratories claiming the ability to quantitatively analyze sea water for low concentrations of strontium-90, cesium-137 and plutonium, are ''qualified'' by HASL. This involves submission of blank, duplicate and known samples and subsequent evaluation of the results. Requests for proposals from qualified laboratories are then evaluated by a panel and a contractor is selected.
RESULTS: The data frcm this program are used by the investigators at WHOI and by the scientific community in understanding physical and chemical oceanographic properties such as circulation patterns, sedimentation rates and currents. In addition, the information is valuable in evaluating planned or unplanned releases of radioactive wastes to the environment.
KEYWORDS: WATER POLLUTION;STRONTIUM 90;CESIUM 137;PLUTONIUM;SEDIMENTS;SEAS;SEAWATER;RADIOCHEMICAL ANALYSIS;RADIOACTIVE WASTES;WASTE DISPOSAL;FISSION PRODUCTS;QUANTITATIVE CHEMICAL ANALYSIS

<091014>
TITLE: Basic Computations and Experiments
PROJECT NUMBER: 000730
PRINCIPAL INVESTIGATOR: McLaughlin, J.E.
ADDRESS: 376 Hudson Street, New York, NY 10014
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DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHCNE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$373,000
TECHNOLOGY: NUCLEAR/General (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (50%);ANALYTICAL (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The project is designed so that general methods can be derived and applied to problems in radiation shielding, radiation dosimetry, environmental health and sometimes to non-nuclear oriented problems.
APPROACH: Following the identification of a safety-related problem, fundamental physical principles and data are employed in the development of a method that can be applied to a group of such problems. Oftentimes complete reliance on measurements does not lead to a general solution, so we have developed or adapted computational methods that can be verified with benchmark experiments. This systematic approach, for example, has led to generally acceptable radiation shielding calculations and environmental radiation measurement methods.
RESULTS: Theoretical computational and experimental methods for characterizing man's environment and how it is perturbed should be reported in the literature and applied to a variety of real and perceived safety problems concerning HASL and other ERDA programs.
KEYWORDS: INSTRUMENTATION;RADIATION PROTECTION;DOSIMETRY;HEALTH HAZARDS;ENERGY;SAFETY;MATHEMATICAL MODELS;CALCULATION METHODS;ENVIRONMENT;RADIATIONS;COMPUTER CODES

<091015>
TITLE: Radiation Dosimetry
PROJECT NUMBER: 000731
PRINCIPAL INVESTIGATOR: McLaughlin, J.E.
ADDRESS: 376 Hudson Street, New York, NY 10014
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MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHCNE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$549,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (20%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Basic computational and experimental methods are applied to practical radiation dosimetry investigations of concern to ERDA and other organizations. Man's external radiation exposure usually occurs at low dose rates so the methods must be carefully employed, particularly with regard to quantifying the time and location dependence of components on the environmental radiation field.
APPROACH: Systems for the accurate determination of dose to man from manmade and natural sources are developed. These systems include the specification of the underlying principles; the instrument and methods for its use; and the eventual data recovery and interpretation. HASL-developed computations are employed to guide the design and interpretation of field and laboratory measurements.
RESULTS: The project provides basic data on human exposure to natural radiation, occupational sources and power-related emissions.
KEYWORDS: RADIATION MONITORING;DOSIMETRY;BIOLOGICAL RADIATION EFFECTS;HUMAN POPULATIONS;ENERGY;HEALTH HAZARDS;OCCUPATIONS;BACKGROUND RADIATION;RADIOACTIVE EFFLUENTS

<091016>
TITLE: Assessment and Control of Radioactive Air Contaminants
PROJECT NUMBER: 000732
PRINCIPAL INVESTIGATOR: Breslin, A.J.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
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DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.

TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$87,000
CHNOLOGY: NUCLEAR/General (100%)
ERGY CYCLE: EXTRACTION (30%)
..LLUTANTS: RADIATION/U; Ru (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The exposure of man and his environment to airborne radioactive substances is studied in terms of the successive steps from sources via environmental pathways to ultimate sites of deposition including the respiratory tract. Particular attention is being given to public exposure to background radon and radon daughters. The long range objectives of these investigations are to improve capabilities to assess, monitor and control contaminants in public and occupational environments.
APPROACH: Emphasis is on field investigations of the sources of radioactive air contaminants, the concentration and physical properties of the airborne radionuclides (including particle size and solubility of particulates), and the resultant exposure to humans. Field measurements are complemented by laboratory experiments to provide a bridge between actual conditions of exposure and precise measurements of the physical properties and human intake of specific contaminants.
RESULTS: A pilot study will provide data on ambient radon and radon daughters in buildings in the New York metropolitan area using integrated monitors that have been developed for that purpose. As time and additional instrumentation permit, this will be expanded to yield estimates of average exposure to a representative cross-section of the local population. An investigation of exposures of uranium mill workers to uranium ore dust should provide information on the validity of assumptions on which the present maximum permissible concentration is based. Measurements include the distribution, particle size, and solubility of radionuclides in the airborne dust as well as fractional deposition of the dust in the respiratory tract.
KEYWORDS: RADIOACTIVE AEROSOLS;HEALTH HAZARDS;ENVIRONMENTAL EFFECTS;ENVIRONMENTAL EXPOSURE PATHWAY;RADON;MONITORING;MEASURING INSTRUMENTS;MEASURING METHODS;AIR POLLUTION;DAUGHTER PRODUCTS;INHALATION;RADIOISOTOPES

<091017>
TITLE: Aerosol Technology
PROJECT NUMBER: 000733
PRINCIPAL INVESTIGATOR: Breslin, A.J.
ADDRESS: 376 Hudson Street, New York, NY 10014
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DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$373,000
TECHNOLOGY: FOSSIL FUEL/General (75%);GEOTHERMAL/General (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Fundamental information is developed about the characteristics of airborne particles and techniques for particle generation and measurement which is needed for filtration studies, inhalation studies, and calibrating size-classifying air samplers.
APPROACH: Information about the properties and behavior of aerosols such as particle size, density, charge, diffusivity, and agglomeration is obtained to meet existing or anticipated demands of HASL research in health protection and population exposures to airborne particulates. Similarly, techniques for aerosol generation and measurement are developed in the absence of existing methods in order to fulfill research requirements in related programs.
RESULTS: A more sensitive condensation nuclei counter than earlier models developed here (with ranges of about 10/sup 6/ to 5 x 10/sup 2//cm/sup 3/ and 5 x 10/sup 2/ to 1/cm/sup 3/) is being designed with a limit of detection as little as 10/sup -3//cm/sup 3/. This will have application in measuring the size distribution of background aerosols and the collection efficiency of High Efficiency Particulate Aerosol filters. Commercial high volume cascade impactors are being evaluated for their accuracy and reliability in measuring the particle size distributions of environmental aerosols. The effects of particulate bounce and wall losses are receiving particular attention because of their potential contribution to errors. It is anticipated that this evaluation will provide a basis for selecting the best available unit for future environmental studies.
KEYWORDS: AEROSOLS;CHEMICAL PROPERTIES;PHYSICAL PROPERTIES;HEALTH HAZARDS;BEHAVIOR;PRODUCTION;MEASURING METHODS;MEASURING INSTRUMENTS;INHALATION;CASCADE IMPACTORS;PARTICLE SIZE

<091018>
TITLE: Development Studies in Instrumentation
PROJECT NUMBER: 000735
PRINCIPAL INVESTIGATOR: Graveson, R.T.
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DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$104,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/Fission (25%);GEOTHERMAL/General (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
ROJECT DESCRIPTION: The objective of this project is to develop new instrumentation for application to field and laboratory measurement problems. New sensor concepts are investigated for translating physical parameters to electronic signals. Also, instrument circuitry and computer based systems for data acquisition and equipment control are improved.
APPROACH: Methods of utilizing new types of sensors are developed. These include optical, mechanical, and electronic transducers which respond to input stimulus and transmit a related electronic signal. Since the integrated circuit and the microprocessor are making complex digital systems economical and efficient, a

considerable effort is related to the interfacing of detectors and standard digital subassemblies. The systems assembled contain direct input for multiple sensors and correlate interrelated parameters to determine the necessary computer based control and data acquisition information.
RESULTS: Desirable sensor concepts with poor stability can be used successfully if calibrated just prior to measurement. The microprocessor circuits can be the basis of systems to automatically control this function. Transfer standards and control circuits will be adapted for this technique.
KEYWORDS: POLLUTION;MEASURING INSTRUMENTS;MEASURING METHODS;COMPUTERS;AUTOMATION;TRANSDUCERS;ELECTRONIC EQUIPMENT;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION

<091019>
TITLE: Evaluation Studies of Instrument Components
PROJECT NUMBER: 000736
PRINCIPAL INVESTIGATOR: Graveson, R.T.
ADDRESS: 376 Hudson Street, New York, NY 10014
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DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$74,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/Fission (25%);GEOTHERMAL/General (25%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective of this project is to improve the sensitivity and reliability of measurements based on the characteristics and quality of new components and of instrument techniques.
APPROACH: New devices are characterized and new instruments investigated as the basis for predicting performance in a particular application. The uniqueness of response of optical, electronic and mechanical transducers to their stated parameters is determined by testing. Correlation with theoretical principles is performed so that efficiency of design can be deduced. Also, the instrument or device response is investigated at conditions of temperature, pressure, humidity and physical abuse so that the limits of reliability can be described.
RESULTS: The solid state devices used as electrical transducers for air pressure measurements will be characterized for linearity, stability and accuracy. These can be used for automatically recording differential pressure drop across filters and orifices. The metal oxide semiconductor transistors are particularly susceptible to humidity. The change in this device's characteristics will be related to the moisture content of the air, and its feasibility as a humidity detector will be determined. Optical absorption techniques will be applied to the detection of gaseous contaminants in the atmosphere, such as ozone.
KEYWORDS: AIR POLLUTION;AIR SAMPLERS;EQUIPMENT;PERFORMANCE TESTING;SENSITIVITY;EFFICIENCY;DESIGN;HUMIDITY;MOISTURE;FEASIBILITY STUDIES;TECHNOLOGY ASSESSMENT;MEASURING INSTRUMENTS;MEASURING METHODS

<091020>
TITLE: Analytical Development Studies
PROJECT NUMBER: 001778
PRINCIPAL INVESTIGATOR: Welford, G.A.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$173,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (30%);METALS (70%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of this program are to develop methods of analysis for selected trace elements, anions, organic and gaseous pollutants in environmental and biological materials; and to determine the reliability of the selected method for the specific pollutant with variations in major and minor constituents. Individual pollutants will be investigated based on potential toxicity to man, reported levels of environmental contamination, and reported reliability of existing methods and measurements. Methods to be developed will be subjected to extensive evaluation by analyzing actual samples over extended periods of time so that accuracy and precision statements are possible.
APPROACH: Both classical and newer analytical techniques for isolating the material and sensitive instrumentation for determination will be investigated.
RESULTS: Investigations are in progress to handle larger samples and to include chemical isolation in order to increase analytical precision and accuracy. Methods for analyzing anions and trace metals in precipitation samples from baseline stations will be provided. Methods for analyzing selected gaseous and organic pollutants in air and water samples will also be developed as required.
KEYWORDS: BIOLOGICAL MATERIALS;QUALITATIVE CHEMICAL ANALYSIS;QUANTITATIVE CHEMICAL ANALYSIS;ENVIRONMENT;POLLUTION;ANIONS;ORGANIC COMPOUNDS;GASEOUS WASTES;MEASURING METHODS;HEALTH HAZARDS;RELIABILITY;AIR POLLUTION;WATER POLLUTION;CHEMICAL ANALYSIS;EQUIPMENT;ELEMENTS;TRACE AMOUNTS

<091021>
TITLE: Trace Elements in the Biosphere
PROJECT NUMBER: 001779
PRINCIPAL INVESTIGATOR: Hardy, E.P. Jr.
ADDRESS: 376 Hudson Street, New York, NY 10014
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DIVISION: Health and Safety Laboratory
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TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Energy Research and Development Administration FY77:$46,500
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: TRANSPORTATION (20%);ELECTRICITY GENERATION (80%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (60%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objective is to measure and evaluate trace metal concentrations in various biological materials and systems with specific emphasis on the pathways to man and the levels in diet and human tissue.
APPROACH: Human metabolic balance experiments utilizing the cadmium, copper, manganese, nickel, lead and zinc naturally present in the diet are carried out on a cooperative basis with Dr. Herta Spencer of the Hines Veterans Administration Hospital near Chicago. Trace element concentrations in various trophic levels of the food web leading to man will be determined in an area where a coal-fired fossil-fuel plant is to be constructed. Sediment cores from four lakes will be chronologically sectioned and analyzed for trace metals to obtain a history of anthropogenic pollution. The cores will be taken by the Woods Hole Oceanographic Institution as part of a joint project.
RESULTS: The controlled intake and excretion experiments are designed to compare trace element behavior under various intake conditions with regard to absorption and retention patterns. Identification of natural pathways of trace metals in an area where a coal-fired plant will be constructed will allow assessments to be made of the impact on biological systems when the plant or similar plants is in operation. Observed time trends in trace metal concentrations in human tissues will be compared with air and diet measurements to assess the more important exposure route.
KEYWORDS: BIOSPHERE;TRACE AMOUNTS;AIR POLLUTION;FOSSIL FUELS;ENVIRONMENTAL EFFECTS;ENVIRONMENTAL EXPOSURE PATHWAY;MAN;METABOLISM;HEALTH HAZARDS;CADMIUM;COPPER;MANGANESE;NICKEL;LEAD;ZINC;FOSSIL-FUEL POWER PLANTS;WATER POLLUTION;LAND POLLUTION;POLLUTION;FOOD;TISSUES

<091022>
TITLE: Documentation of Natural Activity Levels in the Biosphere
PROJECT NUMBER: 001780
PRINCIPAL INVESTIGATOR: Welford, G.A.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: P660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: COMBUSTION OR END USE (30%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Marine;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project has been undertaken to document the naturally occurring radioactive nuclides in man and his environment.
APPROACH: Measurements of natural radionuclides including radium-226, lead and polonium-210 in wet, dry, and total fallout in the urban environment will be performed. Analyses will be made of World Health Organization human bones for radium-226 and stable calcium. Measurement of samples from areas around coal-fired power plants to document their discharge of natural radionuclides will also be performed.
RESULTS: The expected data should illustrate seasonal and spatial variations of natural radionuclides. The World Health Organization bone analyses offer a relatively fast and inexpensive method of locating areas of high natural radioactivity for detailed study.
KEYWORDS: BIOSPHERE;BACKGROUND RADIATION;ECOSYSTEMS;RADIATION MONITORING;RADIOISOTOPES;RADIUM 226;LEAD;POLONIUM 210;CALCIUM;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;NATURAL OCCURRENCE;RADIOECOLOGICAL CONCENTRATION;CONTAMINATION;RADIOACTIVE EFFLUENTS;MAN;INGESTION;INHALATION;TISSUES

<091023>
TITLE: Non-Nuclear Pollutants in Surface Air
PROJECT NUMBER: 001781
PRINCIPAL INVESTIGATOR: Hardy, E.P. Jr.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: P660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$156,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: TRANSPORTATION (30%);ELECTRICITY GENERATION (70%)
POLLUTANTS: NOXIOUS GAS (30%);METALS (60%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The HASL Surface Air Sampling Program provides stable lead particulate concentrations through the entire range of pollution levels from the global baseline concentrations observed at Mauna Loa, Hawaii to some of the most highly contaminated urban centers in both hemispheres. Measurements of sulfate, nitrate and a number of trace metals will be initiated at selected sites. The basic aim is to document the air concentrations of energy-related pollutants as part of the input information required to assess their impacts on the environment and man.
APPROACH: Twenty stations extending from 77 degrees N to the South Pole collect particulates on Microsorban filters. Similar air sampling is carried out at a regional station 35 miles west of lower Manhattan. Measurements of industrial gaseous pollutants will be initiated at the regional site. HASL will evaluate, supervise the manufacture, and field test special gas chromatographic-electron capture analyzers developed

by NOAA for planned releases of atmospheric tracers. The air samplers at some of the regional and global baseline stations have been modified to collect as a function of wind direction so that only clean air, unperturbed by local sources, is sampled. Techniques and capabilities developed in this program will be applied to the Multistate Atmospheric Power Production Pollution Study (MAP/sup 3/S).
RESULTS: The sampling network will provide data on transport mechanisms and on sources of pollution. The tracer studies are intended to test models of transcontinental atmospheric transport.
KEYWORDS: BASELINE DATA;SURFACE AIR;AIR POLLUTION;FOSSIL FUELS;LEAD;DIFFUSION;AIR SAMPLERS;DESIGN;SULFATES;NITRATES;HEALTH HAZARDS;TRACE AMOUNTS;ELEMENTS;REGIONAL ANALYSIS;GLOBAL ASPECTS

<091024>
TITLE: Assessment and Control of Non-Nuclear Air Contaminants
PROJECT NUMBER: 001785
PRINCIPAL INVESTIGATOR: Breslin, A.J.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$117,000
TECHNOLOGY: FOSSIL FUEL/General (90%);GEOTHERMAL/General (2%);SOLAR/General (2%);CONSERVATION/General (6%)
ENERGY CYCLE: COMBUSTION OR END USE (30%)
POLLUTANTS: PARTICULATES (50%);SPECIFIED OTHER POLLUTANTS/Aerosols (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Methods are developed for assessing and reducing exposures to man from hazardous air contaminants arising from energy production.
APPROACH: The reliability of techniques for monitoring exposures to toxic substances is improved through studies of the performance of monitoring instrumentation in practical applications. Methods of measurement are developed to improve definition of hazardous aerosols through proper recognition of the effects of physical and chemical properties on respiratory tract deposition and retention. The basic elements of control technology are evaluated for their effectiveness as applied to processes that generate hazardous atmospheres. Deficiencies are remedied by improving existing methods or devising alternatives.
KEYWORDS: AIR POLLUTION;AIR SAMPLERS;PERFORMANCE TESTING;AEROSOLS;DIFFUSION;HEALTH HAZARDS;CONTROL;MEASURING METHODS;TECHNOLOGY ASSESSMENT;INHALATION;DOSEMETERS

<091029>
TITLE: Inconvenience Payment to Utirik People
PROJECT NUMBER: 006276
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Plutonium;RADIATION/Iodine (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Marshall Islands
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Recompensation to Utirik people for suffering from fallout in 1954.
KEYWORDS: RADIOACTIVITY;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;EPIDEMIOLOGY;MARSHALL ISLANDS;FALLOUT;GOVERNMENT POLICIES;COST;SOCIO-ECONOMIC FACTORS

<091032>
TITLE: The Cytogenetic Bases of Resistance to Radiation-Induced Sterility in Insect Species with Holokinetic Chromosomes
PROJECT NUMBER: 6519
PRINCIPAL INVESTIGATOR: Lachance, L.E.
ADDRESS: Department of Agriculture
AFFILIATION: Department of Agriculture, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$37,000
TECHNOLOGY: SOLAR/Biomass (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Development of the sterile male technique for lepidopteran species (pink bollworm, tobacco budworm, corn borer, cabbage looper, codling moth, flour moth) would permit the control of important agricultural pests without continued reliance on pesticides. This approach has proven successful in several dipteran species. However, lepidopteran species require extremely high radiation doses to induce sterility, and this may affect field competitiveness. These species also have holokinetic chromosomes, and we are investigating the possible relation between kinetochore structure and radioresistance. Sterility involves either failure of the treated males to transfer eupyrene sperm or the induction of dominant lethal mutations in the sperm. Studies include the cytogenetic nature of dominant lethal mutations and their time of expression, effects of radiation on sperm transfer and other aspects of reproductive physiology, determination of optimum stage to irradiate to minimize debilitating effects, use of sterile hybrids from interspecific crosses, biochemical and electron microscope studies of lepidopteran chromosomes and dividing cells.
APPROACH: (1) Majority of insects can transfer eupyrene sperm at the fully sterilizing doses; (2) at semi-sterilizing doses the F/sub 1/ progeny are more sterile than the treated parent, but the F/sub 1/ males often do not inseminate the females. (3) Unlike the Diptera, dominant lethal mutations induced in

sperm produce late embryonic deaths. (4) Holokinetic chromosomes do not always confer radioresistance. (5) Eupyrene sperm transfer is required in order for the female to start ovipositing and become unreceptive to future matings. (6) Photoperiod drastically affects the reproductive ability of these species.
KWORDS: CYTOGENETICS;PEST;STERILITY;INSECTS;CHROMOSOMES;RADIOSENSITIVITY;GENETIC VARIABILITY;MALES;STERILE MALE TECHNIQUE;STERILE INSECT RELEASE;AGRICULTURE;STERILITY;RADIOINDUCTION;CROPS;PRODUCTION

<091037>
TITLE: Flow of Energy Cycling of Elements and Effects of Environmental Change in Estuarine and Nearshore Oceanic Ecosystems
PROJECT NUMBER: 006536
PRINCIPAL INVESTIGATOR: Rice, T.R.
ADDRESS: Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Beaufort, NC 28516
AFFILIATION: National Marine Fisheries Service, Beaufort, N.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George
TELEPHONE: C(301)353-5548
TYPE OF FUNDING: Contract No.-E(49-7)-5
77 FUNDING: Energy Research and Development Administration FY77:$310,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);NUCLEAR/Fission (50%)
POLLUTANTS: METALS (33%);RADIATION (33%);HEAT, THERMAL (34%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Southeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: A long term multidisciplinary study of cycling and effects of nuclide, metal, and other pollutants in estuarine environments.
KEYWORDS: AQUATIC ECOSYSTEMS;BIOLOGICAL MODELS;MINERAL CYCLING;RADIOISOTOPES;RADIONUCLIDE MIGRATION;RADIONUCLIDE KINETICS;METALS;TRANSLOCATION;COAL INDUSTRY;FISSION PRODUCTS;ENVIRONMENTAL EFFECTS;WATER POLLUTION;FISHES;INVERTEBRATES;CHEMICAL EFFLUENTS;COASTAL REGIONS;BACTERIA

<091038>
TITLE: Behavioral Measures of Environmental Stress: Marine Fishes and Invertebrates
PROJECT NUMBER: 006537
PRINCIPAL INVESTIGATOR: Olla, B.L.
ADDRESS: Sandy Hook Laboratory, NMFS, MACFC, Highlands, NJ 07732
AFFILIATION: National Oceanic and Atmospheric Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: C(301)353-5324
TYPE OF FUNDING: Contract No.-E(49-7)-3045;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$45,000; Environmental Protection Agency FY77:$34,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: HEAT, THERMAL/Thermal (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: A behavioral study of the effects of sub-lethal temperature stress on species representative of the near shore environment of the Mid-Atlantic region. Fish and invertebrates typical of major modes of life are used.
KEYWORDS: AQUATIC ECOSYSTEMS;FISHES;BEHAVIOR;THERMAL POLLUTION;TEMPERATURE EFFECTS;BIOLOGICAL STRESS;WATER POLLUTION;INVERTEBRATES;THERMAL EFFLUENTS;AQUATIC ORGANISMS

<091040>
TITLE: Project Ash Can
PROJECT NUMBER: 006542
PRINCIPAL INVESTIGATOR: Falkowski, S.J.
ADDRESS: Acting Director of Technical Plans and Operations, Air Force Geophysics Laboratory, L.G. Hanscom Field, Bedford, MA 01730
AFFILIATION: Air Force Geophysics Lab., Hanscom AFB, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Gross, Thomas J.
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$305,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Balloon-borne particulate and gas samplers are flown to altitudes of 70, 80, and 90,000 ft from sites at Fairbanks, Alaska; Alamagordo, New Mexico; and Panama Canal Zone. Flights to 105, 120, and 135,000 ft are capable of being flown. Schedules are coordinated with Project Airstream, the aircraft-borne sampling program which, together with Project Ash Can, constitutes the ERDA upper air sampling program. Payloads are recovered using ground or aerial recovery techniques and filter papers are sent to the ERDA Health and Safety Laboratory for analysis of particulate radioactivity. Exposed molecular sieve is analyzed at Argonne National Laboratory for carbon-14. Interpretative analysis of data is by HASL

and the Air Resources Laboratory, NOAA. The project also includes several test flights for research and development of samplers, associated equipment, and sampling techniques. Guest payloads are flown on most routine and test flights.
KEYWORDS: BALLOONS;AIRCRAFT;AIR POLLUTION;FALLOUT;AERIAL MONITORING;RADIATION MONITORING;EARTH ATMOSPHERE;SAMPLING

<091041>
TITLE: Airlift Support of Project Ash Can
PROJECT NUMBER: 006544
PRINCIPAL INVESTIGATOR: Gaskill, S.E.
ADDRESS: DCS, Controller, Hq Military Airlift Command, Scott Air Force Base, IL 62225
AFFILIATION: Military Airlift Command, Scott AFB, Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Gross, Thomas J.
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$65,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Balloon-borne particulate and gas samplers are flown to altitudes of 70, 80, and 90,000 ft from sites at Fairbanks, Alaska; Alamagordo, New Mexico; and Panama Canal Zone. Flights to 105, 120, and 135,000 ft are capable of being flown.
KEYWORDS: EARTH ATMOSPHERE;RADIATION MONITORING;BALLOONS;SAMPLING;AERIAL MONITORING;AIRCRAFT

<091042>
TITLE: Part I. Transport, Deposition, and Meteorological Effects of Atomic Debris in the Atmosphere
PROJECT NUMBER: 006547
PRINCIPAL INVESTIGATOR: Machta, L.
ADDRESS: National Oceanographic and Atmospheric Administration, Air Resources Laboratory, Silver Spring, MD
AFFILIATION: National Oceanic and Atmospheric Administration, Silver Spring, Md. (USA). Air Resources Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Ballentine, David S.
TELEPHONE: F233-3600;C(301)353-3600
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$524,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (80%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The research is directed toward improving techniques for predicting the distribution, transport, and deposition of radioactive debris in the atmosphere while simultaneously using radioactive debris as tracers to investigate atmospheric processes. Balloon, aircraft, and surface sampling systems have provided data on various radioactive tracers from nuclear testing, from other atmospheric inputs, and from natural processes. These tracers have been used to develop models of stratospheric circulation, of stratospheric-tropospheric exchange, of interhemispheric mixing, temporal and spatial deposition, and verification of global circulation models. This project also provides technical assistance to the high altitude sampling program, model development and long-range transport studies applicable to fossil fuels as well as radioactive contaminants.
KEYWORDS: FALLOUT;RADIATION MONITORING;EARTH ATMOSPHERE;DEPOSITION;AERIAL MONITORING;BALLOONS;AIRCRAFT;MASS TRANSFER;AIR POLLUTION;MATHEMATICAL MODELS

<091045>
TITLE: Advisory Center on Toxicology
PROJECT NUMBER: 006557
AFFILIATION: Department of the Navy, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$29,000
TECHNOLOGY: FOSSIL FUEL/Coal (75%);NUCLEAR/Fission (25%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (25%);ORGANICS (25%);RADIATION (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
KEYWORDS: TOXICITY;HEALTH HAZARDS;ENERGY;POLLUTION;GASES;METALS;ORGANIC COMPOUNDS;RADIATIONS;DATA ACQUISITION SYSTEMS;INFORMATION;CARCINOGENS;DISEASES;MEDICINE;METABOLISM

<091046>
TITLE: Study of Plutonium Oxide in a Natural Environment; Project Indola
PROJECT NUMBER: 006558
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5355
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION/Plutonium;RADIATION/Americium (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Spain

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Study of the physiological and ecological behavior of plutonium oxide in a contaminated rural environment.
ROACH: This is a four-point program designed to obtain information on (1) uptake and excretion of plutonium and uranium by a population group, (2) resuspension of plutonium from contaminated soil, (3) internal and external contamination of agricultural products, and (4) temporal migration and redistribution of plutonium oxide in the soil.
RESULTS: A summary of the data obtained in Project Indola was prepared.
PROJECT MILESTONES: Annual review of the program and evaluation of equipment requests.
KEYWORDS: FATE;PLUTONIUM OXIDES;AMERICIUM OXIDES;SPAIN;FISSION PRODUCTS;HEALTH HAZARDS;BIOLOGICAL RADIATION EFFECTS;BIOLOGICAL REPAIR;BIOLOGICAL RECOVERY;TOXICITY;METABOLISM;INHALATION;AIR POLLUTION;RADIONUCLIDE MIGRATION,RADIONUCLIDE KINETICS;CARCINOGENS;MEDICINE;SOILS

<091053>
TITLE: Airstream
PROJECT NUMBER: 006807
PRINCIPAL INVESTIGATOR: Johnston, B.
ADDRESS: Associate Administrator for Applications, NASA Headquarters, Washington, DC 20546
AFFILIATION: National Aeronautics and Space Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Gross, Thomas J.
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$458,000
TECHNOLOGY: NUCLEAR/Fission (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: A WB-57F aircraft flies particulate, whole air, and tritium samplers from bases at Anchorage, Alaska; Tacoma, Washington; Houston, Texas; and the Panama Canal Zone three times a year at four altitudes ranging from 40-63,000 ft to provide a nearly continuous sampling profile from 75 degress N to 10 degrees S latitude along the west coast of the Western Hemisphere. Schedules are coordinated with Project Ash Can, the balloon-borne sampling program in the Northern Hemisphere, which, together with Project Airstream, constitutes the ERDA upper air sampling program. Filters and whole air samples are sent to the ERDA Health and Safety Laboratory for analysis of particulate and gaseous radioactivity and other constituents including fluorocarbons. Tritium samples are analyzed by the University of Miami. Interpretive analysis of data is done by HASL and the Air Resources Laboratory, NOAA. Guest payloads are flown on many flights.
KEYWORDS: AERIAL MONITORING;SAMPLING;AIR POLLUTION;AIRCRAFT;TRITIUM;EARTH ATMOSPHERE;RADIATION MONITORING

<091060>
TITLE: Health Effects--Krypton
PROJECT NUMBER: 007194
PRINCIPAL INVESTIGATOR: Kirk, W.
ADDRESS: U.S. Environmental Protection Agency, Research Triangle Park, NC 27711
AFFILIATION: Environmental Protection Agency, Research Triangle Park, N.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: C(301)353-5468
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION/Kr;RADIATION/Ze (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Kr-85 is a radioactive noble gas which is produced and released into the environment in large quantities in fission reactors. To define the biological hazard from Kr-85 released into the environment experimental animals are being exposed to a cloud of Kr-85. The study will evaluate long-term exposure effects in guinea pigs and chronic exposure of rats to w-10,000 times the occupational MPC/sub (a)/ for Kr-85.
APPROACH: The distribution, rate of removal and the dose to several organs in the animals were determined. Following this evaluation animals were exposed to determine the acute LD/sub 50-90/ for acute exposure. Chronic exposures to Kr-85 with lifetime of observation of the animals are in progress to evaluate long-term hazards. Rats will be exposed in utero and chronically post-natally to Kr-85 in a beta infinite geometry at multiples of the occupational MPC/sub (a)/.
RESULTS: The results of this research will make it possible to define the acute and chronic effects of exposure to Kr-85 in rodents. Evaluation of the effects from these exposures relative to other radiation sources and determination of relative biological affectiveness of Kr-85 exposures is essential. This will make it possible to determine if MPC/sub (a)/ and other standards for this noble are appropriate.
PROJECT MILESTONES: (1) FY 78 Evaluate carcinogenic and other biological effects of high level Kr-85 exposures which produce major life-shortening. (2) FY 79 Evaluate life shortening, total tumor incidence and other biological alterations in rats and guinea pigs exposed to lower levels of Kr-85 either as a single exposure or chronically. (3) FY 80 Determine how the data support or suggest changes in current standards. Evaluate the need for future studies.
KEYWORDS: KRYPTON 85;BIOLOGICAL RADIATION EFFECTS;CHRONIC IRRADIATION;INTERNAL IRRADIATION;GUINEA PIGS;RATS;DOSE-RESPONSE RELATIONSHIPS;RADIATION DOSE DISTRIBUTIONS;LIFE SPAN;SURVIVAL CURVES;LETHAL IRRADIATION;TIME DEPENDENCE;ACUTE IRRADIATION;HEALTH HAZARDS;NUCLEAR POWER PLANTS;RADIOACTIVE EFFLUENTS;GASEOUS WASTES;HUMAN POPULATIONS;ENVIRONMENTAL TRANSPORT;INHALATION;WHOLE-BODY IRRADIATION;RARE GASES

<091061>
TITLE: Development of a National Plan for the Safety and Health of Divers in Their Quest for Subsea Energy
PROJECT NUMBER: 007186
PRINCIPAL INVESTIGATOR: Wallace, D.H.
ADDRESS: National Oceanic and Atmospheric Administration, 6010 Executive Blvd., Rockville, MD 20852
AFFILIATION: Department of Commerce, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Weyzen, W.W.
TYPE OF FUNDING: Interagency agreement-National Oceanic and Atmospheric Administration
77 FUNDING: Energy Research and Development Administration FY77:$500,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Hyperbaric conditions (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To establish a U.S. National Diving Accident Network capable of giving medical advice and rendering emergency treatment of diving casualties and to develop a program of training in underwater technology.
APPROACH: Conduct a comprehensive analysis of emergency medical technician/diver training available in the U.S. and the design and implementation of a hyberbaric training program for physicians. Conduct a survey of hyperbaric treatment facilities and make recommendations based on previously established acceptance criteria for their inclusion in the network of emergeny treatment centers. Provide support for the development of a program leading to an Associate of Science Degree in Underwater technology.
RESULTS: The program for hyperbaric medicine training has been established and six physicians have completed the course and are now capable of functioning in the proposed network. The survey of hyperbaric treatment facilities is underway. The college-level training program in undersea technology has currently over 60 students enrolled in the first year class which commences in January 1976.
PROJECT MILESTONES: A preliminary report on the possible network of hyperbaric treatment centers will be prepared September 30, 1978.
KEYWORDS: HYPERBARIC;UNDERWATER OPERATIONS;PERSONNEL;DIVING OPERATIONS;SAFETY;EDUCATION;ACCIDENTS;FIRST AID;THERAPY;MEDICINE;HIGH PRESSURE;ENVIRONMENT;BIOLOGICAL EFFECTS

<091062>
TITLE: Gulf Geothermal SEIS/SUBS
PROJECT NUMBER: 007227
PRINCIPAL INVESTIGATOR: Gangliono
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: GEOTHERMAL/General (100%)
KEYWORDS: GEOTHERMAL ENERGY;ENVIRONMENTAL IMPACTS;GULF OF MEXICO;SEISMIC SURVEYS

<091063>
TITLE: Remote Measurement of Atmospheric Pauam
PROJECT NUMBER: 007376
PRINCIPAL INVESTIGATOR: Haugen
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$67,000
TECHNOLOGY: GENERAL SCIENCE (100%)
KEYWORDS: REMOTE SENSING;EARTH ATMOSPHERE;AIR QUALITY;MONITORING;MEASURING METHODS

<091064>
TITLE: Studies and Environmental Policy Analysis: Air Quality Issues that Affect ERDA Programs
PROJECT NUMBER: 007414
PRINCIPAL INVESTIGATOR: none
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: GENERAL SCIENCE (100%)

<091065>
TITLE: Social and Economic Impacts of Energy Facilities Siting
PROJECT NUMBER: 007258
PRINCIPAL INVESTIGATOR: Susskind, L.;O'Hare, M.
ADDRESS: Laboratory of Architecture and Planning, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA). Lab. of Architecture and Planning
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Office
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-E 76-A-01-2295
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To assess state and local responses to energy development needs.
APPROACH: Case studies plus analysis.
RESULTS: Improved understanding of methods available for states for accommodating development needs.
PROJECT MILESTONES: Periodic progress reports. Final report.
KEYWORDS: LAND USE;ENERGY SOURCES;SITE SELECTION;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;COST BENEFIT ANALYSIS;DECISION MAKING;COMPARATIVE EVALUATIONS;PUBLIC OPINION

<091070>
TITLE: Energy and Social Science Evaluations
PROJECT NUMBER: 007267
INCIPAL INVESTIGATOR: Gould, L.;Walker, C.
ADDRESS: Yale University, Institution for Social and Policy Studies, New Haven, CT 06520
AFFILIATION: Yale Univ., New Haven, Conn. (USA). Institution for Social and Policy Studies
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Office
MONITOR: Ccoper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-E-0277-0231.00
77 FUNDING: Energy Research and Development Administration FY77:$5,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);SOLAR/General (25%);CONSERVATION/General (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To specify requirements of social impact assessments for energy technologies and apply assessment methcds to selected energy and conservation options.
APPROACH: Analytical.
RESULTS: Individual reports on aspects of social impact assessment; assembly of relevant documents; social impact assessments.
PROJECT MILESTONES: Reports, workshops. Interim report Sept. 1978.
KEYWORDS: ENERGY SOURCES;ENERGY MANAGEMENT;ENERGY CONSERVATION;SOCIO-ECONOMIC FACTORS;PUBLIC OPINION;DATA COMPILATION;TECHNOLOGY ASSESSMENT;REGIONAL ANALYSIS;EPIDEMIOLOGY

<091071>
TITLE: Health and Safety Effects on Productivity in Eastern and Western Coal Mines
PROJECT NUMBER: 7598
PRINCIPAL INVESTIGATOR: Conway, R.
ADDRESS: Washington, DC
AFFILIATION: Systems Consultants, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Blumenauer, William
TYPE OF FUNDING: Contract No.-E-01-77-0492
77 FUNDING: Energy Research and Development Administration FY77:$16,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: PARTICULATES/Dust (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: A set of issues related to productivity and health/safety as they relate to coal mining to the year 1985 will be assembled through a review of the literature and through interviews with representatives of industry, labor, government and public interest groups. The study team will particularly concentrate on issues that highlight or exemplify the regional differences that exist in Eastern and Western mining activities.
RESULTS: The product of task I will be a compilation and discussion of the occupational health/safety and productivity issues associated with coal mining through the year 1985. The product of task II will be a series of displays that reflect the relationship between the cost of coal and factors affecting productivity and occupational health/safety.
KEYWORDS: DUSTS;COAL INDUSTRY;HEALTH HAZARDS;COAL MINING;FORECASTING;OCCUPATIONS;ECONOMICS;SOCIO-ECONOMIC FACTORS;SAFETY;DATA COMPILATION;REGIONAL ANALYSIS;COMPARATIVE EVALUATIONS

<091072>
TITLE: Assessment of the Potential Environmental Conflicts of Energy Conservation Activities
PROJECT NUMBER: 7599
PRINCIPAL INVESTIGATOR: Rattien
ADDRESS: 1055 Jefferson St., N.W., Suite 414, Washington, DC 20007
AFFILIATION: Donovan, Hamester and Rattien, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Blumenauer, William
TYPE OF FUNDING: Contract No.-E-01-77-0489
77 FUNDING: Energy Research and Development Administration FY77:$39,000
TECHNOLCGY: CONSERVATION/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This proposal would review environmental/conservation literature, examine the criteria for characterizing the direct or indirect environmental effects--long term and short term, structure a means for quantifying the system wide impacts and provide policy-oriented insights.
APPROACH: Develop a set of the key environmental parameters that should be measured quantitatively and develop a format for arraying them with regard to a wide range of conservation options. The key indicators and measures of environmental conflict resulting from energy conservation and decentralized technologies will be examined and clarified.
PROJECT MILESTONES: (1) Contract award date Initiate Tasks 1, 2 and 4. (2) After 2 months Submit draft of Task 1 report; initiate Task 3. (3) After 2 1/2 months Submit draft of Task 2 report; initiate Task 5. (4) After 4 months Complete Tasks 3, 4, and 5; submit copies of draft final report. (5) After 4 1/2 months Comments on draft final report obtained from ERDA. (6) After 5 months Submit 10 copies of final report.
KEYWORDS: ENERGY CONSERVATION;ENVIRONMENTAL IMPACTS;DATA COMPILATION;DATA ANALYSIS;GOVERNMENT POLICIES;ENERGY POLICY;CHEMICAL EFFLUENTS;DECISION MAKING

<091073>
TITLE: Analysis Assistance: Presidential Messages
PROJECT NUMBER: 7600
PRINCIPAL INVESTIGATOR: Rattien
ADDRESS: 1055 Jefferson St., N.W., Suite 414, Washington, DC 20007
AFFILIATION: Donovan, Hamester and Rattien, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Blumenauer, William
TYPE OF FUNDING: Contract No.-E-01-77-0437
77 FUNDING: Energy Research and Development Administration FY77:$9,000
TECHNOLCGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Prepare a detailed analysis of (at least) the following: (a) ''The National Energy Plan'' (4/29/77), (b) The National Energy Act (H.R. 6831-4/29/77), (c) The President's Environmental Message (5/24/77), (d) ''Fact Sheet'' for Environmental Message. This analysis shall give particular attention to those areas in the above four national policy documents in which there are trade-offs implied between environmental factors and energy development and use.
APPROACH: This analysis shall further be oriented toward the practical implications of these national policy statements as they affect the design of programs in the Office of the Assistant Administrator for Environment and Safety for FY 1978 through FY 1980, with full consideration of similar factors that are likely to be important in the proposed Department of Energy.
PROJECT MILESTONES: This analysis shall be completed according to the following schedule: (1) Briefing and draft report, submitted to the AES Office of Environmental Policy Analysis, within 7 weeks of contract award (12 copies); (2) Final report-12 weeks from award of contract (25 copies).
KEYWORDS: ENERGY POLICY;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL IMPACTS;GOVERNMENT POLICIES;DATA ANALYSIS;DOCUMENT TYPES;ECOSYSTEMS;TECHNOLOGY ASSESSMENT

<091074>
TITLE: Energy Policy Analysis Document
PROJECT NUMBER: 7603
PRINCIPAL INVESTIGATOR: Stover, L.V.
ADDRESS: 4 Research Place, Rockville, MD 20850
AFFILIATION: NUS Corp., Rockville, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Blumenauer, William
TYPE OF FUNDING: Contract No.-E-01-77-0521
77 FUNDING: Energy Research and Development Administration FY77:$9,000
TECHNOLCGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The contractor shall prepare and submit to ERDA a report dealing with environmental policy analysis. The report shall be organized to address the following specific matters: (1) the process of environmental policy analysis; (2) inventory of baseline data; (3) development of environmental subsystems; (4) environmental quality profile; (5) environmental goals; (6) environmental development objectives; (7) specifications of alternatives; (8) environmental impact assessment; (9) ranking of alternatives; (10) optimization.
PROJECT MILESTONES: A detailed outline of the report will be delivered by August 5, 1977 and after review and coordinatiCn the draft report will be delivered by August 15. The final, after revision, will be delivered by September 1.
KEYWORDS: ENERGY POLICY;DATA ANALYSIS;EVALUATION;ENVIRONMENT;BASELINE ECOLOGY;INTERCHANGEABILITY;QUALITY CONTRCI;ECCSYSTEMS

<091075>
TITLE: Studies of Selective Laser Methods for the Detection of OH, OH2, ClO and Other Trace Constituents in the Atmosphere
PROJECT NUMBER: 7609
PRINCIPAL INVESTIGATOR: Wang, C.C.
ADDRESS: P.O. Box 2053, Dearborn, MI 48123
AFFILIATION: Ford Motor Co., Dearborn, Mich. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Washington Headquarters
77 FUNDING: Energy Research and Development Administration FY77:$91,000
TECHNOLCGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Dr. Wang proposes to develop an instrumental capability for the measurement of OH, OH2 and ClO at various altitudes based on laser-induced fluorescence techniques. Particular attention will be given to region 20 to 35 km, which covers the ozone belt. No measurements have been made at low altitudes in the field. In 1974 this group was the first to measure OH in ambient air (laboratory), with a detection limit of approximately 5 x 10atsup 6at OH/cm3. The problems facing them for a field measurement capatility are to overcome interference effects including: (a) Two-photon dissociation of water; (b) Laser-induced dissociation of ozone; and (c) Dissociation of various trace constituents. They will concentrate on two-photon excitation for OH measurements. The companion radial, HO2, will require development of the use of a third harmonic of a dye laser (2,000 A).
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;EARTH ATMOSPHERE;ALTITUDE;CHEMICAL COMPOSITION;LASERS;FLUORESCENCE SPECTROSCOPY;HYDROXIDES;CARBON 10;MEASURING METHODS;OZONE;PHOTONS;CHEMICAL REACTIONS;CHEMICAL EFFLUENTS;GASEOUS WASTES;TRACE AMOUNTS;HYDROXYL RADICALS;CHLORINE OXIDES

<091076>
TITLE: Cooperative Effort for Development, Fabrication, and Evaluation of Gas Analysis and Detection System for Multiple Trace Gas Characterization Measurement and Monitoring
JECT NUMBER: 7610
NCIPAL INVESTIGATOR: Wood, G.M.
ADDRESS: Langley Research Center, Hampton, VA 23665
AFFILIATION: National Aeronautics and Space Administration, Langley Station, Va. (USA). Langley Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Washington Headquarters
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);ORGANICS (50%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The subject of this interagency agreement with NASA is the support of a cooperative effort for development, fabrication, and evaluation of a gas analysis system for multiple trace gas characterization, measurement and monitoring. The objective is development of a low-cost small, portable mass spectrometer having direct air sample inlet features and incorporating a rugged, simplified, early serviceable quadruple MS head unit, ion source, ion pump, microprocessor, etc.
KEYWORDS: AIR POLLUTION MONITORS;DESIGN;PERFORMANCE TESTING;CHEMICAL EFFLUENTS;GASEOUS WASTES;TRACE AMOUNTS;MONITORING;MASS SPECTROMETERS;HYDROCARBONS

<091077>
TITLE: Assessment of Oil Spill Prevention and Clean-up
PROJECT NUMBER: 800069
PRINCIPAL INVESTIGATOR: King, W.L.
AFFILIATION: Coast Guard, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts all;HYDROGRAPHIC AREAS/Other hydrographic areas all
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECT
PROJECT DESCRIPTION: To determine the extents of hazard of 5.7 cubic meter liquid natural gas released on water utilizing predictive mathematical models to determine extent of hazard. Perform appropriate field experiments and compare analyzed results with models.
KEYWORDS: OIL SPILLS;CLEANING;WATER POLLUTION ABATEMENT;MARITIME TRANSPORT;LIQUEFIED NATURAL GAS;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;COMPARATIVE EVALUATIONS

<091078>
TITLE: Environmental Implications of Acid Mine Drainage
PROJECT NUMBER: 800137
AFFILIATION: West Virginia Univ., Morgantown (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
KEYWORDS: COAL MINES;LIQUID WASTES;ACID MINE DRAINAGE;ENVIRONMENTAL EFFECTS

<091123>
TITLE: Impacts Associated with Offshore Power Plants-Transport and Fate of Nickel, Copper and Zinc in Coastal Waters of North Carolina
PROJECT NUMBER: 008009
PRINCIPAL INVESTIGATOR: Cross, F.A.
ADDRESS: National Marine Fisheries Service, Atlantic Estuarine Fisheries Center, Beaufort, NC 28516
AFFILIATION: National Marine Fisheries Service, Beaufort, N.C. (USA). Atlantic Estuarine Fisheries Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Saunders, George E.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: FY77:$100,000; Energy Research and Development Administration FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);FOSSIL FUEL/Oil and Gas (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: METALS/Copper;METALS/Nickel;METALS/Zinc (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Other coasts Mid-Atlantic;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Copper, nickel and zinc are three potential contaminants that are often present in discharge waters of power plants. Because additional power plants will be constructed along or off the east coast of the United States to meet increased electrical demand, the biogeochemical behavior of contaminants that will be released from these facilities must be known so that potential adverse effects on fisheries can be evaluated. Long-range objectives of this research are to (1) develop a dynamic model of the cycling and fate of these three metals in coastal waters of North Carolina and (2) determine the effects of dissolved organic compounds originating from watersheds and salt marshes on the physical transport and biological availability of copper to marine organisms. Specific objectives for FY 76 are to (1) determine baseline levels including temporal and spatial variability of concentrations of nickel,

copper and zinc in dissolved and particulate phases of water and in dominant pelagic organisms in coastal waters near Beaufort, North Carolina and (2) determine the concentrations and spatial variability of dissolved and organically chelated copper in the Newport River and estuary.
KEYWORDS: OFFSHORE SITES;THERMAL POWER PLANTS;CHEMICAL EFFLUENTS;COPPER;NICKEL;ZINC;BIOGEOCHEMISTRY;COASTAL WATERS

<091124>
TITLE: Effects of Condenser Passage on Marine Organisms
PROJECT NUMBER: 008011
PRINCIPAL INVESTIGATOR: Coutant, C.C.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$45,000
TECHNOLOGY: MULTITECHNOLOGY (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective is to determine the location in a simulated power plant condenser system where physical damage is done to small aquatic organisms, principally fish eggs and larvae, that are entrained in cooling water. The engineering objective is to provide design criteria for condenser piping and pumps that will minimize damages.
APPROACH: The approach is to pass test organisms through a simulated condenser cooling system and to observe immediate and latent mortality, or behavioral changes that could affect survival. Emphasis will be on the pump design in current experiments since previous work has concentrated on the condenser. Effects will be associated with specific features of pump design and operation where feasible, e.g., specific speed, and net positive suction head. A redesigned simulated condenser system is being constructed for experimentation in the spring of 1976.
RESULTS: Marine and freshwater organisms will be tested as available for collection or laboratory culture.
KEYWORDS: CONDENSER COOLING SYSTEMS;ENTRAINMENT;AQUATIC ORGANISMS;BIOLOGICAL EFFECTS;SURVIVAL TIME;MORTALITY;BEHAVIOR;PUMPS;DESIGN;FISHES;LARVAE

<091125>
TITLE: Non-nuclear Pollutants on the Earth's Surface
PROJECT NUMBER: 002477
PRINCIPAL INVESTIGATOR: Volchok, L.
ADDRESS: Health and Safety Laboratory, 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Slade, David
TELEPHONE: C(301)353-4374;F233-4374
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$156,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Lead;METALS/Cadmium;METALS/Nickel;METALS/Vanadium (80%);PARTICULATES/Sulfate;PARTICULATES/Nitrate;PARTICULATES/Chlorate (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Deposition of a number of stable trace metals is being measured routinely in New York City and San Francisco. In addition to the total deposit, a specially designed collector is being used to separate wet and dry fallout. A "regional" baseline station has been established at Lloyd, New York. The site, on land owned by New York State, has an instrumented 300 ft meteorological tower in addition to standard ground level weather observation instruments. Presently, total, wet, and dry fallout sampling is being carried out over monthly intervals. "Baseline" stations at Mauna Loa, Hawaii; Barrow, Alaska; American Samoa; and Antarctica are available to HASL through NOAA for carrying out long-term measurements of non-nuclear pollutants. The objective is to learn about geographical differences and time trends of pollutants which are distributed globally as opposed to emissions from local or regional sources. Through the French Atomic Energy Commission, HASL will also be able to maintain sampling equipment on Kerguellen Island. The present goals are to develop and improve low background sampling and analytical systems, to monitor the impact of energy systems upon global, regional and urban baseline levels and, to relate sources to concentrations and transport mechanisms.
APPROACH: Total as well as wet and dry fallout collected over monthly periods is being analyzed for lead, cadmium, nickel, and vanadium. This sampling is done in New York City, San Francisco, and Lloyd, N.Y. A wet-dry fallout collector has been developed and tested successfully in New York and San Francisco for over a year. Analytical methods are being developed for sulfate, nitrate, and chloride in wet and dry monthly fallout.
KEYWORDS: LEAD;CADMIUM;NICKEL;VANADIUM;AIR POLLUTION;CHEMICAL EFFLUENTS;GLOBAL ASPECTS;AIR SAMPLERS;METALS;TRACE AMOUNTS;PERFORMANCE TESTING;NEW YORK;CALIFORNIA;SAMPLING;SULFUR COMPOUNDS;DEPOSITION

<091131>
TITLE: Standard Neutron Fields
PROJECT NUMBER: 600034
PRINCIPAL INVESTIGATOR: Schwartz, R.B.
ADDRESS: Department of Commerce, National Bureau of Standards, Gaithersbury, MD
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Operational and Environmental Safety
MONITOR: Vallario, E.J.

TELEPHONE: F353-5640
TYPE OF FUNDING: Contract No.-F49-01-3800
77 FUNDING: Energy Research and Development Administration FY77:$70,000
CHNOLOGY: NUCLEAR/General (100%)
LLUTANTS: RADIATION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific ERDA contractors
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To make available four (4) monoenergetic neutron beams (thermal, 2 keV, 25 keV, and 144 keV) for use in evaluation and development of neutron dosimeters and portable survey instruments. These beams will be maintained afterwards for such work and as a calibration facility.
APPROACH: Filters appropriate to transmission of the desired energy are inserted into radial beam from the core of the reactor. Thereby creating a beam of nearly monoenergetic neutrons.
RESULTS: The following beams will be available at the end of the project: thermal, 2 keV, 25 keV, and 144 keV.
PROJECT MILESTONES: Project completion 1 October 1976.
KEYWORDS: OCCUPATIONAL EXPOSURES;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;NEUTRON BEAMS;RADIATION DETECTORS;NEUTRONS;MAINTENANCE;PERSONNEL DOSIMETRY;US ERDA;DESIGN;RADIATION PROTECTION

<091143>
TITLE: Identification of Toxic Coal Particulates
PROJECT NUMBER: 7197
PRINCIPAL INVESTIGATOR: Wallace, W.E. Jr.
ADDRESS: Morgantown Energy Research Center, P.O. Box 880, Morgantown, WV 26505
AFFILIATION: West Virginia Univ., Morgantown (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$48,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS (30%);PARTICULATES (50%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Characterize biologically and biochemically toxic particulates from Morgantown FBC.
APPROACH: Sample effluents from experimental combustor. Analyzer particulates from samples. Biologically characterize particulates for trace elements, organometallics and hydrocarbons for lung surface damage.
RESULTS: Characterize biologically and biochemically toxic particulates from Morgantown FBC.
KEYWORDS: COAL;COMBUSTION PRODUCTS;TOXICITY;PARTICLES;AEROSOLS;SAMPLING;CHEMICAL ANALYSIS;BIOLOGICAL EFFECTS;HEALTH HAZARDS;TRACE AMOUNTS;HYDROCARBONS;METALS;ORGANIC COMPOUNDS;LUNGS;FLUIDIZED-BED COMBUSTION;INHALATION;IN VITRO;IN VIVO;METABOLISM;ANIMAL CELLS;BIOCHEMISTRY

<091144>
TITLE: Study for Energy Conservation in the Treatment of Industrial Wastewaters
PROJECT NUMBER: 7386
ADDRESS: Cambridge, MA
AFFILIATION: Water Purification Associates, Cambridge, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview
MONITOR: Hagey, Graham
TELEPHONE: F376-9074
77 FUNDING: Energy Research and Development Administration FY77:$5,000
KEYWORDS: SAFETY;ENERGY CONSERVATION;WASTE WATER;WASTE PROCESSING;INDUSTRIAL PLANTS;WATER TREATMENT;ENVIRONMENTAL EFFECTS

<091145>
TITLE: Biogeochemistry of Petroleum Components at the Sediment-Water Interface
PROJECT NUMBER: 007300
PRINCIPAL INVESTIGATOR: Teal, J.M.;Farrington, J.W.
ADDRESS: Woods Hole Oceanographic Institution, Department of Biology, Woods Hole, MA 02543
AFFILIATION: Woods Hole Oceanographic Institution, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549;C(301)353-5549
TYPE OF FUNDING: Contract No.-EE 77-S-02-4256;Agency in-house effort-+ BLM cofunding;Interagency agreement-BLM-ERDA
77 FUNDING: Bureau of Land Management FY77:$46,000; Energy Research and Development Administration FY77:$46,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine principal processes that control the distribution of hydrocarbons such as adsorption--desorption between sediments and water, diffusion between pore waters and overlaying water; physical mixing of sediment and overlaying water, biological activities (bioturbation, ingestion, and metabolism).
APPROACH: Simple mixing experiments will be conducted and current velocities will be varied over experimentally enclosed sediments to form a background for comparison of hydrocarbon distribution and composition to biological activity. Biological effects will be measured by using benthic systems isolated in enclosed chambers, first in the laboratory then in the field, at Buzzards Bay and the New York Bight. Factors will be introduced consecutively to elucidate the role of each.
RESULTS: A determination will be made as to which chemical compartments the hydrocarbons are located, how tightly they are bound, how extraction by organisms compares with solvent extraction. Clarification will be made of the role of benthic animals changing the composition of the hydrocarbons and redistributing hydrocarbons at the mud-water interface.
PROJECT MILESTONES: First year--complete chamber experiments in laboratory with Cape Cod and Buzzards Bay sediment and biota, hold two sampling cruises in these areas, short sampling cruise to New York Bight. Second year--continue water partition experiments, make cruises in Cape Cod and Buzzards Bay and New York Bight for field collections and ''in-situ'' chamber experiments.
KEYWORDS: AQUATIC ORGANISMS;HYDROCARBONS;METABOLISM;SEDIMENTS;SEAWATER;ATLANTIC OCEAN;COASTAL WATERS;NEW YORK;CONTINENTAL SHELF;BENTHOS;WATER CURRENTS;VELOCITY;DEPTH;ECOLOGICAL CONCENTRATION;PETROLEUM PRODUCTS;BIOCHEMISTRY

<091157>
TITLE: Non-Nuclear Pollutants in Stratospheric Air
PROJECT NUMBER: 001783
PRINCIPAL INVESTIGATOR: Hardy, E.P. Jr.
ADDRESS: 376 Hudson Street, New York, NY 10014
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
DIVISION: Health and Safety Laboratory
MONITOR: Harley, John H.
TELEPHONE: F660-3616
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$171,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objectives of this project are: to document the concentrations of selected stable tracers (particulates and gases) in the stratosphere as a function of latitude, altitude and season; to inventory the stratospheric burdens of these substances; to develop and test stratospheric transport models; and to supply basic data for other scientific programs in evaluating the ultimate deposition of tracers in the environment.
APPROACH: Particulate sampling is conducted by both aircraft and balloons. The balloon program provides samples from 20 to 27 km at 65 degrees N, 33 degrees N, and 9 degrees N, several times a year. The aircraft sampling extends from 75 degrees N to 10 degrees S in the western hemisphere and ranges in altitude from 12 to 19 km. At least three aircraft missions are flown per year. The National Center for Atmospheric Research receives a portion of each filter for analyses of sodium, potassium, calcium, magnesium, chloride, sulfate and nitrate. Total stratospheric air is collected in stainless steel spheres through compressors. The total air samples are analyzed at HASL for Freon-11 (CCl/sub 3/F), sulfur hexafluoride (SF/sub 6/) and other halocarbons. Nitrogen oxides, specifically N/sub 2/O will be added to the program.
RESULTS: Freon-11 and sulfur hexafluoride are ideal tracers for global atmospheric diffusion studies and the Freons are also important for their potential effect on the ozone shield. The other halocarbons and N/sub 2/O now appear to have a considerable bearing on the chemistry of the stratosphere and should help to explain atmospheric behavior of trace gases.
KEYWORDS: STRATOSPHERE;AIR POLLUTION;MONITORING;BALLOONS;AIRCRAFT;SAMPLING;TRANSPORT;TRACER TECHNIQUES;DIFFUSION;AEROSOLS;AIR;GASES

<091160>
TITLE: Policy Issues Related to Coal Conversion to Synthetic Fuels
JECT NUMBER: 7474
NCIPAL INVESTIGATOR: Holt, E.C. Jr.
ADDRESS: Silver Spring, MD
AFFILIATION: Hoffman-Munter Corp., Silver Spring, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Technology Overview, Integrated Assessment Program
MONITOR: Cooper, Raymond D.
TELEPHONE: F233-3631
TYPE OF FUNDING: Contract No.-EE-77-X-01-2735
77 FUNDING: Energy Research and Development Administration FY77:$9,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
KEYWORDS: ENERGY POLICY;SYNTHETIC FUELS;COAL GASIFICATION;COAL LIQUEFACTION;USA;GOVERNMENT POLICIES;EVALUATION

<091161>
TITLE: Development of a Technical Assistance Manual for Management of Transmission Line Rights of Way for Fish and Wildlife
PROJECT NUMBER: 007403
PRINCIPAL INVESTIGATOR: Quinn, H.B.
ADDRESS: Office of Biological Services, Fish and Wildlife Services, Department of the Interior, Washington, DC 20240
AFFILIATION: Fish and Wildlife Service, Washington, D.C. (USA). Office of Biological Services
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-EE-77-A-28-3232
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of the project is to prepare a technical assistance manual which integrates specific management problems, proven fish and wildlife management techniques, and special problems in transmission line ROW management into comprehensive management strategies for land used as transmission line ROW by electric utilities. This manual could then be used by biologists to develop specific management plans for overhead transmission line ROW. This manual will treat separately the various biological provinces and communities of the United States and will address the management problems specific to each. The manual will provide the technical guidance necessary to implement a management plan in a particular biological community in any province.
RESULTS: The project will be in two phases. In Phase I, 37 biological communities within 19 provinces throughout the U.S. will be studied. The number of communities treated in Phase II will be dependent on the results of Phase I, but will include approximately 35 biological communities in 14 provinces in the conterminous U.S.
KEYWORDS: POWER TRANSMISSION LINES;ELECTRIC POWER;ENVIRONMENTAL EFFECTS;REGIONAL ANALYSIS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;FISHES;WILD ANIMALS;BIOLOGICAL EFFECTS;MANAGEMENT;POWER TRANSMISSION;USA

<091163>
TITLE: Manuscript for a Public Information Document Describing Environmental Programs
PROJECT NUMBER: 007461
PRINCIPAL INVESTIGATOR: Watriss, W.
ADDRESS: Fact Research, Inc., 1025 15th Street, NW, Washington, DC 20005
AFFILIATION: Fact Research, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-EE-77-X-01-2727
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The contractor will write the manuscript for a public information document describing the current research conducted by the Environmental Programs, Division of Biomedical and Environmental Research, the U.S. Energy Research and Development Administration.
KEYWORDS: US ERDA;RESEARCH PROGRAMS;ENVIRONMENT;DATA COMPILATION;INFORMATION;PUBLIC RELATIONS

<091164>
TITLE: Second International Conference on Environmental Future on ''Growth Without Ecodisasters''
PROJECT NUMBER: 007462
PRINCIPAL INVESTIGATOR: Malone, T.
ADDRESS: Holcomb Research Institute, Butler University, Indianapolis, IN 46208
AFFILIATION: Butler Univ., Indianapolis, Ind. (USA). Holcomb Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5529
E OF FUNDING: Contract No.-EE-77-G-01-6095
FUNDING: Energy Research and Development Administration FY77:$16,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This conference held in June 1977 addressed the most pressing environmental issue of the moment: continuing economic development without harm to the global environment. This conference went somewhat beyond environmental issues by including economic and industrial components of development.
KEYWORDS: MEETINGS;ENVIRONMENT;SOCIO-ECONOMIC FACTORS;INDUSTRY;GLOBAL ASPECTS;ENVIRONMENTAL EFFECTS

<091165>
TITLE: Workshop, The Role of Oceanic Fronts in Coastal Processes
PROJECT NUMBER: 007463
PRINCIPAL INVESTIGATOR: Bowman, M.J.
ADDRESS: State University of New York, Stony Brook, NY 11794
AFFILIATION: State Univ. of New York, Stony Brook (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-EE-77-G-01-6096
77 FUNDING: Energy Research and Development Administration FY77:$16,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This partially covers administrative cost of a conference on the dynamics of small scale ocean fronts, the coupling between ocean fronts and biological processes and the role of fronts in transport and dispersion of materials.
KEYWORDS: WORKSHOP;INFORMATION DISSEMINATION;OCEANOGRAPHY;MEETINGS;MANAGEMENT;COST

<091166>
TITLE: Shaping Energy Policy: Alternatives, Priorities, and Infrastructure
PROJECT NUMBER: 007475
PRINCIPAL INVESTIGATOR: Duzak, J.
ADDRESS: New York Public Interest Research Group, Inc., 1004 E. Adams Street, Syracuse, NY 13210
AFFILIATION: New York Public Interest Research Group, Inc., Syracuse (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-EE-77-G-01-6084
77 FUNDING: Energy Research and Development Administration FY77:$1,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this symposium, held April 16-17, 1977, were: (1) to provide information on the current and predicted advancements in alternative energy technology (i.e., solar, wind, coal, etc.); (2) to provide insight as to how industry and government alike are presently formulating long range energy policy.
KEYWORDS: ENERGY POLICY;ENVIRONMENT;MEETINGS;GOVERNMENT POLICIES;INDUSTRY;EDUCATION;INFORMATION NEEDS;DECISION MAKING;TECHNOLOGY ASSESSMENT;ENERGY MODELS;PLANNING;FORECASTING

<091167>
TITLE: Bistate Conference on the Chesapeake Bay To Be Held April 27-29, 1977, in Leonardtown, Maryland
PROJECT NUMBER: 007479
PRINCIPAL INVESTIGATOR: Cronin, L.E.
ADDRESS: Chesapeake Research Consortium, Inc., 100 Merryman Hall, The Johns Hopkins University, Baltimore, MD 21218
AFFILIATION: Chesapeake Research Consortium, Inc., Baltimore, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Contract No.-EE-77-G-01-6109
77 FUNDING: Energy Research and Development Administration FY77:$4,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Marine:GEOGRAPHIC AREAS/Northeast;COASTS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The purpose of this public conference is: (1) to update public understanding concerning the Chesapeake Bay and its tributaries; (2) to clarify the roles of state and federal agencies; (3) to identify issues which are expected to be most serious during the next decade; (4) to develop plans for obtaining improved information and understanding to assist effective management; (5) to strengthen coordination among state and federal agencies related to the bay.
KEYWORDS: CHESAPEAKE BAY;ECOLOGY;REGIONAL ANALYSIS;MEETINGS;WATER POLLUTION;POLLUTION LAWS;PUBLIC OPINION;MANAGEMENT;DATA COMPILATION;TABLES;AQUATIC ECOSYSTEMS

<091168>
TITLE: Investigation of the Capture of Sulfur Dioxide and Oxygen by Condensation of Water in Droplets, Fogs, and Aerosols
PROJECT NUMBER: 007496
PRINCIPAL INVESTIGATOR: Matteson, M.J.
ADDRESS: Georgia Institute of Technology, Atlanta, GA 30332
AFFILIATION: Georgia Inst. of Tech., Atlanta (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert W.
TELEPHONE: F233-3764;C(301)353-3764

77 FUNDING: Energy Research and Development Administration
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine the sorption and desorption of SO2 and O2 during condensational growth of droplets, fogs and aerosols. Preliminary studies indicate that during rapid condensation concentrations do not follow Henry's Law. The resulting supersaturation may explain H2SO4 formation in plumes.
APPROACH: (a) Test the effects of various dissolved salts on enhanced absorption of SO2. (b) Determine whether the supersaturations levels observed with SO2 are also obtained with O2. (c) Measure the desorption rates following cessation of growth. (d) Investigate the phenomenon of enhanced absorption on single droplets and clouds of nuclei of known size and composition.
RESULTS: Results of this work will provide further input into the understanding of chemistry of SO2 in fossil fuel plumes.
KEYWORDS: SULFUR DIOXIDE;OXYGEN;ABSORPTION;DROPLETS;AEROSOLS;FOG;VAPOR CONDENSATION;PLUMES;SUPERSATURATION;CHEMICAL REACTIONS;SALTS;SOLUBILITY;PLUMES;GASEOUS WASTES;SURFACE AIR

<091170>
TITLE: Environmental Impact Analysis of the National Energy RD and D Plan
PROJECT NUMBER: 007413
PRINCIPAL INVESTIGATOR: Kalagher, R.
ADDRESS: Westgate Research Park, McLean, VA 22101
AFFILIATION: Mitre Corp., McLean, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Williams, Edward R.
TELEPHONE: C(202)376-4187
TYPE OF FUNDING: Contract No.-EE-77-C-10-0035
77 FUNDING: Energy Research and Development Administration FY77:$350,000
TECHNOLOGY: FOSSIL FUEL/General (30%);NUCLEAR/General (20%);GEOTHERMAL/General (10%);SOLAR/General (20%);CONSERVATION/General (20%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Complete array of air, water, solid wastes, radiation and toxic residuals (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Perform an environmental analysis of the National Plan for energy research, development, and demonstration on an annual basis, beginning with the 1977 Plan. The purpose of this analysis will be to assess the environmental impact of planned major technologies at national and broad regional levels through the year 2000.
APPROACH: The individual energy supply technologies and conservation initiatives which comprise the National Plan scenarios will be analyzed in terms of model plant characteristics and impacts. These activities will be individually examined within each of the general program areas of conservation, fossil energy, nuclear energy, solar energy, and geothermal energy. An integrated analysis of the combined environmental and indirect economic impacts of all energy supply technologies and demand activities, at both national and regional levels, will be undertaken.
RESULTS: Annual environmental analysis report.
PROJECT MILESTONES: Complete first report, September 1977.
KEYWORDS: ENERGY SOURCES;ENVIRONMENTAL EFFECTS;COMPARATIVE EVALUATIONS;ECONOMICS;RADIOACTIVE EFFLUENTS;CHEMICAL EFFLUENTS;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;SYNTHETIC FUELS;COMPUTER CALCULATIONS;ENVIRONMENTAL TRANSPORT;RADIOACTIVITY;TOXIC MATERIALS

<091171>
TITLE: Interim Planning and Test Support for Homer City Coal Cleaning Demonstration
PROJECT NUMBER: 800159
PRINCIPAL INVESTIGATOR: Campbell, C.
ADDRESS: 747 Third Avenue, New York, NY 10017
AFFILIATION: Chem Systems, Inc., New York (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Grua, Charles
TELEPHONE: C(919)549-2851
TYPE OF FUNDING: Contract No.-68-02-2639;Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$200,000; Environmental Protection Agency FY77:$275,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
KEYWORDS: EFFLUENTS;EMISSIONS;COAL;DESULFURIZATION;DENITRIFICATION;GASEOUS WASTES;AIR POLLUTION ABATEMENT;DEMONSTRATION PLANTS;NITROGEN COMPOUNDS;SULFUR COMPOUNDS

<091172>
TITLE: Environmental Impacts of Energy Production Facilities Using Solar Derived Fuels
PROJECT NUMBER: 800200
PRINCIPAL INVESTIGATOR: Austin, T.A.
ADDRESS: 487 Town Engineering Building, Iowa State University, Ames, IA 50011
AFFILIATION: Iowa State Univ. of Science and Technology, Ames (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas W.

TYPE OF FUNDING: Contract No.-W-7405-ENG-82
77 FUNDING: Energy Research and Development Administration FY77:$25,000
TECHNOLOGY: SOLAR/Biomass (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Environmental impacts of biomass conversion (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This project is designed to provide ECT of ERDA with sufficient background on the state of knowledge in the developments of Biomass Conversion Technology to document the known and potential environmental impacts from widespread applications of these technologies for energy production. The impacts will include air pollution, water pollution, and land impacts resulting from both the disposal of residues remaining after processes and the utilization of the derived fuel. A general planning document will be completed by mid fiscal year 1978. This document will identify those technologies that have immediate application. Environmental control technologies will be investigated to determine their effectiveness in controlling the environmental impacts.
APPROACH: Data from pilot plants using biomass conversion processes using solar derived fuels will be collected. These data will include characterizations of all waste streams from the plants as well as the residuals. These data will be analyzed to document the environmental impacts, both known and potential, from the disposal of these wastes. A careful investigation of the effectiveness of environmental control technologies that are being used at the pilot plants will be conducted. Waste characterization studies will be conducted only where data do not exit and other studies are not under way.
RESULTS: A documentation of the environmental impacts from biomass conversion of solar derived fuels and an evaluation of current environmental control technologies to allieviate these impacts.
PROJECT MILESTONES: A general planning document outlining the state of knowledge of biomass conversion technology including an evaluation of their potential for immediate, intermediate or long range application on a large scale will be prepared by mid fiscal year 1978.
KEYWORDS: EMISSIONS;LAND;WASTE;BIOMASS;SOLAR ENERGY CONVERSION;SYNTHETIC FUELS;ENVIRONMENTAL IMPACTS;AIR POLLUTION;LAND POLLUTION;WATER POLLUTION;AIR;SEWAGE;WATER

<091173>
TITLE: Assessment of Energy Conserving Industrial Waste Treatment Processes
PROJECT NUMBER: 189-77-RU-14
PRINCIPAL INVESTIGATOR: McGuire, H.E.
ADDRESS: Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Environmental Control Technology
MONITOR: Boehm, Douglas
TELEPHONE: F233-5511
TYPE OF FUNDING: Contract No.-189-77-RU-14
77 FUNDING: Energy Research and Development Administration FY77:$22,000
TECHNOLOGY: CONSERVATION/General (50%);CONSERVATION/Improved conversion efficiency (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS (25%);PARTICULATES (25%);ORGANICS (25%);HEAT, THERMAL (25%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: PNL will prepare a plan to recommend alternative possibilities of energy conserving industrial waste treatment processes. This program would provide an overview of ERDA work in this area and develop a center of excellence available to ERDA for such matters as pollution abatement, regulation interpretation, and appraisal of other government agency's programs. Additionally, the program will analyze what is currently happening in industrial pollution control, forming a quantitative data bank and pinpointing key problem areas for detailed study.
APPROACH: An extensive literature review, along with industry contacts will be used to establish an industry priority list, develop industry process diagrams, determine pollutant discharges, identify current study areas and outline possible future study areas.
RESULTS: The data will be presented in a final report suitable for use as a program guide in determining possible future study areas.
PROJECT MILESTONES: (1) October 1, 1977 Industry priority list, process diagrams, and pollutant discharges. (2) October 15, 1977 Current research summary and possible future study areas. (3) October 31, 1977 Draft final report.
KEYWORDS: EFFLUENTS;LAND;WASTE;INDUSTRIAL WASTES;WASTE PROCESSING;ENERGY CONSERVATION;POLLUTION CONTROL;AIR POLLUTION;LAND POLLUTION;WATER POLLUTION;AIR;WATER

<091174>
TITLE: Partial Support from the Energy Research and Development Administration for the ICMSE Study on University Oceanography
PROJECT NUMBER: 7402
PRINCIPAL INVESTIGATOR: White, R.M.
ADDRESS: 610 Executive Blvd., Rockville, MD 20852
AFFILIATION: Federal Council for Science and Technology, Washington, D.C. (USA). Interagency Committee on Marine Science and Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen
TELEPHONE: F233-5549
TYPE OF FUNDING: Interagency agreement-EE-77-A-28-3234-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this research are to conduct a comprehensive study of funding of academic marine science research, to determine the adequacy of funding in terms of various goals and objectives and to assess its impact on the development of the marine sciences over the past decade. A

primary objective is to distinguish those problem areas which exist across higher education and the sciences from those which are peculiar to marine sciences.
RESULTS: The results of the study will be helpful in policy formulation and program development for the marine sciences community and the funding agencies.
JECT MILESTONES: 2/78 Final report.
KEYWORDS: OCEANOGRAPHY;RESEARCH PROGRAMS;BASELINE ECOLOGY;EDUCATION;AQUATIC ECOSYSTEMS;GOVERNMENT POLICIES;FINANCING

<091175>
TITLE: Water Quality Criteria and National Energy Goals
PROJECT NUMBER: 7437
PRINCIPAL INVESTIGATOR: Meyers, C.
ADDRESS: 444 E. Cross Street, Baltimore, MD 21230
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Nash, J.
TELEPHONE: F233-3034
TYPE OF FUNDING: Contract No.-E-10-77-0277
77 FUNDING: Energy Research and Development Administration FY77:$7,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Water pollutants (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Outline the federal role in water quality criteria and its relationship to state development of water quality standards.
APPROACH: Review the water quality criteria as proposed by EPA, then review the implementation of the EPA criteria in development of water quality standards by the states.
RESULTS: Final report.
PROJECT MILESTONES: Final report, July 1977.
KEYWORDS: ENERGY POLICY;USA;WATER QUALITY;WATER POLLUTION;FRESH WATER;GOVERNMENT POLICIES;REGULATIONS;STANDARDS;REVIEWS;US EPA;IMPLEMENTATION;ENVIRONMENTAL IMPACTS

<091176>
TITLE: Comparative assessment of Net Energy Methodologies As Applied to Fuel Cycle Evaluation
PROJECT NUMBER: 7453
PRINCIPAL INVESTIGATOR: Sedlik, B.
ADDRESS: 4701 Sangamor Road, Washington, DC 20016
AFFILIATION: Teknekron, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Holt, H.R.
TELEPHONE: F233-4570
TYPE OF FUNDING: Contract No.-E-10-77-0361
77 FUNDING: Energy Research and Development Administration FY77:$9,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);SOLAR/General (25%);CONSERVATION/General (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide a comparative analysis of the net energy methodologies as used by at least five groups of investigators. Comparative analysis will be applied to nuclear, fossil, solar and conservation technologies.
APPROACH: Perform a systematic comparison of the assumptions, boundary conditions, terminology and analysis methods employed by the various investigators.
RESULTS: Final report.
PROJECT MILESTONES: 77/07/01 Final report.
KEYWORDS: TECHNOLOGY ASSESSMENT;COMPARATIVE EVALUATIONS;ENERGY MODELS;NET ENERGY;EVALUATION;FOSSIL FUELS;NUCLEAR FUELS;NUCLEAR FUELS;SOLAR ENERGY;ENERGY CONSERVATION;FUEL CYCLE;ENERGY ANALYSIS

<091177>
TITLE: Legal Study of Water Appropriation in the Eastern United States
PROJECT NUMBER: 7472
PRINCIPAL INVESTIGATOR: Brion, D.J.
ADDRESS: College of William and Mary, Marshall-Wythe School of Law, Williamsburg, VA 23185
AFFILIATION: College of William and Mary, Williamsburg, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Nash, J.
TELEPHONE: F233-3034
TYPE OF FUNDING: Contract No.-EE-77-G-05-5475
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;HYDROGRAPHIC AREAS/Other hydrographic areas Fresh water in eastern United States
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Compile the law relevant to allocation of water resources in the eastern United States
APPROACH: Prepare a bibliography and summary of the relevant statutes and develop a digest of the principal common law doctrines that affect water allocation through research of current statutes.
RESULTS: Bibliography and summary of relevant water allocation statutes. Digest of common law doctrines on water allocations.
JECT MILESTONES: 9/30/77 Final report.
KEYWORDS: WATER RESOURCES;ALLOCATIONS;DISTRIBUTION;USA;LEGAL ASPECTS;MANAGEMENT;CASE LAW;LAWS;BIBLIOGRAPHIES

<091178>
TITLE: Development of the Upgrade System
PROJECT NUMBER: 7564
PRINCIPAL INVESTIGATOR: Reisa, J.J.
ADDRESS: 722 Jackson Place N.W., Washington, DC 20006
AFFILIATION: Council on Environmental Quality, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Policy Analysis
MONITOR: Holt, H.R.
TELEPHONE: F233-4570
TYPE OF FUNDING: Contract No.-EE-77-A-28-3240
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Generalized air/water pollutant data (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide ERDA access to environmental data bases maintained by CEQ.
APPROACH: Develop agreement for use of upgrade system by ERDA staff.
KEYWORDS: DATA ACQUISITION;AIR POLLUTION;WATER POLLUTION;STANDARDS;SOCIO-ECONOMIC FACTORS;SIMULATION;REGIONAL ANALYSIS;INFORMATION SYSTEMS;ENVIRONMENTAL EFFECTS;AIR QUALITY;WATER QUALITY;QUALITY ASSURANCE

<091179>
TITLE: Health Effects of Combustion Generated Soot and Polycyclic Aromatic Hydrocarbons
PROJECT NUMBER: 7571
PRINCIPAL INVESTIGATOR: Thilly, W.G.
ADDRESS: Massachusetts Institute of Technology, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No.-EE-77-5-02-4267
77 FUNDING: Energy Research and Development Administration FY77:$165,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS/PAH (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Characterization of organic compounds in soot and measurement of selected polycyclic aromatic hydrocarbons.
APPROACH: Extraction followed by analysis by GC/MS.
RESULTS: Development of analytical methodology for selective analysis of specific polycyclic aromatic hydrocarbons of special mutagenic or mechanistic interest.
KEYWORDS: AIR POLLUTION;CHEMICAL EFFLUENTS;GASEOUS WASTES;COAL;COMBUSTION;HEALTH HAZARDS;SOOT;POLYCYCLIC AROMATIC HYDROCARBONS;BIOLOGICAL EFFECTS;HUMAN POPULATIONS;MUTAGENESIS

<091180>
TITLE: Electron Transport Calculations with Biomedical and Environmental Applications
PROJECT NUMBER: 6560
PRINCIPAL INVESTIGATOR: Berger, M.J.
ADDRESS: National Bureau of Standards, Washington, DC 20234
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Divisions of Biomedical and Environmental Research
MONITOR: Frank P. Hudson
TELEPHONE: F233-4066;C(301)353-4066
TYPE OF FUNDING: Contract No.-E-(49-1)3719
77 FUNDING: Energy Research and Development Administration FY77:$1,000
TECHNOLOGY: NUCLEAR/General (40%);NUCLEAR/Fission (60%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Study of the transport of electrons to provide reliable radiological data as input for the assessment of environmental radiation hazards arising in nuclear technology; and as input for various models attempting to explain the action of radiation on living matter. The main emphasis is on electron energies between 10 KeV and a few eV.
APPROACH: Calculations of electron stopping-powers and ranges in various media, spatial distribution of dose, electron energy degradation spectra, microdosimetric even-size distributions, etc.
RESULTS: Inelastic scattering cross-section of electrons in oxygen; electron-energy degradation calculations in nitrogen, oxygen, air and water using the new scattering cross-sections; compilation of cross-section sets for scattering of electrons by atoms;
PROJECT MILESTONES: (1) Electron-energy degradation spectra in water. (2) Inelastic scattering cross-sections of electrons in nitrogen and water. (3) Calculation of microdosimetric event-size distribution in small spherical irradiated sites.
KEYWORDS: ELECTRON REACTIONS;INELASTIC SCATTERING;OXYGEN;NITROGEN;AIR;WATER;SCATTERING AMPLITUDES;CROSS SECTIONS;ENERGY LEVELS;RADIATION DOSE DISTRIBUTIONS;SPATIAL DOSE DISTRIBUTIONS;MICRODOSIMETRY;RADIOBIOLOGY;ELECTRONS;ENERGY RANGE;EV RANGE 01-10;KEV RANGE 01-10;BIOLOGICAL RADIATION EFFECTS;ANIMALS;SPHERES;TESTING

<091181>
TITLE: Transportable, Self-Contained HF Shore-Based Radar System
PROJECT NUMBER: 7185
PRINCIPAL INVESTIGATOR: Barrick, D.E.
ADDRESS: Sea State Studies Program, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA). Environmental Research Labs.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Goldstein, Gerald
TELEPHONE: F233-5348
TYPE OF FUNDING: Contract No. EY 76 A 20 0204
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: EXTRACTION (50%);TRANSPORTATION (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Development of instrumentation for measuring and mapping near-surface ocean currents.
APPROACH: A high frequency radar system is employed with ocean waves as the target. The Doppler shift in the frequency of the echo signal and the phase differences in the signals at 3 independent antennas provide information sufficient to construct a current-vector map of surface currents.
RESULTS: Development, calibration, and delivery of a transportable radar system with appropriate manuals and documentation.
PROJECT MILESTONES: (1) Fabrication and field testing of total system. (2) Calibration and validation studies. (3) Complete documentation.
KEYWORDS: SEAS;COASTAL WATERS;WATER CURRENTS;MEASURING METHODS;RADAR

<091183>
TITLE: Medium-Scale LNG Spill Tests
PROJECT NUMBER: 800220
PRINCIPAL INVESTIGATOR: Lind, C.D.
ADDRESS: U.S. Naval Weapons Center, China Lake, CA 93555
AFFILIATION: Naval Weapons Center, China Lake, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Cece, J.M.
TELEPHONE: C(301)353-5486
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (60%);STORAGE (30%);PROCESSING, CONVERSION (10%)
POLLUTANTS: NOXIOUS GAS (5%);PARTICULATES (10%);ORGANICS (5%);HEAT, THERMAL (70%);VISUAL AESTHETICS (10%)
REGIONS OF INTEREST: BIOMES/Marine;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Determine extent of hazard if 50 cubic m LNG released on water or land.
APPROACH: Utilizing predictive models determine extent of vapor cloud travel and radiation from fire, then conduct test and compare experimental results with predictive models.
RESULTS: Initial planning and conceptual design begun.
PROJECT MILESTONES: 6/79 Conduct medium-scale LNG tests.
KEYWORDS: LIQUEFIED NATURAL GAS;TRANSPORT;ACCIDENTS;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;ENVIRONMENTAL TRANSPORT;FIRES;HAZARDS;TESTING;SAFETY;GAS SPILLS

<091184>
TITLE: Analysis of the Environmental Control Technology for Oil Shale Development
PROJECT NUMBER: 800150
PRINCIPAL INVESTIGATOR: de Nevers, N.H.
ADDRESS: Department of Chemical Engineering, Salt Lake City, UT 84112
AFFILIATION: Utah Univ., Salt Lake City (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Grua, Charles
TELEPHONE: F233-5587
TYPE OF FUNDING: Contract No.-EY-76-S-02-4043.M001
77 FUNDING: Energy Research and Development Administration FY77:$52,600
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (25%);COMBUSTION IN SITU (25%);PROCESSING, CONVERSION (25%);WASTE MANAGEMENT (25%)
POLLUTANTS: NOXIOUS GAS (25%);METALS (10%);PARTICULATES (25%);ORGANICS (10%);VISUAL AESTHETICS (10%);SPECIFIED OTHER POLLUTANTS/Aquifer disturbance (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Oil shale
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Analyze the environmental control technology for oil shale development.
APPROACH: Review and analysis of existing literature; additional analytical studies as needed.
RESULTS: Final report summarizing above; making recommendations for additional research.
PROJECT MILESTONES: Preliminary draft (in form of extended progress report) submitted October 1, 1976. Final report due September 30, 1977.
KEYWORDS: CHEMICAL EFFLUENTS;OIL SHALE INDUSTRY;POLLUTION CONTROL;AQUIFERS;WATER POLLUTION;TECHNOLOGY ASSESSMENT;RECOMMENDATIONS;WASTE MANAGEMENT;ENVIRONMENTAL IMPACTS

<091185>
TITLE: Oil and Hazardous Materials Simulated Environmental Test Off Shore Testing
PROJECT NUMBER: 800223
PRINCIPAL INVESTIGATOR: Farlow, J.
ADDRESS: Edison Water Quality Research Lab, Edison, NJ 08817
AFFILIATION: Environmental Protection Agency, Edison, N.J. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Roy Maxwell
TELEPHONE: F233-5589
TYPE OF FUNDING: Contract No.-EE-77-A-28-3235
77 FUNDING: Energy Research and Development Administration FY77:$330,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Oil spills (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;HYDROGRAPHIC AREAS/Other hydrographic areas Simulate
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To assess and evaluate the state-of-the-art of existing harbor offshore-oil spill cleanup capabilities in the event of an oil spill during drilling operation for oil in the outer shelf.
APPROACH: Three offshore oil skimming devices (a MARCO Class V, a cyclonet 100, and an Offshore Devices, Inc.) will be tested and evaluated in the Oil and Hazardous Materials Simulated Environmental Test Tank (OHMSETT), located in Leonardo, N.J. The tank is 667 feet long, 65 feet wide and the tank holds 8 feet of water. Waves as much as 2.5 feet high can be generated, simulating harbor conditions.
RESULTS: The data will be analyzed for each item, a report written plus color slides and a 20 minute movie film will be prepared.
PROJECT MILESTONES: Report by February 1978.
KEYWORDS: OIL SPILLS;CLEANING;DRILLING;OFFSHORE OPERATIONS;SKIMMERS;DATA ANALYSIS;TESTING;SIMULATION

<091186>
TITLE: Field Test of Oil Spill Cleanup Equipment
PROJECT NUMBER: 800199
PRINCIPAL INVESTIGATOR: Farlow, J.S.
ADDRESS: Oil and Hazardous Materials Spills Branch, Edison, NJ 08817
AFFILIATION: Environmental Protection Agency, Edison, N.J. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Maxwell, Roy D.
TELEPHONE: F233-5589
TYPE OF FUNDING: Contract No.-EE-77-A-28-3235;Interagency agreement-EPA
77 FUNDING: Energy Research and Development Administration FY77:$75,000; Environmental Protection Agency FY77:$75,000; Coast Guard FY77:$75,000; Department of the Navy FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oil spill study (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Other hydrographic areas Study tank
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To test and evaluate oil spill control and/or cleanup equipment in the EPA Oil and Hazardous Simulated Environmental Test Tank (OHMSETT) facility located at Leonardo, New Jersey. The test simulates actual operational conditions by generating waves up to 2.5 feet high and other complex wave motion found in harbors. The equipment to be tested has been developed by private enterprise and is offered for sale to the general public.
APPROACH: Equipment to be tested is placed in a tank (667 feet long by 65 feet wide and a depth of eight feet) wave motion generated then the control equipment is moved over the surface at simulated operation speeds. Various skimmers are tested to collect oil from the water surface, then grab samples of water are collected and analyzed to evaluate the effectiveness of the equipment.
RESULTS: Written reports will be available; slides of the tests will be available; a 15 minute movie will be developed for loan to persons or organizatons interested in the results.
PROJECT MILESTONES: The field testing will be completed during the summer and fall of 1977.
KEYWORDS: OIL SPILLS;CLEANING;SKIMMERS;EQUIPMENT;TESTING;EVALUATION;CONTROL;SIMULATION;OFFSHORE OPERATIONS

<091187>
TITLE: Assessment of Hazards and Control of LNG Spills on Water
PROJECT NUMBER: 800140
PRINCIPAL INVESTIGATOR: Taylor, M.W.
ADDRESS: 400 7th St., S.W. (G-DSA-1), Washington, DC 20590
AFFILIATION: Coast Guard, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Cece, J.M., Jr.
TELEPHONE: C(301)353-5486
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (70%);STORAGE (20%);PROCESSING, CONVERSION (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Determine extent of hazard of 5.7 cubic m LNG released on water.
APPROACH: Utilize predictive mathematical models to determine extent of hazard. Perform appropriate field experiments and compare analyzed results with models.
RESULTS: Test program completed.
PROJECT MILESTONES: 10/77--publish final report (will be published as USCG R and D report).
KEYWORDS: LIQUEFIED NATURAL GAS;CONTROL;HAZARDS;MATHEMATICAL MODELS;DATA ANALYSIS;WATER POLLUTION;SAFETY;PLUMES;FOSSIL FUELS;CRYOGENICS

<091188>
TITLE: Characterization of Contaminants in Oil Shale Residuals and the Potential for Their Management to Meet Environmental Quality Standards
JECT NUMBER: 800141
NCIPAL INVESTIGATOR: Schmidt-Collerus, J.J.
ADDRESS: Chemical Division, Denver Research Institute, University of Denver, Denver, CO 80208
AFFILIATION: Denver Research Inst., Colo. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Advanced Environmental Research and Technology
MONITOR: Bryan, Edward H.;Grua, Charles
TELEPHONE: C(202)632-4356
TYPE OF FUNDING: EPA pass-thru funding;Interagency agreement-NSF (RANN)
77 FUNDING: Environmental Protection Agency National Science Foundation FY77:$20,000; Energy Research and Development Administration Federal Energy Administration
TECHNOLOGY: FOSSIL FUEL/General (10%);FOSSIL FUEL/Coal Conversion liquefaction (10%);FOSSIL FUEL/Oil Shale (50%);GENERAL SCIENCE (30%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: NOXIOUS GAS/NOx;NOXIOUS GAS/SO2;NOXIOUS GAS/HCN;NOXIOUS GAS/Etc. (10%);PARTICULATES/Stack emission;PARTICULATES/Oil shale operation (10%);ORGANICS/Polyaromatics;ORGANICS/Hydrocarbons;ORGANICS/Acids;ORGANICS/Bases (70%);SPECIFIED OTHER POLLUTANTS/Trace elements (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (70%);DEVELOPMENT/Laboratory scale (30%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental;COASTS/Gulf;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Phase--Investigation of environmental impact from in situ operations due to trace organic compounds: (a) effusion through overburden, (b) leaching by breakins of water from underground basins or water tables, and (c) evaluation of these and other possible emission sources from in situ operations. Phase 2--Development of monitoring strategies and control technologies for the in situ and above ground emissions from oil shale processing.
APPROACH: (1) Establish (a) sources of possible emissions (pollution) from in situ operations, particularly with respect to water quality, and (b) study possible mechanism of mobilization of trace organic and complex materials. (2) Bench scale study of the detection and monitoring of these pollutants. Field study on pilot or demonstration sites. (3) Study of possible abatement of these pollutants to be compatible with the type of in situ operation.
RESULTS: (1) Effective control technology for in situ oil shale operations. (2) Possible application of the same or related technology for above ground retorting operations.
PROJECT MILESTONES: (1) Evaluation of possible sources of pollution and health hazards from various in situ operations--estimated 4 months. (2) Bench scale evaluation of pollutants and possible abatements. Laboratory evaluation of mutagenic and/or carcinogenic and ecologic effects. Water quality--estimated 12 months. (3) Field tests. Establishment of sampling and monitoring protocol--estimated 8 months. (4) Recommendations for control technology--estimated 2 months.
KEYWORDS: MOBILIZATION;PROCESS WATER;OIL SHALES;IN-SITU RETORTING;ENVIRONMENTAL IMPACTS;WATER QUALITY;POLLUTION CONTROL;WASTE MANAGEMENT;HEALTH HAZARDS;ENVIRONMENTAL TRANSPORT;POLYCYCLIC AROMATIC HYDROCARBONS;AQUIFERS;TRACE AMOUNTS;CHEMICAL EFFLUENTS;CARCINOGENS;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;BIOLOGICAL EFFECTS;ZINC;SELENIUM;TOXICITY;MERCURY;METABOLISM;PROCESS CONTROL

<091189>
TITLE: Evaluation of H2S Control Technology for Geothermal Energy Sources
PROJECT NUMBER: 800143
PRINCIPAL INVESTIGATOR: Galeski, James B.
ADDRESS: 425 Volker Blvd., Kansas City, MO 64110
AFFILIATION: Midwest Research Inst., Kansas City, Mo. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Boehm, Douglas
TELEPHONE: C(301)353-5511
TYPE OF FUNDING: Contract No.-EE-77-C-02-4255. A000
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: GEOTHERMAL/General (10%);GEOTHERMAL/Hydrothermal (60%);GEOTHERMAL/Geopressurized (15%);GEOTHERMAL/Hot dry rock (15%)
ENERGY CYCLE: EXTRACTION (10%);TRANSPORTATION (10%);PROCESSING, CONVERSION (20%);ELECTRICITY GENERATION (60%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Site specific a;COASTS/Gulf;COASTS/Far West
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objectives of this study are to identify and evaluate technology for control of H2S emissions from existing and several planned geothermal energy developments, to prepare a state-of-the-art report describing all previous and ongoing attempts to control H2S emissions from geothermal energy systems, and identify potentially applicable H2S removal technologies which are available, or could be developed within a commensurate time frame to control H2S emissions from several planned geothermal development projects.
APPROACH: The study will be divided into two major areas, emphasizing H2S removal technology for existing and planned geothermal energy developments, respectively. The efforts will be performed concurrently for approximately the duration of the project. An initial task of short duration (about 1 month) will involve a literature search to provide data inputs for both subsequent task areas.
RESULTS: The state-of-the-art report will support ERDA activities in evaluation of available control options relative to existing, proposed, and anticipated standards and in resource allocation for development of specific control options. The summary of H2S control technology for planned geothermal energy developments will serve as a basis from which to establish the feasibility of meeting future H2S ambient concentration standards.
PROJECT MILESTONES: The first task (Literature Search and Data Acquisition) is scheduled for completion on

about September 1, 1977. Tasks 2 and 3 will run concurrently through about January 15, 1978. Draft copies of the state-of-the-art report and the draft final report will be submitted to the project officer on or before April 1, 1978.
KEYWORDS: PLUMES;SCRUBBER;HYDROGEN SULFIDES;AIR POLLUTION ABATEMENT;DATA ACQUISITION;REMOVAL;TECHNOLOGY ASSESSMENT;GEOTHERMAL POWER PLANTS

<091190>
TITLE: Waste Heat Management in the Electric Power Industry: Issues of Energy Conservation and Station Operation Under Environmental Constraints
PROJECT NUMBER: 800136
PRINCIPAL INVESTIGATOR: Harleman, D.R.F.
ADDRESS: Room 48-311, Department of Civil Engineering, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Civil Engineering
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Gottlieb, Myron
TELEPHONE: C(301)353-5587
TYPE OF FUNDING: Contract No.-EY-76-S-02-4114.A001
77 FUNDING: Energy Research and Development Administration FY77:$304,000
TECHNOLOGY: FOSSIL FUEL/General (35%);NUCLEAR/General (35%);CONSERVATION/General (30%)
ENERGY CYCLE: ELECTRICITY GENERATION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific River;HYDROGRAPHIC AREAS/Other hydrographic areas River
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The project involves two subtasks. The goal in the first is to quantify costs (especially of fuel) associated with the choice of condenser cooling systems for base load steam-electric power plants. The goal in the second is to investigate the operation of supplementary cooling systems for the purpose of meeting environmental constraints on temperature increases induced in receiving waters.
APPROACH: In Subtask 1, state-of-the-art cooling systems (river diffusers, artificial cooling ponds, wet and dry towers) are designed and their performances compared for a hypothetical site on the Mississippi River. Eventually the results will be aggregated to yield comparisons on a national level. Subtask 2 involves a case study of TVA's Brown's Ferry Nuclear Power Plant which has been designed to operate its cooling system in open, helper and closed modes. A predictive model for natural temperature fluctuations and a short-term projection model for induced temperatures are being developed to study the effects on plant efficiency of the nature of the temperature standard, the placement and timing of temperature monitors, the performance characteristics of the cooling system and the mode change design criteria.
RESULTS: Subtask 1: A consistent set of design procedures for each cooling system has been developed. Of particular interest has been the development of a quasi-steady representation of the transient response of systems with large thermal inertia (e.g., cooling ponds). Using these procedures the operational and construction costs of cooling systems will be comparable on a one site basis (this year) and on a national basis (next year). Subtask 2: A one-dimensional natural water temperature model has been developed. Several statistical time series models have been developed and compared in terms of their ability to reduce the variance between observed and predicted induced temperature rises. The sensitivities listed above will be examined shortly.
PROJECT MILESTONES: Quarterly progress reports have been distributed for periods 9/1/76 to 11/30/76, 12/1/76 to 2/28/77 and 3/1/77 to 5/31/77. The first year's report covering work through 8/31/77 is forthcoming.
KEYWORDS: ELECTRIC POWER;INDUSTRY;WASTE HEAT;WASTE MANAGEMENT;ENERGY CONSERVATION;COST;REACTOR COOLING SYSTEMS;POWER PLANTS;COOLING PONDS;MISSISSIPPI RIVER;NUCLEAR POWER PLANTS;DESIGN;TEMPERATURE MONITORING;MATHEMATICAL MODELS;COMPUTER CODES

<091191>
TITLE: Assessment of Practicality of Oil Spill Treatment
PROJECT NUMBER: 800139
PRINCIPAL INVESTIGATOR: Wilson, M.P.
ADDRESS: Mechanical Engineering Department, Kingston, RI 02881
AFFILIATION: Rhode Island Univ., Kingston (USA). Dept. of Mechanical Engineering and Applied Mechanics
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental Control Technology
MONITOR: Cece, John M.
TELEPHONE: C(301)353-5486
TYPE OF FUNDING: Contract No.-E(11-1)4047
77 FUNDING: Energy Research and Development Administration FY77:$400,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (80%);STORAGE (10%);PROCESSING, CONVERSION (10%)
POLLUTANTS: PARTICULATES (10%);ORGANICS (70%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST:
BIOMES/Marine;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Determine practicability and feasibility of treating oil spills with dispersants.
APPROACH: Conduct mathematical, laboratory-scale, meso-scale and in situ experiments to compare treated and untreated oil spills.
RESULTS: Literature search and background study completed.
PROJECT MILESTONES: 6/78--Complete meso-scale tests.
KEYWORDS: OIL SPILLS;CLEANING;AQUATIC ECOSYSTEMS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;SURFACTANTS;COMPARATIVE EVALUATIONS;WATER POLLUTION;PETROLEUM PRODUCTS

<091192>
TITLE: Eleventh International Symposium on Remote Sensing of the Environment
PROJECT NUMBER: 007059
PRINCIPAL INVESTIGATOR: Cook, J.J.
ADDRESS: Environmental Research Institute of Michigan, P.O. Box 618, Ann Arbor, MI 48107
AFFILIATION: Environmental Research Inst. of Michigan, Ann Arbor (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: Contract No.-EE-77-G-01-6088
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The symposium, held April 25-29, 1977, in Ann Arbor, Michigan, was to encourage reports of work in progress and to stimulate an exchange of information throughout the international remote sensing community.
KEYWORDS: MEETINGS;ENVIRONMENT;MONITORING;REMOTE SENSING;WATER POLLUTION;AIR POLLUTION;DATA COMPILATION

<091193>
TITLE: Partial Support--Ocean Sciences Board
PROJECT NUMBER: 006540
PRINCIPAL INVESTIGATOR: Vetter, R.C.
ADDRESS: National Academy of Sciences, 2101 Constitution Avenue N.W., Washington, DC 20550
AFFILIATION: National Academy of Sciences, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Interagency agreement-ERDA E(49-7)1181
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Other hydrographic areas All
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The objectives of the Ocean Sciences Board are to contribute to the advancement of the scientific understanding of the ocean by the maintenance of a continuing oversite of the health of ocean sciences and the stimulation of their progress as necessary; to foster the application of scientific knowledge to the wise use of the ocean and its resources; to assist in the formulation of policies that affect ocean science and the clarification of scientific issues that affect ocean policy in general; and to facilitate communication among oceanographers and communication and cooperation among ocean scientists and scientists from the basic disciplines and from related earth sciences.
KEYWORDS: OCEANOGRAPHY;RESEARCH PROGRAMS;PLANNING;COST;WATER POLLUTION;SEAS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT

<091194>
TITLE: Partial Support of the University National Oceanographic Laboratory System (UNOLS) Office
PROJECT NUMBER: 007136
PRINCIPAL INVESTIGATOR: Johrde, M.K.
ADDRESS: National Science Foundation, Office for Oceanographic Facilities and Support, Washington, DC 20550
AFFILIATION: National Science Foundation, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Energy Research and Development Administration FY77:$7,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The UNOLS Office objectives are to create a mechanism for coordinated utilization and planning for oceanographic facilities through an association of academic institutions in a national system whereby institutions can work together and with funding agencies to assist in the effective use, assessment and planning for oceanographic facilities. To improve the level and stability of federal support for academic oceanography, thereby continuing and enhancing the excellence of this nation's oceanographic programs.
KEYWORDS: OCEANOGRAPHY;RESEARCH PROGRAMS;PLANNING;COST

<091195>
TITLE: Absorption by Vegetation, Foliar Rates and Effects on Photosynthesis of Phytotoxic Air Pollutants Resulting from Fossil Fuel Utilization
PROJECT NUMBER: 007216
PRINCIPAL INVESTIGATOR: Bennett, J.H.
ADDRESS: Agricultural Research Service, U.S.D.A., Beltsville, MD 20705
AFFILIATION: Agricultural Research Service, Beltsville, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-EE-77-A-28-3238
77 FUNDING: Energy Research and Development Administration FY77:$47,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)

CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose is to determine the rates of absorption and effects on photosynthesis of the air pollutants, sulfur dioxide and nitrogen dioxide.
APPROACH: Plants will be exposed to controlled concentrations of pollutants in chambers and chemical, physiological, and biological parameters will be measured.
RESULTS: The results will help answer the following questions: what are the doses of sulfur dioxide and nitrogen dioxide which inhibit photosynthesis and growth of plants; do these pollutants act synergistically on plants; which properties of the plant determine absorption rates of sulfur dioxide and nitrogen dioxide; what is the effect of ozone or ethylene on the response of plants to sulfur dioxide and nitrogen dioxide; can exposure to low concentrations of sulfur dioxide or nitrogen dioxide improve sulfur or nitrogen nutrition of nutrient deficient plants.
KEYWORDS: FOSSIL FUELS;COMBUSTION;GASEOUS WASTES;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;SULFUR DIOXIDE;NITROGEN OXIDES;BIOLOGICAL EFFECTS;TOXICITY;FOLIAR UPTAKE;PLANTS;PHOTOSYNTHESIS;AIR POLLUTION;GROWTH;TERRESTRIAL ECOSYSTEMS

<091196>
TITLE: Effects of Sulfur Dioxide and Nitrogen Dioxide on Vegetation
PROJECT NUMBER: 007235
PRINCIPAL INVESTIGATOR: Weinstein, L.H.
ADDRESS: 1086 N. Broadway, Yonkers, NY 10701
AFFILIATION: Boyce Thompson Inst. for Plant Research, Inc., Yonkers, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: C(301)353-5329
TYPE OF FUNDING: Contract No.-EE-77-5-02-4368
77 FUNDING: Energy Research and Development Administration FY77:$170,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purposes of this study are to determine: (1) the rate of uptake and metabolic transformations of SO2 in plants; (2) the effect of SO2 on plant diseases; (3) the effect of SO2 on production of insect attractants and occurrence of insect infestation in plants; (4) the combined effects of SO2 and NO2 on plants.
APPROACH: Plants will be exposed to controlled concentrations of SO2 or SO2 and NO2 in chambers and chemical, biochemical and biological measurements will be performed.
RESULTS: These investigations will help answer the following questions: (1) what is the mechanism of action of SO2 in plants; (2) does SO2 enhance plant susceptibility to diseases or insect infestation, (3) does NO2 alter the phototoxicity of SO.
KEYWORDS: TERRESTRIAL ECOSYSTEMS;PLANTS;AIR POLLUTION;BIOLOGICAL EFFECTS;CHEMICAL EFFLUENTS;ENVIRONMENTAL TRANSPORT;SULFUR DIOXIDE;NITROGEN OXIDES;TOXICITY;METABOLISM;GROWTH

<091197>
TITLE: An Inner Shelf Sediment Transport Experiment, Coastal Long Island (INSTEP)
PROJECT NUMBER: 007237
PRINCIPAL INVESTIGATOR: Swift, D.J.P.
ADDRESS: NOAA, Atlantic Oceanographic and Meteorological Laboratories, Miami, FL 33149
AFFILIATION: National Oceanic and Atmospheric Administration, Miami, Fla. (USA). Atlantic Oceanographic and Metecrolcgical Labs.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Joseph, Arnold B.
TELEPHONE: F233-3035
TYPE OF FUNDING: Interagency agreement-USERDA
77 FUNDING: National Oceanic and Atmospheric Administration FY77:$150,000; Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Middle Atlantic;COASTS/Northeast;HYDROGRAPHIC AREAS/Continental shelf
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Determine coastwise and coast-normal components of suspended sediment flux. Determine patterns of sea floor erosion and sedimentation.
APPROACH: Procure, assemble and test instrument arrays combining current meters, nephelometers, acoustic transducers, cameras and wave gages. Use these instruments to measure movement of suspended sediments and bed loads and to characterize bottom erosion and deposition.
RESULTS: Ability to quantitatively estimate suspended sediment fluxes vis a vis sea floor sediment character.
KEYWORDS: OCEANOGRAPHY;COASTAL WATERS;NEW YORK;SEDIMENTS;ENVIRONMENTAL TRANSPORT;WATER CURRENTS;CHEMICAL COMPOSITION;REMOTE SENSING

<091198>
TITLE: Analysis of Air Quality and Meteorological Baseline Data from Federally Leased Oil Shale Tracts in Colcrado and Utah
PROJECT NUMBER: 007343
PRINCIPAL INVESTIGATOR: Slinne, W.G.N.
ADDRESS: Oregon State University, Corvallis, OR 97331
AFFILIATION: Oregon State Univ., Corvallis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert
TELEPHONE: C(301)353-3764;F233-3764
77 FUNDING: Energy Research and Development Administration FY77:$90,000

TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Basic baseline data (100%)
RACTER OF STUDY: ANALYTICAL (100%)
IONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northwest
EARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Extensive analysis and interpretation of the C-a, C-b, and V-a, V-b oil shale tract lease baseline data will be undertaken to determine the commonality of the measurements.
APPROACH: Data sets will be correlated with meteorological conditions to determine causes of simultaneous or phase-lagged extrema measured at each site.
RESULTS: Results will be needed to assess impact of oil shale activities on air quality in this region.
KEYWORDS: UTAH;COLORADO;METEOROLOGY;AIR QUALITY;OIL SHALE DEPOSITS;ENVIRONMENTAL EFFECTS;DATA COMPILATION;REGIONAL ANALYSIS;AIR POLLUTION;MONITORING;ACCURACY;ECONOMICS

<091199>
TITLE: Sources of Ozone and Sulfates in the Northeastern U.S.
PROJECT NUMBER: 007344
PRINCIPAL INVESTIGATOR: Husain, L.
ADDRESS: New York State Dept. of Health, Albany, NY 12202
AFFILIATION: New York State Dept. of Health, Albany (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Beadle, Robert
TELEPHONE: F233-4488;C(301)353-4488
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine the source of anomolous high ozone readings which are observed at the remote Whiteface Mt. station and to see what correlations exist with simultaneously measured sulfate aerosols.
APPROACH: Collect samples of air at the Whiteface Mtn. site and analyze for ozone, sulfate, natural radioisotopes of Be-7, P-32 and P-33 (tracers for stratospheric input) and trace elements, and evaluate the results in terms of meteorology and trajectory models.
RESULTS: A large mass of data on concentration of ozone, sulfates, trace elements and natural radioisotopes will be generated and an evaluation made of the relative contribution of stratospheric and long range transport of ozone. The correlations between anthropogenic ozone and sulfates will be developed.
PROJECT MILESTONES: Annual report of first year results, mid 1978.
KEYWORDS: NEW YORK;AIR POLLUTION;METEOROLOGY;OZONE;SULFATES;ENVIRONMENTAL TRANSPORT;AEROSOLS;MIXING;RURAL AREAS;BERYLLIUM 7;PHOSPHORUS 32;PHOSPHORUS 33;STRATOSPHERE;TROPOSPHERE;TRACER TECHNIQUES

Energy Research and Development Administration/Fossil Energy AA

<093050>
TITLE: Environmental Aspects of In Situ Oil Shale Processing
PROJECT NUMBER: BC-01-03
PRINCIPAL INVESTIGATOR: Poulson, R.E.
ADDRESS: Laramie Energy Research Center, Laramie, WY 82071
AFFILIATION: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
DIVISION: Laramie Energy Research Center
MONITOR: Decora, Andrew W.
TELEPHONE: F328-4258
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$700,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (50%);PROCESSING, CONVERSION (10%);WASTE MANAGEMENT (20%)
POLLUTANTS: NOXIOUS GAS (15%);METALS (20%);PARTICULATES (10%);ORGANICS (45%);RADIATION (5%);HEAT, THERMAL (5%)

CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (25%);FULL SCALE DEMONSTRATION (10%);PRODUCTION (10%);ANALYTICAL (5%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Assess the total environmental impact of in situ oil shale development and processing and develop controls and procedures to mitigate any effects.
APPROACH: Maintain a long range research program identifying and characterizing the products and effluents from an in situ oil shale industry. Develop monitoring and control technology which will address any environmental problems which are identified. Assist in process technology development.
RESULTS: (1) Data and analyses which describe oil shale potential environmental impacts. (2) Equipment and procedures to monitor and control effluents. (3) Improvements in process technology to minimize effluents.
PROJECT MILESTONES: (1) 1975 Begin development of baseline data field sites. (2) 1975-76 Characterize gas, liquid and solid products in in situ oil shale development. (3) 1977 Assess environmental effects of No. 2. (4) 1977 Develop monitoring and control technology.
KEYWORDS: IN-SITU PROCESSING;OIL SHALES;OIL SHALE INDUSTRY;ENVIRONMENTAL EFFECTS;AIR POLLUTION ABATEMENT;WATER POLLUTION ABATEMENT;LAND POLLUTION ABATEMENT;CHEMICAL EFFLUENTS;MONITORING;POLLUTION CONTROL EQUIPMENT;TECHNOLOGY ASSESSMENT;DESIGN;AIR;ECOSYSTEMS;SYNTHETIC FUELS;WATER

<093051>
TITLE: Laboratory Determination of Leaching Rates from Oil Shale Retorted Under Simulated In Situ Retorting Conditions
PROJECT NUMBER: G 025 4011
PRINCIPAL INVESTIGATOR: Parker, H.W.
ADDRESS: Texas Tech. University, Lubbock, TX 79409
AFFILIATION: Texas Tech Univ., Lubbock (USA)
MONITORING AGENCY: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
DIVISION: Laramie Energy Research Center
MONITOR: Poulson, Richard E.
TELEPHONE: F328-4257
TYPE OF FUNDING: Grant No.-G 025 4011
77 FUNDING: Energy Research and Development Administration FY77:$73,100; Texas Tech Univ. FY77:$3,400
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Determine the rate of leaching of inorganic salts from oil shale during and after in situ processing.
APPROACH: Measure water quality parameters after leaching of oil shale processed under controlled conditions.
RESULTS: Quantity of leached salts as a function of shale heating history.
PROJECT MILESTONES: (1) 2/75 Begin equipment design and fabrication. (2) 7/75 Begin running initial experiments. (3) 3/77 Finish final leach experiments.
KEYWORDS: OIL SHALES;IN-SITU RETORTING;ENVIRONMENTAL EFFECTS;OIL SHALE INDUSTRY;LEACHING;INORGANIC COMPOUNDS;WATER QUALITY;POLLUTION CONTROL EQUIPMENT;SIMULATION;WATER POLLUTION ABATEMENT;ECOSYSTEMS;CHEMICAL EFFLUENTS;SOILS;SYNTHETIC FUELS;WATER

<093052>
TITLE: Biological Degradation of the Soluble Organic Components in Retort Water
PROJECT NUMBER: E(29-2)-3619
PRINCIPAL INVESTIGATOR: Yen, T.F.
ADDRESS: University of Southern California, Los Angeles, CA 90007
AFFILIATION: University of Southern California, Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
DIVISION: Laramie Energy Research Center
MONITOR: Poulson, Richard E.
TELEPHONE: F328-4257
TYPE OF FUNDING: Contract No.-E(29-2)-3619
77 FUNDING: Energy Research and Development Administration FY77:$70,000; University of Southern California
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Convert organics in in situ oil shale retorting process water to retrieval products or carbon dioxide.
APPROACH: Cultivate bacterial cultures in retort water.
RESULTS: Feasibility shown that bacteria cultures can grow in retort water and biodegradable organics. Lab scale lagoon model built and tested.
PROJECT MILESTONES: (1) Preliminary analysis of retort water 7/75 to 6/77. (2) Evaluate bacteria strains 7/75 to 6/77. (3) Demonstrate process efficiency 6/76 to 6/78.
KEYWORDS: OIL SHALE PROCESSING PLANTS;LIQUID WASTES;ORGANIC COMPOUNDS;BACTERIA;METABOLISM;DECOMPOSITION;BIODEGRADATION;BIOCHEMISTRY;CARBON DIOXIDE;GENETIC VARIABILITY;ENVIRONMENTAL EFFECTS;ECOSYSTEMS;OXIDATION;SYNTHETIC FUELS;WATER

<093053>
TITLE: Water Conservation with In Situ Oil Shale Development
PROJECT NUMBER: W-7405-Eng-48
PRINCIPAL INVESTIGATOR: Thomas, J.F.
ADDRESS: East End of Hearst Avenue, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, San Francisco, Calif. (USA). San Francisco Operations Office
DIVISION: San Francisco Operations Office
MONITOR: Poulson, Richard
TELEPHONE: F328-4258;C(307)721-2011
TYPE OF FUNDING: Contract No.-W-7405-Eng-48;Interagency agreement-ERDA, DOI
77 FUNDING: Energy Research and Development Administration FY77:$40,000; Department of the Interior FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: METALS (20%);PARTICULATES (20%);ORGANICS (20%);HEAT, THERMAL (20%);SPECIFIED OTHER POLLUTANTS/PH (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (25%);ANALYTICAL (75%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To produce a Water Conservation Program for use with in situ production of shale oil that will permit full exploration of this new energy resource within economic, public health, and environmental constraints. (Region of study: Green River Formation marlstone, State of Colorado.)
APPROACH: Total project consists of 7 tasks. LBL is responsible for Task 1, parts a and b, and Tasks 6 and 7: Task 1, Identify water requirements and management, and effluent characterization and discharge, strategies for alternate oil shale technologies; Task 6, Develop water-quality monitoring strategy; and Task 7, Discuss implications of study results for oil shale development and deployment policies.
RESULTS: Final product is a detailed plan which solves the problems of the potential impacts of water availability and water quality.
PROJECT MILESTONES: Completion of Tasks listed under 93b are the milestones for which LBL is responsible. Those for which the U.C. Sanitary Engineering Research Lab is responsible include: (a) water quality and demands by subsequent use category; (b) identification of economic, public health, and environmental impacts of state-of-the-art oil shale processes; (c) assessment of alternate strategies to mitigate water impacts; and (d) identification of remaining unabated impacts on water availability and quality. Dates for completion of specific tasks have not been established.
KEYWORDS: OIL SHALE INDUSTRY;ENVIRONMENTAL EFFECTS;WATER RESOURCES;RESOURCE CONSERVATION;SOCIO-ECONOMIC FACTORS;WATER POLLUTION ABATEMENT;PUBLIC HEALTH;HEALTH HAZARDS;IN-SITU PROCESSING;OIL SHALES;CHEMICAL EFFLUENTS;MEASURING INSTRUMENTS;SYNTHETIC FUELS

<093054>
TITLE: Monitoring of Emissions from an In Situ Coal Gasification Test
PROJECT NUMBER: EP-77-C03-1502
PRINCIPAL INVESTIGATOR: Magee, B.
ADDRESS: 8500 Shoal Creek Blvd., P.O. 9948, Austin, TX 78766
AFFILIATION: Radian Corp., Austin, Tex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
DIVISION: Laramie Energy Research Center
MONITOR: Fischer, Dennis D.
TELEPHONE: F328-4375
TYPE OF FUNDING: Contract No.-EP-77-C03-1502
77 FUNDING: Energy Research and Development Administration FY77:$50,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: NOXIOUS GAS (75%);PARTICULATES (25%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Monitor trace gaseous and particulate emissions in the product gas stream from an in situ coal gasification test to assess environmental impacts.
APPROACH: Monitor 25 periods during the well-to-well forward gasification. At the wellhead, measure particulates, NH/sub 3/, COS, CS/sub 2/, HCN, Hg, As, Pb, Cd, Se, Na, K, Li, Ca and V.
RESULTS: Emissions as noted in (b) including size distributions of particulates and their elemental composition; effectiveness of the sampling program and techniques; and interpretation of results regarding the process environmental effects.
PROJECT MILESTONES: (1) Preparation for sampling 9/1/77 to 11/1/77. (2) Sample collection 11/1/77 to 4/30/78. (3) Laboratory analysis 12/1/77 to 6/30/78. (4) Data analysis and reporting 5/1/78 to 8/31/78.
KEYWORDS: HANNA IV;COAL GASIFICATION;AIR POLLUTION;MONITORING;ENVIRONMENTAL EFFECTS;IN-SITU GASIFICATION;AEROSOLS;SULFUR OXIDES;NITROGEN OXIDES;HYDROCARBONS;CARBON DIOXIDE;CARBON MONOXIDE;AMMONIA;HYDROCYANIC ACID;MERCURY;ARSENIC;LEAD;CADMIUM;SELENIUM;SODIUM;POTASSIUM;LITHIUM;CALCIUM;VANADIUM;CHEMICAL EFFLUENTS;SYNTHETIC FUELS;AIR

<093066>
TITLE: Mechanical Perturbation Studies of MHD Superconducting Magnets
PROJECT NUMBER: ANL-49738
PRINCIPAL INVESTIGATOR: Petrick, N.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60438
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy, MHD
MONITOR: Rudins, George
TELEPHONE: C(202)376-4858
TYPE OF FUNDING: Interagency agreement-ANL-49738
77 FUNDING: Energy Research and Development Administration FY77:$9,000

TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop basic information on the effect of local mechanical perturbations on the overall cryogenic stability of large superconducting MHD magnets.
APPROACH: Analytical and experimental studies of local relative motions of conductors which result in pulsed heating will be related to methods for the design and analysis of winding and support configurations.
RESULTS: The resultant information will provide a rational basis for understanding the effect of mechanical perturbations on the cryogenic stability of ETF and base-load superconducting magnets for the program.
PROJECT MILESTONES: (1) Establish geometry, boundaries, and major components for local models. (2) Develop and refine local models. (3) Define and start laboratory tests. (4) Analyze various techniques for predicting coil deformations. (5) Define needed development in techniques and improve techniques.
KEYWORDS: MHD GENERATORS;SUPERCONDUCTING MAGNETS;DISTURBANCES;STABILITY;CRYOGENICS;DESIGN;MATHEMATICAL MODELS;SAFETY

<093067>
TITLE: Study of Coal-Associated Wastes Resulting from Mining Processing and Utilization
PRINCIPAL INVESTIGATOR: Leonard, J.W.
ADDRESS: Morgantown, WV 26506
AFFILIATION: West Virginia Univ., Morgantown (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Materials and Exploratory Research
MONITOR: Scott, P.C.
TYPE OF FUNDING: Grant No.-E(49-18)-1218
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (50%);PARTICULATES/Ash (50%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Investigate waste by-products associated with conversion and use of coal. (2) Characterize by-products physically and chemically. (3) Suggest safe disposal methods for these materials. (4) Describe environmental impact.
APPROACH: This study, which currently is studying the utilization of waste products from coal conversion plants, consists of the following five tasks: (1) Develop Sulphurtain process. (2) Examine potential use of acid mine drainage sludge for purification of sewage and waste waters. (3) Study use of fly ash for neutralizing strip mine spoil. (4) Prepare fired structural materials (bricks and blocks) using coal-fired power plant ashes and sodium. (5) Examine and evaluate underground disposal of coal wastes.
RESULTS: Work needed on the utilization of these waste by-products will be accomplished in this study.
PROJECT MILESTONES: (1) Develop Sulphurtain process (2) Examine use of acid mine drainage sludge. (3) Study use of fly ash. (4) Prepare fired structural materials. (5) Examine and evaluate underground waste disposal.
KEYWORDS: COAL MINING;COAL PREPARATION;COMBUSTION PRODUCTS;COAL;WASTE MANAGEMENT;WASTES;CHEMICAL PROPERTIES;PHYSICAL PROPERTIES;ACID MINE DRAINAGE;FLY ASH;WASTE PRODUCT UTILIZATION;UNDERGROUND DISPOSAL;SULFUR COMPOUNDS;WATER POLLUTION

<093068>
TITLE: MHD High Performance Demonstration Experiment
PROJECT NUMBER: E(49-18)-1542
PRINCIPAL INVESTIGATOR: Garrison, G.W.
ADDRESS: Arnold Air Force Station, TN 37389
AFFILIATION: Arnold Engineering Development Center, Arnold Air Force Station, Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy, MHD
MONITOR: Postlethwaite, A.W.
TELEPHONE: C(202)376-9159
TYPE OF FUNDING: Interagency agreement-E(49-18)-1542
77 FUNDING: Energy Research and Development Administration FY77:$70,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;OS
PROJECT DESCRIPTION: To demonstrate MHD generator performance efficiency of 20 percent enthalpy extraction with greater than 60 percent turbine efficiency. Several subsystems could involve safety related considerations.
APPROACH: Assemble and test components of a high performance demonstration facility. Operate the facillity.
RESULTS: A demonstration of MHD generator performance efficiency of 20 percent enthalpy extraction with greater than 60 percent turbine efficiency.
PROJECT MILESTONES: (1) Facility development. (2) Flow components. (3) Generator system. (4) Magnet system. (5) Shakedown and operation.
KEYWORDS: MHD GENERATORS;THERMAL EFFICIENCY;ENTHALPY;EFFICIENCY;SAFETY;DEMONSTRATION PROGRAMS;TEST FACILITIES;PERFORMANCE TESTING;MAGNETIC FIELDS;BIOLOGICAL EFFECTS

<093069>
TITLE: Development Program for MHD Direct Coal-Fired Power Generation Test Facility
PROJECT NUMBER: EX-76-C-01-1760
PRINCIPAL INVESTIGATOR: Dicks, J.B.
ADDRESS: Tullahoma, TN 37388
AFFILIATION: Tennessee Univ., Tullahoma (USA). Space Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy, MHD
MONITOR: Epstein, J.

TELEPHONE: C(202)376-4856
TYPE OF FUNDING: Contract No.-EX-76-C-01-1760
77 FUNDING: Energy Research and Development Administration FY77:$226,900
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY:OS
PROJECT DESCRIPTION: Design and construct an 8 lb/sec. total gas flow direct coal-fired MHD power generator test facility. Design, fabricate, install and test MHD components in the 8 lb/sec. facility. Perform tests in an existing facility to support the design of the 8 lb/sec. facility.
APPROACH: Use an existing test facility to develop engineering data for the design of a larger facility and its MHD components. Test components in this larger facility.
RESULTS: The primary goal is 100 hours of continuous testing of the UTSI combustor-generator by August 1977. A secondary goal is 300 hours of cumulative operation on the various system segments including combustor-channel, slag/seed separation, seed recovery and pollution control.
PROJECT MILESTONES: (1) Supporting experiments for the design of a coal-fired MHD flow facility. (2) Design and construction of the coal-fired flow facility. (3) Program for open cycle, direct coal-fired technology development. (4) Materials application support program. (5) Data analysis. (6) Additional ERDA test programs in new facility.
KEYWORDS: COAL-FIRED MHD GENERATORS;TEST FACILITIES;DESIGN;PERFORMANCE TESTING;DATA;MATERIALS TESTING;SULFUR DIOXIDE;COAL;COMBUSTION;ENVIRONMENTAL IMPACTS

<093070>
TITLE: Coal Gasification Environmental Problems from Trace Materials in By-Products
PROJECT NUMBER: E(49-18)-2019
PRINCIPAL INVESTIGATOR: Van Meter, W.
ADDRESS: Missoula, MT 58901
AFFILIATION: Montana Univ., Missoula (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Materials and Exploratoy Research
MONITOR: Scott, P.C.
TYPE OF FUNDING: Grant No.-E(49-18)-2019
77 FUNDING: Energy Research and Development Administration
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: PARTICULATES/Ash (60%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (40%)
CHARACTER OF STUDY: RESEARCH/Applied (30%);DEVELOPMENT/Pilot plant (40%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Conduct tests to characterize coal gasifier ash and other waste materials with regard to the amounts of toxic, water-soluble chemical species they contain and to determine the rates at which they are released by leaching treatments.
APPROACH: (I) Obtain representative ash and other waste samples from several operating gasification pilot plants. (II) Leach the Task I samples with distilled and natural ground water, an ammonium acetate solution, and sulfuric acid, using standard column chromatography techniques. The ammonium acetate (an ionic, buffered medium) will cause the release of many ions that are not removed by simple solubility in water, yet it will not mask the subsequent analysis of the toxic species. The sulfuric acid will indicate the amounts of metals that may be released over a long time. (III) Perform a qualitative and quantitative elemental analysis on the leachates obtained in Task II to determine whether or not ground and surface water contamination may result from the interaction of natural forces with the fly ash, slag, and other by-products of coal gasification plants.
RESULTS: When coupled with baseline data on the presence of naturally occurring minerals in water, such an investigation may be expected to delineate the possibilities for ground and surface water contamination.
PROJECT MILESTONES: (1) Obtain representative waste samples. (2) Leach samples with different liquids. (3) Qualitative and quantitative analysis of leachates.
KEYWORDS: COAL GASIFICATION;ENVIRONMENTAL IMPACTS;TRACE AMOUNTS;BY-PRODUCTS;AEROSOLS;FLY ASH;TOXICITY;WATER POLLUTION;LEACHING;SULFURIC ACID;AMMONIUM COMPOUNDS;SLAGS;BASELINE ECOLOGY;ECOLOGICAL CONCENTRATION;METALS;QUANTITATIVE CHEMICAL ANALYSIS;QUALITATIVE CHEMICAL ANALYSIS

<093071>
TITLE: Hazardous and Other Undesirable Elements and Compounds in Supplementary Gaseous and Liquid Fuels from Coal
PROJECT NUMBER: PERC-7097
PRINCIPAL INVESTIGATOR: Sharkey, A.G. Jr.
ADDRESS: 4800 Forbes Ave., Pittsburgh, PA 15213
AFFILIATION: Energy Research and Development Administration, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Materials and Exploratory Research
MONITOR: Harney, B.
TYPE OF FUNDING: Contract No.-PERC-7097
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS/HO/sub x/;NOXIOUS GAS/SO/sub x/ (40%);PARTICULATES/Ash (30%);ORGANICS (20%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (10%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Provide data concerning contaminants in process streams to assist in the design of proper purification procedures for producing environmentally acceptable supplemental fuels.
APPROACH: Products from coal gasification and liquefaction including gas, oil, tar, water, and char will be investigated for toxic or hazardous components. Analytical techniques will be developed for determining organic and inorganic constituents. Trace elements that possibly are toxic in the vapor form or produce hazardous compounds will be investigated by spark-source mass spectrometry, neutron activation, atomic

absorption, and other techniques. Organic material associated with these streams will be analyzed by high-resolution mass spectrometry, combined gas chromatography-mass spectrometry, and other appropriate spectral techniques. Organic and inorganic contaminants also will be evaluated in terms of standard lists of hazardous compounds such as Threshold Limit Values (American Conference of Government Industrial Hygienists, U.S. Coast Guard List), lists prepared by the National Research Council, the Toxic Substance List published by HEW in 1971, and recent lists of carcinogens released by OSHA.
PROJECT MILESTONES: (1) 9/77 Screen liquefaction products. (2) 9/77 Determine hazardous elements in synthane. (3) 9/77 Determine hazardous elements in by-product waters. (4) 9/77 Investigate tars and chars. (5) 9/77 Develop techniques. (6) 9/77 List standards.
KEYWORDS: SUPPLEMENTAL FUELS;COAL GAS;COAL LIQUIDS;COAL LIQUEFACTION;COAL GASIFICATION;HAZARDOUS MATERIALS;TAR;CHARS;TOXIC MATERIALS;CARCINOGENS;MAXIMUM PERMISSIBLE CONCENTRATION;WASTE WATER;SYNTHANE PROCESS;STANDARDS;TRACE AMOUNTS;SPECTROSCOPY;SYNTHETIC FUELS;REFINING

<093072>
TITLE: ERDA, FE/MHD Operational Support
PROJECT NUMBER: EX-76-C-01-2228
PRINCIPAL INVESTIGATOR: Crego, E.F.
ADDRESS: P.O. Box 1498, Reading, PA 19603
AFFILIATION: Gilbert Associates, Inc., Reading, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy, MHD
MONITOR: Jackson, W.D.
TELEPHONE: C(202)376-4630/31
TYPE OF FUNDING: Contract No.-EX-76-C-01-2228
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY;OS
PROJECT DESCRIPTION: To provide in-depth architect/engineering support services and power plant systems engineering, to prepare environmental and economic studies and to give technical consultation in a timely manner for assisting the MHD division to achieve MHD power generation. To provide project office operational support concerning project control and evaluation, program planning, budgeting and the establishment of modern program management systems.
APPROACH: Provide fast-response analysis and reporting of the results and status of a variety of division activities and projects.
RESULTS: Design review recommendations for a variety of MHD systems and subsystems. Recommendations and assistance in the areas of project control and evaluation, program planning, budgeting, and the establishment of modern program management systems.
PROJECT MILESTONES: (1) Administration of contract. (2) Science and technology. (3) MHD systems engineering. (4) Facilities engineering support. (5) International cooperative program support. (6) Program management support. (7) Contractor surveillance support. (8) End of contract.
KEYWORDS: SUPPORT SERVICES;MHD GENERATORS;MANAGEMENT;PLANNING;DESIGN;ENGINEERING;TEST FACILITIES;POLLUTION REGULATIONS;IMPLEMENTATION

<093073>
TITLE; System Analysis and Establishment of Design Criteria
PROJECT NUMBER: EX-76-C-01-2243
PRINCIPAL INVESTIGATOR: Demetriades, S.;Maxwell, C.
ADDRESS: P.O. Box C, Arcadia, CA 91006
AFFILIATION: STD Research Corp., Arcadia, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy, MHD
MONITOR: Sluyter, M.M.
TELEPHONE: C(202)376-9158
TYPE OF FUNDING: Contract No.-EX-76-C-01-2243
77 FUNDING: Energy Research and Development Administration FY77:$38,750
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To develop engineering information for designers of MHD generator channels and evaluate the results of development testing. To develop analytical models, computer programs, and display techniques for utilization with data relative to MHD phenomena in MHD channels. To perform analysis of experimental data and analytical conclusions. A subtask which involves environmental and safety related research is designed to evaluate the environmental impact of MHD power plants.
APPROACH: Research and analysis to obtain engineering data, analytical models and computer programs and information concerning environmental impacts of MHD.
RESULTS: Engineering data, analytical models, computer programs, and display techniques for use by designers of MHD generator channels and a report on the environmental impact of MHD power plants.
PROJECT MILESTONES: (1) Channel design and test analysis. (2) Development of codes. (3) Assistance in simulation and modelling of entire MHD system. (4) Closed cycle coal burning MHD generator. (5) Quick reaction capability. (6) End of contract.
KEYWORDS: MHD GENERATORS;ENGINEERING;MHD CHANNELS;MATHEMATICAL MODELS;COMPUTER CODES;DATA ACQUISITION;MHD POWER PLANTS;ENVIRONMENTAL IMPACTS;DESIGN;NITROGEN;SULFUR;MAGNETIC FIELDS;SAFETY

<093074>
TITLE: Develop Reference Designs for Superconducting MHD Magnets for Both Experimental and Base Load Plants
PROJECT NUMBER: E(49-18)-2285
PRINCIPAL INVESTIGATOR: Detra, R.
ADDRESS: 2385 Revere Beach Parkway, Everett, MA 02149
AFFILIATION: Avco-Everett Research Lab., Everett, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy, MHD
MONITOR: Rudins, George
TELEPHONE: C(202)376-4858

TYPE OF FUNDING: Contract No.-E(49-18)-2285
77 FUNDING: Energy Research and Development Administration FY77:$38,000
ECHNOLOGY: FOSSIL FUEL/Coal (100%)
NERGY CYCLE: ELECTRICITY GENERATION (100%)
HARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To design superconducting magnets for MHD application. Safety considerations are incorporated into the design work.
APPROACH: Design and evaluate superconducting magnets for MHD application.
RESULTS: Design characteristic of superconducting magnets for MHD application.
PROJECT MILESTONES: End of contract.
KEYWORDS: SAFETY;MHD GENERATORS;SUPERCONDUCTING MAGNETS;DESIGN;SAFETY;PERFORMANCE

<093075>
TITLE: Support in Planning and Managing ERDA's Super Conducting MHD Magnet Development Program
PROJECT NUMBER: EX-76-A-01-2295
ADDRESS: 77 Massachusetts Institute of Technology, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy--MHD
MONITOR: Rudins, G.
TELEPHONE: C(202)376-4858
TYPE OF FUNDING: Contract No.-EX-76-A-01-2295
77 FUNDING: Energy Research and Development Administration FY77:$109,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;OS
PROJECT DESCRIPTION: To provide support in planning and managing ERDA's superconducting MHD magnet development program.
APPROACH: Support design and evaluation of superconducting magnets for MHD application.
RESULTS: Design characteristics of superconducting magnets for MHD application.
PROJECT MILESTONES: (1) Planning and establishment of an overall superconducting MHD magnet development program. (2) Monitoring and continuing review. (3) Participating in and supporting ERDA with management of superconducting magnet design and construction projects. (4) Coordinate the MHD magnet program activities.
KEYWORDS: MHD GENERATORS;SUPERCONDUCTING MAGNETS;PLANNING;MANAGEMENT;DESIGN;PERFORMANCE TESTING

<093076>
TITLE: Guidelines and Methodologies for Environmental Reports
PRINCIPAL INVESTIGATOR: Krajeski, E.
ADDRESS: McLean, VA
AFFILIATION: Mitre Corp., McLean, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environment and Safety Programs
MONITOR: Hemenway, Allyn
TELEPHONE: C(202)376-1720
TYPE OF FUNDING: Contract No.-E(49-18)-02350 Task 2.1
77 FUNDING: Energy Research and Development Administration FY77:$76,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To prepare guidelines and methodologies for preparation of environmental assessments and impact statements.
APPROACH: In order for information on air, water, and solid waste pollution to be made readily accessible, a single reference document was compiled. Fossil energy personnel would use this document during preparatiion of Environmental Impact Statements.
RESULTS: A document containing samples of environmental issue statements was prepared.
KEYWORDS: RECOMMENDATIONS;ENVIRONMENTAL IMPACT STATEMENTS;TECHNOLOGY ASSESSMENT;AIR POLLUTION;WATER POLLUTION;SOLID WASTES;LAND USE;WASTE DISPOSAL;FOSSIL FUELS;MEASURING METHODS

<093077>
TITLE: Westinghouse--ETF
PROJECT NUMBER: EP-77-C-01-2363
ADDRESS: Large, PA 15025
AFFILIATION: Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Advanced Energy Systems Div.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy--MHD
MONITOR: Epstein, J.
TELEPHONE: C(202)376-4856
TYPE OF FUNDING: Contract No.-EP-77-C-01-2363
77 FUNDING: Energy Research and Development Administration FY77:$58,500
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop MHD ETF design criteria.
APPROACH: Reform analysis of existing information.
RESULTS: MHD ETF design criteria. Design criteria will include safety and environmental considerations.
PROJECT MILESTONES: End of contract.
KEYWORDS: ELECTROMAGNETIC;MHD GENERATORS;TEST FACILITIES;DESIGN;SAFETY;ENVIRONMENTAL IMPACTS;MAGNETIC FIELDS;BIOLOGICAL EFFECTS

<093078>
TITLE: Investigation of the Potential for Utilization of Saline Groundwater in Energy-Related Processes
PRINCIPAL INVESTIGATOR: Mesich, F.
ADDRESS: Austin, TX 78766
AFFILIATION: Radian Corp., Austin, Tex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environment and Safety Projects
MONITOR: Nardella, John
TELEPHONE: C(202)376-1725
TYPE OF FUNDING: Contract No.-E(49-18)-2444
77 FUNDING: Energy Research and Development Administration FY77:$66,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To evaluate and assess the technical feasibility of saline water substitution in energy-related process models.
APPROACH: (1) Review data on saline water in western coal-bearing regions. (2) Review data and requirements for model fossil-fired steam electric plants. (3) Review data and requirements for model 250 million cubic feet per day high Btu coal-gasification plant. (4) Evaluate effect of potential saline water supplies on near and far term standards for fossil fuel plants. (5) Analyze impact of environmental and meteorological conditions. (6) Examine alternative and environmental impacts. (7) Assess economic and environmental feasibility of saline water substitution.
RESULTS: There is adequate saline water in coal-bearing regions. Saline water can be substituted for fresh water in most process units. However, each situation must be evaluated on a case-by-case basis.
KEYWORDS: SALINE WATER SUBSTITUTION;FUEL CONVERSION PROCESSES;GROUND WATER;WATER REQUIREMENTS;ENERGY SOURCE DEVELOPMENT;DATA ANALYSIS;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL IMPACTS;COAL GASIFICATION;BRINES;INTERCHANGEABILITY;FRESH WATER;METEOROLOGY;FEASIBILITY STUDIES;COAL GASIFICATION PLANTS

<093079>
TITLE: CDIF Project Management Support and Related MHD Development Efforts
PROJECT NUMBER: EF-77-C-01-2524
PRINCIPAL INVESTIGATOR: Meglen, J.D.
ADDRESS: P.O. Box 3809, Butte, MT 59701
AFFILIATION: Montana Energy and MHD Research and Development Inst., Inc., Butte (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy--MHD
MONITOR: Lightner, R.G.
TELEPHONE: C(202)376-4696
TYPE OF FUNDING: Contract No.-EF-77-C-01-2524
77 FUNDING: Energy Research and Development Administration FY77:$813,500
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);SPECIFIED OTHER POLLUTANTS/Trace elements (20%)
CHARACTER OF STUDY: RESEARCH/General (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: To provide engineering information for use in the design/development of MHD generators and subsystem components and to prepare for the operation and management of the Component Development and Integration Facility. Several subtasks involve environmental and safety related investigations.
RESULTS: Engineering information for use in the design/development of MHD generators and subsystem components and personnel and procedures for managing the Component Development and Integration Facility (CDIF).
PROJECT MILESTONES: (1) CDIF Component, Subsystem and System Design Support. (2) CDIF Instrumentation, Control, and Data Acquisition. (3) Preliminary ETF Environmental Analysis and Site Study. (4) Materials Evaluation and Management of University and MERDI Supporting Science and Technology. (5) Characterization of Coal for Open Cycle MHD Power Generation System. (6) Studies of MHD Preheater Materials. (7) Selected Investigation: Preparation of Rosebud Seam Coal for MHD. (8) Slag Flow and NOx Kinetics: Moderate Temperature Slag Flow Facility. (9) Slag Seed Equilibria and Separations Related to MHD Systems. (10) Slag Physical Properties: Properties of Current Carriers. (11) Physical Properties of Coal Slag: Thermionic Emission. (12) Slag Physical Properties: Electrical and Thermal Conductivity. (13) MHD Systems and Data Acquisition. (14) Cycle Analysis and Control. (15) Facility Coordination. (16) CDIF Facility and Test Article Interface Control. (17) CDIF Environmental Monitoring. (18) MERDI CDIF Representation at Test Component Supplier Facilities. (19) EPA Hazardous Waste Permit Study. (20) MHD-CDIF Preoperational Baseline Biological Surveillance Program. (21) Socioeconomic Impact of MHD-CDIF Project-Phase I. (22) End of Contract.
KEYWORDS: FAUNA;MHD GENERATORS;ENGINEERING;INFORMATION;TEST FACILITIES;MANAGEMENT;ENVIRONMENTAL IMPACTS;SAFETY;SITE SELECTION;BIOLOGICAL EFFECTS;MAGNETIC FIELDS

<093080>
TITLE: CDIF Integration
PROJECT NUMBER: EF-77-C-01-2617
PRINCIPAL INVESTIGATOR: Feret, J.M.
ADDRESS: P.O. Box 10864, Pittsburgh, PA 15236
AFFILIATION: Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Advanced Energy Systems Div.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy--MHD
MONITOR: Lightner, R.G.
TELEPHONE: C(202)376-4696
TYPE OF FUNDING: Contract No.-EF-77-C-01-2617
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To interface system components.

APPROACH: Analytical.
RESULTS: Integration of components to form a safe functional system.
PROJECT MILESTONES: (1) Completion of Generator/Combustor Interface. (2) Completion of Generator/Diffuser Interface. (3) Completion of Exhaust Gas Treatment System. (4) Interface Magnet to Facility.
KEYWORDS: MHD GENERATORS;TEST FACILITIES;COMBUSTORS;DIFFUSERS;ELECTROMAGNETS;EXHAUST GASES;PERSONNEL;SAFETY

<093081>
TITLE: Development of Conceptual Designs for Water Treatment in Demonstration Plants
PRINCIPAL INVESTIGATOR: Goldstein, D.J.
ADDRESS: 238 Main St., Cambridge, MA 02142
AFFILIATION: Water Purification Associates, Cambridge, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Major Facility Project Management
MONITOR: Nakley, T.J.
TELEPHONE: C(202)376-9380
TYPE OF FUNDING: Contract No.-EF-77-C-01-2635;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$264,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (70%);CONSERVATION/General (30%)
ENERGY CYCLE: TRANSPORTATION (40%);PROCESSING, CONVERSION (60%)
POLLUTANTS: PARTICULATES/Residues (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To provide conceptual designs for integrated water treatment plants for incorporation into coal gasification demonstration plants which will produce pipeline gas and fuel gas. Further objectives are: (a) removal of all residuals as segregated solid wastes, and (b) to develop a test program for the non-standard treatment technologies so as to provide data for demonstrating the adequacy and optimizing of the water treatment plant conceptual designs.
APPROACH: The work is divided into the following for technical phases. (1) Conceptual designs for water treatment technologies. (2) Ultimate disposal of residuals. (3) Integrated water treatment plants. (4) Develcpment of a test program.
RESULTS: Six complete integrated water treatment plant designs will be provided, one for each of six plant-site combinations. A test program will be developed for technologies which will enable demonstration plants to be utilized to provide data for demonstrating the adequacy and optimization of the water treatment plant designs.
PROJECT MILESTONES: (1) Process and site selection report 6/10/77. (2) Plant No. 1 design complete 1/10/78. (3) Plant No. 2 design complete 2/1/78. (4) Plant No. 3 design complete 2/22/78. (5) Plant No. 4 design complete 3/21/78. (6) Plant No. 5 design complete 4/15/78. (7) Plant No. 6 design complete 5/15/78. (8) Draft final report submittal 7/10/78.
KEYWORDS: WATER TREATMENT;WASTE MANAGEMENT;PILOT PLANTS;DESIGN;COAL GASIFICATION;WATER POLLUTION;WASTE DISPOSAL;OPTIMIZATION

<093082>
TITLE: Water Discharge Monitoring Program, Synthane Pilot Plant
ADDRESS: Graduate Schcol of Public Health, Pittsburgh, PA 15261
AFFILIATION: Pittsburgh Univ., Pa. (USA). Graduate School of Public Health
MONITORING AGENCY: Energy Research and Development Administration, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
DIVISION: Pittsburgh Energy Research Center
MONITOR: Scott, R.L.
TELEPHONE: F726-2534
TYPE OF FUNDING: Contract No.-E(11-1)-2999
77 FUNDING: Energy Research and Development Administration FY77:$18,400
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (40%);SPECIFIED OTHER POLLUTANTS/Water (60%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: (1) To provide monitoring data in accordance with the NPDES permit. (2) To provide analysis and consulting services on proper operation and optimization of operations related to discharges. (3) To provide adequate documentation of the characteristics and quantity of discharge from synthane to the aquatic environment.
APPROACH: Sampling and monitoring in accordance with EPA requirements.
RESULTS: Characterization of synthane outfall and compliance with NPDES requirements.
KEYWORDS: SYNTHANE PROCESS;COAL GASIFICATION;ENVIRONMENTAL IMPACTS;WATER POLLUTICN;MONITORING;SAMPLING;SYNTHETIC FUELS

<093083>
TITLE: Role of Spent Shale in Oil Shale Processing and the Management of Environmental Residues
PRINCIPAL INVESTIGATOR: Hines, A.L.
ADDRESS: Colcrado School of Mines, Golden, CO 80401
AFFILIATION: Colorado School of Mines, Golden (USA). Dept. of Chemical and Petroleum Refining Engineering
MONITORING AGENCY: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
MONITOR: Duvall, John J.
TELEPHONE: F328-4258
TYPE OF FUNDING: Contract No.-E(29-2)-3780
77 FUNDING: Energy Research and Development Administration FY77:$99,000; Colorado School of Mines FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: METALS (20%);PARTICULATES (20%);ORGANICS (60%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)

REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLCGICAL PROCESSES AND EFFECTS;ECT;OS
PROJECT DESCRIPTION: To investigate leaching of spent shale to identify the leachable salts and organics and to develop methcds to clean up water produced during in situ retorting processes.
APPROACH: Laboratory studies.
RESULTS: Proposed methods to minimize leaching and to clean up retort waters.
PROJECT MILESTONES: (1) Month 6 Equipment design and construction. (2) Month 6-30 Experimental measurements. (3) Mcnth 30-36 Data analysis.
KEYWORDS: OIL SHALE INDUSTRY;WASTE MANAGEMENT;SPENT SHALES;RESIDUES;LEACHING;WATER POLLUTION CONTROL;RETORTING;EQUIPMENT;DESIGN;MEASURING METHODS;DATA ANALYSIS;AIR

<093084>
TITLE: Mineralogical and Geochemical Study of the Colorado Oil Shales
PRINCIPAL INVESTIGATOR: Slaughter, M.
ADDRESS: Colorado School of Mines, Golden, CO 80401
AFFILIATION: Colorado School of Mines, Golden (USA)
MONITORING AGENCY: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
MONITOR: Robb, William A.
TELEPHONE: C(307)721-4236;F328-4236
TYPE OF FUNDING: Contract No.-EF-77-S-04-4043
77 FUNDING: Energy Research and Development Administration FY77:$62,000; Colorado School of Mines FY77:$3,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To quantitatively determine the elemental and mineralogical analyses of oil shale on a microstratigraphic scale.
APPROACH: Electron microprobe analysis.
RESULTS: Elemental distribution and geochemistry of oil shale genesis.
PROJECT MILESTONES: (1) Month 4 Prepare samples. (2) Month 2-20 Analyze by microprobe. (3) Month 10-20 X-ray diffraction studies. (4) Month 20-24 Correlations, modelling and report.
KEYWORDS: COLORADO;OIL SHALES;GEOCHEMICAL SURVEYS;MINERALS;QUANTITATIVE CHEMICAL ANALYSIS;GEOCHEMISTRY;ELECTRON MICROPROBE ANALYSIS;ELECTRON PROBES;STRATIGRAPHY

<093085>
TITLE: Removal of Ammonia and Alkalinity from Oil Shale Retort Water
PRINCIPAL INVESTIGATOR: Linstedt, K.D.
ADDRESS: University of Colorado, Department of Civil Engineering, Boulder, CO 80309
AFFILIATION: Colorado Univ., Boulder (USA)
MONITORING AGENCY: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
MONITOR: Poulson, Richard
TELEPHONE: C(307)721-4258;F328-4258
TYPE OF FUNDING: Contract No.-EF-77-S-04-4044
77 FUNDING: Energy Research and Development Administration FY77:$47,900; Colorado Univ. FY77:$1,500
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: COMBUSTION IN SITU (100%)
POLLUTANTS: ORGANICS/Ammonia (90%);SPECIFIED OTHER POLLUTANTS/Alkalinity (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (80%);DEVELOPMENT/Laboratory scale (20%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT
PROJECT DESCRIPTION: To develop an operational system for removing ammonium and bicarbonate ions from retort water by treatment with a weak acid cation exchange resin. To reduce the inorganic loading of in situ retort water.
APPROACH: Applied resin technology from laboratory studies to small pilot plant stage.
RESULTS: A method to remove ammonium and alkalinity with potential of resulting in a saleable product.
PROJECT MILESTONES: (1) Month 4 Identify and evaluate resins. (2) Month 9 Resin testing and applications. (3) Month 15 Pilot scale facility. (4) Month 18 Final report.
KEYWORDS: ALKALINITY;OIL SHALES;WASTE WATER;OIL SHALE INDUSTRY;ENVIRONMENTAL IMPACTS;WASTE MANAGEMENT;AMMONIA;REMOVAL;PH VALUE;RESINS;RETORTING;WATER POLLUTION

<093086>
TITLE: Monitoring Trailers, Synthane Pilot Plant
ADDRESS: Allegheny County Airport, West Mifflin, PA 15122
AFFILIATION: Denardo and McFarland, West Mifflin, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
DIVISION: Pittsburgh Energy Research Center
MONITOR: Scott, R.L.
TELEPHCNE: F726-2534
TYPE OF FUNDING: Contract No.-E(11-1)-4063
77 FUNDING: Energy Research and Development Administration FY77:$19,050
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Ti;METALS/V;METALS/Se;METALS/Ni;METALS/Pb;METALS/Fe (20%);SPECIFIED OTHER POLLUTANTS/SOx, NOx, CO, H2S (80%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: (1) To provide for the documentation of the effects of the synthane pilot plant on the ambient air. (2) To provide invaluable data for demonstration and commercialization work with coal conversion processes. (3) To provide a model example how coal conversion processes can work in harmony with the environment.

APPROACH: This project will require the contractor to fabricate two trailers equipped with air pollution equipment to monitor the air around the synthane pilot plant.
RESULTS: Two fully equipped trailers and auxiliary equipment.
KEYWORDS: VEHICLES;MOBILITY;LABORATORY EQUIPMENT;AEROSOL MONITORING;TITANIUM;VANADIUM;SELENIUM;NICKEL;LEAD;IRON;SULFUR DIOXIDE;NITROGEN OXIDES;CARBON MONOXIDE;HYDROGEN SULFIDES;AIR POLLUTION MONITORS;SYNTHETIC FUELS;ENVIRONMENTAL IMPACTS;PILOT PLANTS;SYNTHANE PROCESS;COAL GASIFICATION

<093087>
TITLE: Stack Sampling Program, Synthane Pilot Plant
ADDRESS: Cherry Valley Road, Princeton, NJ 08540
AFFILIATION: Recon Systems, Inc., Princeton, N.J. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
DIVISION: Pittsburgh Energy Research Center
MONITOR: Scott, R.L.
TELEPHONE: P726-2534
TYPE OF FUNDING: Contract No.-E(11-1)-4065
77 FUNDING: Energy Research and Development Administration FY77:$72,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (10%);PARTICULATES (10%);ORGANICS (10%);SPECIFIED OTHER POLLUTANTS/Water vapor (70%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: (1) To provide documentation with emission flow rates for the thermal oxidizer. (2) To provide characterization and quantification of these emissions based on process conditions and coals used. (3) To provide a model example of how coal conversion processes can work in harmony with the environment and ERDA's efforts in this regard.
APPROACH: The thermal oxidizer is approximately 75 feet in height. Sampling points are positioned at approximately two stack diameters from the top of the stack. The outside diameter of the stack is approximately 84 inches at the sampling point. Two sampling ports are provided at ninety degree angles to one another.
RESULTS: Source sampling for particulates, NOx, SO2, organics and metals will be required. Temperatures would be in the range of 1650 to 1700 degrees F.
KEYWORDS: THERMAL OXIDIZER;COAL GASIFICATION;STACK DISPOSAL;FLUE GAS;SAMPLING;SYNTHANE PROCESS;AIR POLLUTION;ENVIRONMENTAL IMPACTS;AEROSOL MONITORING;WATER VAPOR;COAL INDUSTRY;MATHEMATICAL MODELS;PARTICLES;NITROGEN OXIDES;SULFUR DIOXIDE;HYDROCARBONS;METALS;SYNTHETIC FUELS;AIR QUALITY

<093088>
TITLE: Ambient Air Monitoring Contractor Services--Synthane Pilot Plant
ADDRESS: 2421 W. Hillcrest Drive, Newbury, CA 91320
AFFILIATION: Rockwell International Corp., Newbury Park, Calif. (USA). Air Monitoring Center
MONITORING AGENCY: Energy Research and Development Administration, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
MONITOR: Scott, R.L.
TELEPHONE: P726-2534
TYPE OF FUNDING: Contract No.-EF-77-C-02-4244;E(11-1)-4244
77 FUNDING: Energy Research and Development Administration FY77:$103,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS/Ti;METALS/V;METALS/Se;METALS/Ni;METALS/Pb;METALS/Fe (10%);PARTICULATES (10%);SPECIFIED OTHER POLLUTANTS/SO2, NOx, CO, H2S (80%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: (1) To provide documentation reports and analysis on the effects of the Synthane Pilot Plant on the ambient air environment. (2) To maintain to EPA standards the monitoring equipment including calibration and cross-referencing and provide documentation on maintenance operations. (3) To provide consultative services on field placement and operation of equipment.
APPROACH: The work site would encompass six (6) ambient air monitoring sites. At two (2) sites ambient air monitoring trailers are located. At the remaining four (4) sites would be located Hi Vol Samplers, Dustfall Jars and Huey Plates, one of each at each site. The sites would be at key locations of the Windrose for the Synthane Pilot Plant.
RESULTS: Ambient air monitoring data for the Synthane Pilot Plant.
KEYWORDS: COAL GASIFICATION;SYNTHANE PROCESS;AIR POLLUTION;MONITORING;ENVIRONMENTAL IMPACTS;DOCUMENTATION;AIR POLLUTION MONITORS;SITE SELECTION;METEOROLOGY;EARTH ATMOSPHERE;ENVIRONMENTAL TRANSPORT;TITANIUM;VANADIUM;SELENIUM;NICKEL;LEAD;IRON;SULFUR DIOXIDE;NITROGEN OXIDES;CARBON MONOXIDE;HYDROGEN SULFIDES

<093089>
TITLE: Water Impacts of In-Situ Energy
PRINCIPAL INVESTIGATOR: Kerr, B.
ADDRESS: Laramie Energy Research Center, Laramie, WY 82071
AFFILIATION: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environment and Safety Programs
MONITOR: Powderly, John
TELEPHONE: C(202)376-1722
TYPE OF FUNDING: Contract No.-FG-6579
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS (33%);PARTICULATES (33%);ORGANICS (34%)

REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Hanna, WY
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: To determine impacts of underground coal gasification on surrounding groundwater systems; to investigate potential impacts on surface waters, and develop environmental control strategy.
APPROACH: Specifically, the program is designed to: (1) Acquire baseline water quality data. (2) Collect and analyze samples. (3) Determine water quality impacts. (4) Prepare recommendations regarding any mitigating measures that may be necessary for any future underground coal gasification tests.
RESULTS: The effects of undergound coal gasification on groundwater systems will be quantified and assessed.
PROJECT MILESTONES: Hanna tests are scheduled to continue through at least FY-78 and 79. LERC prepares an annual report for this task.
KEYWORDS: IN-SITU PROCESSING;WATER REQUIREMENTS;BASELINE ECOLOGY;COAL GASIFICATION;UNDERGROUND MINING;WATER POLLUTION CONTROL;WATER POLLUTION MONITORS;SAMPLING;CHEMICAL ANALYSIS;POLLUTION CONTROL EQUIPMENT;RECOMMENDATIONS;ENVIRONMENTAL IMPACTS;WATER POLLUTION

<093090>
TITLE: Environmental and Conservation Concerns of In-Situ Fossil Energy Research and Development Projects
PRINCIPAL INVESTIGATOR: Kerr, R.D.
ADDRESS: U.S. ERDA-Laramie Energy Research Center, Laramie, WY 82071
AFFILIATION: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Laramie, Wyo. (USA). Laramie Energy Research Center
DIVISION: Laramie Energy Research Center
MONITOR: Decora, Andrew W.
TELEPHONE: F328-4211
77 FUNDING: Energy Research and Development Administration FY77:$120,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Coal Conversion gasification (10%);FOSSIL FUEL/Oil and Gas (10%);FOSSIL FUEL/Oil Shale (20%);CONSERVATION/General (10%)
ENERGY CYCLE: COMBUSTION IN SITU (30%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS (40%);METALS (20%);PARTICULATES (20%);VISUAL AESTHETICS (20%)
CHARACTER OF STUDY: RESEARCH/Applied (25%);DEVELOPMENT (25%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Far West;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers and reservoirs
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: A program to identify the environmental program elements necessary to address the environmental concerns of ERDA efforts of in-situ technology research.
APPROACH: Write preoperational plans and environmental plans to be incorporated into the final project plans.
RESULTS: Environmental assessment reports on the in-situ projects. This assessment will perport to objectives, data and conclusions of the research.
PROJECT MILESTONES: Started project in FY 76 and continued through FY 77. Various reports in progress.
KEYWORDS: ENERGY CONSERVATION;INHALATION;FOSSIL FUELS;COAL;NATURAL GAS;PETROLEUM;OIL SHALES;ENERGY CONSUMPTION;WASTE MANAGEMENT;SIMULATION;METALS;FRESH WATER;LAND USE;EARTH ATMOSPHERE;AIR POLLUTION;RIVERS;WATER RESERVOIRS;TECHNOLOGY ASSESSMENT;SYNTHETIC FUELS;METEOROLOGY;EPIDEMIOLOGY;IN-SITU COMBUSTION;GASEOUS WASTES;AEROSOLS;CHEMICAL EFFLUENTS;RECOVERY;SAFETY;PARTICLES;TOXIC MATERIALS;PRODUCTION;EXPLORATION;HEALTH HAZARDS;AIR POLLUTION CONTROL;WATER POLLUTION CONTROL;IN-SITU PROCESSING;ENVIRONMENTAL IMPACTS;EVALUATION

<093091>
TITLE: Development and Application of a Methodology for the Socioeconomic Impacts of Demonstration Plants
PROJECT NUMBER: E(49-18)-2493
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environment and Safety Programs
MONITOR: Johnson, Jim
TELEPHONE: C(202)376-1721
77 FUNDING: Energy Research and Development Administration FY77:$136,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop and apply a methodology for monitoring the actual social and economic impacts of a demonstration plant.
APPROACH: (1) Analyze work already done in this area, and conduct literature search. (2) Collect data at particular site. (3) Analyze the collected socioeconomic information. (4) Apply methodology in a case study of a fossil energy demonstration plant.
RESULTS: In each area where a demonstration plant is constructed, certain key factors must be considered in a socioeconomic analysis including: individual family tax burden; federal fiscal contributions; housing standards; public safety and health; and the capacity of local governments to handle the strains of increased population.
KEYWORDS: DEMONSTRATION PLANTS;SOCIO-ECONOMIC FACTORS;SIMULATION;ENERGY MODELS;FOSSIL FUELS;HUMAN POPULATIONS;COMMUNITIES;ENERGY SOURCE DEVELOPMENT;REGIONAL ANALYSIS;ENVIRONMENTAL IMPACTS;DATA ACQUISITION;CONSTRUCTION;MONITORING;POPULATION DENSITY

<093092>
TITLE: Landfill Storage of Solid Wastes from Coal Conversion
PRINCIPAL INVESTIGATOR: Boston, C.R.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Major Facility Project Management
MONITOR: Jones, H.T.
TELEPHONE: C(202)376-9268
TYPE OF FUNDING: Agency in-house effort-189 ORNL
77 FUNDING: Energy Research and Development Administration FY77:$178,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS (50%);ORGANICS (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND

MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECT
PROJECT DESCRIPTION: To assess the environmental acceptability of landfill disposal of coal conversion solid wastes.
APPROACH: An information assessment was prepared which summarizes and evaluates existing literature on solid waste disposal as it bears on the potential impacts arising from disposal of wastes from demonstration plants. FY 78 and FY 79 will involve laboratory and field leaching tests.
RESULTS: An evaluation of the potential problems and controls needed for handling the solid wastes from coal conversion facilities.
PROJECT MILESTONES: FY 77 completion of information assessment document.
KEYWORDS: COAL GASIFICATION;WASTE MANAGEMENT;SOLID WASTES;SANITARY LANDFILLS;ENVIRONMENTAL IMPACTS;DEMONSTRATION PLANTS;INFORMATION NEEDS;BENCH-SCALE EXPERIMENTS;LAND USE;SYNTHETIC FUELS

<093093>
TITLE: Analysis of Potential for Energy Conservation in Coal Conversion Processes
PRINCIPAL INVESTIGATOR: Peters, W.
ADDRESS: 4800 Forbes Ave., Pittsburgh, PA 15213
AFFILIATION: Energy Research and Development Administration, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Enery Division of Environmental and Safety Projects
MONITOR: Nardella, J.
TELEPHONE: C(202)376-1725
77 FUNDING: Energy Research and Development Administration FY77:$130,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop an energy requirement survey methodology for coal conversion processes suitable for the identification of energy conservation opportunities. Identify and document energy conservation opportunities and provide guidelines for their selection, analysis and implementation.
APPROACH: (1) Initiate and maintain in-house energy consumption data base. (2) Measure heat losses from process units. (3) Determine technical feasibility of energy recovery efficiencies for various process units. (4) Calculate theoretical thermal efficiency, and compare theoretical with actual data. (5) Make recommendations based on these findings.
PROJECT MILESTONES: All relevant data have been collected and are now being analyzed so that recommendations can be made.
KEYWORDS: COAL GASIFICATION;COAL LIQUEFACTION;ENERGY DEMAND;ENERGY CONSERVATION;PROCESS DEVELOPMENT UNITS;LASERS;WASTE HEAT UTILIZATION;ENERGY EFFICIENCY;RECOMMENDATIONS;SYNTHETIC FUELS

<093094>
TITLE: Coal Conversion Technology, Environmental and Control Technology Assessment
PRINCIPAL INVESTIGATOR: Lorenzi, L.
ADDRESS: 4800 Forbes Ave., Pittsburgh, PA 15213
AFFILIATION: Energy Research and Development Administration, Pittsburgh, Pa. (USA). Pittsburgh Energy Research Center
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environment and Safety Programs
MONITOR: Nardella, J.
TELEPHONE: C(202)376-1725
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To evaluate present treatment and control practices at pilot plant facilities and determine future needs for commercialization of these processes.
APPROACH: (1) Assess and evaluate current environmental effects in control technology applications at ERDA-owned and sponsored pilot plants. (2) Review and document state of the art and related alternatives to existing control technology and treatment. (3) Provide specific recommendations as to alternative treatment and control application. (4) Assess and evaluate the environmental treatment techniques used in these pilot plants for water and solid waste handling and disposal. (5) Evaluate suitability of this control technology at demonstration and control facilities. (6) Outline areas of needed research.
RESULTS: This evaluation should produce information necessary to the development of suitable pollution control technology for fossil energy technology.
PROJECT MILESTONES: A final review of data on the performance of existing facilities will be completed.
KEYWORDS: COAL GASIFICATION;COAL LIQUEFACTION;PILOT PLANTS;ENVIRONMENTAL EFFECTS;POLLUTION CONTROL EQUIPMENT;WASTE WATER;SOLID WASTES;WASTE MANAGEMENT;INFORMATION NEEDS;SYNTHETIC FUELS;WASTES;WASTE MANAGEMENT

<093095>
TITLE: Study of Contaminants in Oil Shale Residuals
PRINCIPAL INVESTIGATOR: Smidt, C.
ADDRESS: Denver, CO
AFFILIATION: Denver Research Inst., Colo. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environmental and Safety Programs
MONITOR: Powderly, John
TELEPHONE: C(202)376-1725
TYPE OF FUNDING: Contract No.-E-(49-18)-2446
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To characterize the contaminants in oil shale residuals and determine the potential for

their management to meet environmental quality standards.
APPROACH: (1) Investigate spent shale characteristics from an environmental standpoint. (2) Refine analytical methods for quantitative determinatiion of trace elements in spent shale. (3) Conduct solubilization studies of organic trace compounds in the presence of inorganic/soluble organic complexes with trace elements. (4) Cooperative cofunded effort with EPA, FEA, and EPA, and NSP.
RESULTS: Spent shale contaminant characteristic information is needed from environmental standpoints in order that information will be available when EIA's and EIS's are developed for compliance with NSPA.
PROJECT MILESTONES: Commerce study on June 4, 1976; complete study during last quarter of FY-77.
KEYWORDS: OIL SHALE INDUSTRY;ENVIRONMENTAL IMPACTS;TERRESTRIAL ECOSYSTEMS;SPOIL BANKS;OIL SHALES;SPENT SHALES;CHEMICAL PROPERTIES;POLLUTION REGULATIONS;CHEMICAL ANALYSIS;TRACE AMOUNTS;MEASURING METHODS;SHALE OIL;CHEMICAL EFFLUENTS;WASTE MANAGEMENT

<093096>
TITLE: Assistance in Assessing Water Resource Applications of ERDA Fossil Energy Technologies
PRINCIPAL INVESTIGATOR: Lerner, M.
ADDRESS: 1701 N. Ft. Meyer Drive, Arlington, VA
AFFILIATION: Energy and Environmental Analysis, Inc., Arlington, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environmental and Safety Programs
MONITOR: Reilly, Matthew
TELEPHONE: C(202)376-4628
TYPE OF FUNDING: Contract No.-E(49-18)-2344 Task 007
77 FUNDING: Energy Research and Development Administration FY77:$26,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop a programmmatic approach to assess the water resource implications of ERDA fossil energy technologies and formulate procedures for ERDA fossil energy communications with WRC.
APPROACH: (1) Developed a plan for ERDA fossil energy exchanges with WRC in fulfillment of Section 13 responsibilities. (2) Conducted policy reviews of WRC drafts. (3) Identified technical issues raised by WRC. (4) Prepared position papers for WRC meetings.
RESULTS: The project concluded that: (1) WRC has significant responsibility for water assessment work; (2) there is little existing data on water impacts of AFE technologies; (3) no AFE water assessments had been completed; and (4) ERDA and WRC Section 13 responsibilities require considerable fundamental data collection and analysis.
KEYWORDS: US ERDA;RESEARCH PROGRAMS;FOSSIL FUELS;WATER REQUIREMENTS;ENERGY SOURCE DEVELOPMENT;WATER RESOURCES

<093097>
TITLE: Air Pollution and Its Control in Fossil Energy Processes
PRINCIPAL INVESTIGATOR: Calvert, S.
ADDRESS: Washington, DC
AFFILIATION: Air Pollution Technology, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environmental and Safety Programs
MONITOR: Siegel, Jack
TELEPHONE: C(202)376-1723
TYPE OF FUNDING: Contract No.-PO WA-76-4428
77 FUNDING: Energy Research and Development Administration FY77:$9,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To present a three-day course which explains the types of pollution and control as they apply to fossil energy programs.
APPROACH: This three day conference covered air pollution problems associated with fossil energy technology and state-of-the-art in air pollution control.
RESULTS: Participants in the seminar received a document that synthesized the information on air pollution and control discussed at the conference.
KEYWORDS: FOSSIL FUELS;AIR POLLUTION;MEETINGS;AIR POLLUTION CONTROL;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL IMPACTS

<093098>
TITLE: Environmental Review of the Solvent Refined Coal Plant at Ft. Lewis, Washington
PRINCIPAL INVESTIGATOR: Holmes, J.
ADDRESS: 1701 N. Ft. Meyer Drive, Arlington, VA
AFFILIATION: Energy and Environmental Analysis, Inc., Arlington, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environmental and Safety Projects
MONITOR: Nardella, John
TELEPHONE: C(202)376-1725
TYPE OF FUNDING: Contract No.-E(49-18)-2344 Task 008
77 FUNDING: Energy Research and Development Administration FY77:$12,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Ft. Lewis, WA
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To prepare an up-to-date review of the environmental characteristics of the SRC plant at Ft. Lewis.
APPROACH: (1) Gathered and reviewed technical and environmental reports on the operation and design of the SRC plant constructed and operated by the Pittsburgh and Midway Coal Mining Co. at Ft. Lewis, Washington. (2) Conducted a site visit to the pilot plant facility to: (a) observe plant and environmental control systems operations; (b) discuss with plant personnel past operations and future plans; and (c) collect data and technical information on ambient off-site and on-site environmental conditions, types and quantities of residuals and effectiveness of control systems. (3) Prepared a draft environmental review of current and future plant operation.

RESULTS: Study concluded that the plant was operating, overall, in an environmentally clean manner. All pollution control systems were operating properly. Design modifications required by the original environmental assessment had been made.
KEYWORDS: COAL PREPARATION PLANTS;ENVIRONMENTAL IMPACTS;SOLVENT-REFINED COAL;SYNTHETIC FUELS;WASHINGTON;POLLUTION CONTROL EQUIPMENT;EFFICIENCY;AIR POLLUTION CONTROL

<093099>
TITLE: Environmental Aspects of Fossil Demonstration Plants
PRINCIPAL INVESTIGATOR: Holmes, J.
ADDRESS: 1701 N. Ft. Meyer Drive, Arlington, VA
AFFILIATION: Energy and Environmental Analysis, Inc., Arlington, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environmental and Safety Programs
MONITOR: Johnson, Jim
TELEPHONE: C(202)376-1721
TYPE OF FUNDING: Contract No.-E(49-18)-2344 Task 002
77 FUNDING: Energy Research and Development Administration FY77:$29,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Various (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To ensure that Coalcon Demo Plant NEPA requirements were met; to support ADES in chairing the asscciated task force; to ensure that E and S aspects of demo plant projects would meet AFE needs for monitoring and characterization of these technologies.
APPROACH: (1) Prepared analysis of socioeconomic impact of the Clean Boiler Fuel Project. (2) Reported on Environmental Data Summary from Demonstration Plants Division documents. (3) Reported on evaluation of environmental analysis report of the Clean Boiler Fuel Project.
RESULTS: The project was necessary to ensure the fulfillment of NEPA requirements.
PROJECT MILESTONES: (1) Contract for Coalcon did not provide details of E and S requirements. (2) Preparation of EIS's is likely to be on critical path of demo projects. (3) Demo projects should have significant E and S work associated with them as they are being viewed by EPA as a major source of regulatory data.
KEYWORDS: COALCON PROCESS;DEMONSTRATION PLANTS;ENVIRONMENTAL IMPACTS;SOCIO-ECONOMIC FACTORS;POLLUTION REGULATIONS;ENVIRONMENTAL IMPACT STATEMENTS;RECOMMENDATIONS

<093100>
TITLE: Impacts of Clean Air Amendments on Fossil Energy Projects
PRINCIPAL INVESTIGATOR: Lerner, M.
ADDRESS: 1701 N. Ft. Meyer Drive, Arlington, VA
AFFILIATION: Energy and Environmental Analysis, Inc., Arlington, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Fossil Energy Division of Environmental and Safety Programs
MONITOR: Siegel, Jack
TELEPHONE: C(202)376-1723
TYPE OF FUNDING: Contract No.-E(49-18)-2344 Task 003
77 FUNDING: Energy Research and Development Administration FY77:$15,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Various (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To determine the impact of Clean Air Act amendments on FE research programs, the emphasis of the FE programs and commercial environmental acceptability of FE technologies.
APPROACH: Monitored the progress of Clean Air Act amendments in House, Senate and Conference and briefed task monitor on any amendments likely to affect FE technologies. Analyzed key amendments singled out by task monitor for their impacts on: (1) relative cost and environmental competitiveness of FE technologies; (2) siting of FE research and commercial plants; (3) cost and technical feasibility of FE technologies given the emission control implication of the specific amendment; and (4) possible delays in programs and commercialization due to controls.
RESULTS: Project concluded that although current FE technologies would not violate the Clean Air Act or amendments thereto, further work was needed to verify that violations would not occur. Further work would be concentrated in three areas: (1) terrain considerations, (2) hydrocarbon control, and (3) impacts of coal liquefaction.
KEYWORDS: FOSSIL FUELS;CLEAN AIR ACT;ENERGY SOURCE DEVELOPMENT;AIR POLLUTION;RESEARCH PROGRAMS;TECHNOLOGY TRANSFER;COST;SITE SELECTION;AIR POLLUTION CONTROL;COMMERCIALIZATION;LAND POLLUTION;HYDROCARBONS;COAL LIQUEFACTION;SYNTHETIC FUELS;ECONOMIC IMPACT

Energy Research and Development Administration/Solar, Geothermal, and Advanced Energy AA

<094001>
TITLE: Labile SO2 Complexes as a Scavenging Basis
PROJECT NUMBER: E-501
PRINCIPAL INVESTIGATOR: Kubas, G.J.
ADDRESS: Los Alamos Scientific Laboratory, P.O. Box 1663, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Stevenson, F. Dee
TELEPHONE: F233-5008
TYPE OF FUNDING: Contract No.-W-7405-ENG-36
77 FUNDING: Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The interaction of sulfur dioxide with a variety of chemical compounds is being investigated in order to develop the basic chemistry necessary to provide for a regenerative process of SO/sub 2/ removal, from flue gases, etc. A major goal is to develop compounds which will bind SO/sub 2/ reversibly, have a vapor pressure of SO/sub 2/ which will differ by 10/sup 3/ to 10/sup 4/ over a modest temperature range, and be relatively inexpensive. Re-use of the SO/sub 2/-depleted substrate is thus the key objective.
APPROACH: Exploratory work involving synthesis and characterization of a variety of substrates suitable for reversible SO/sub 2/ addition must be carried out as a first step. A thorough understanding of the various modes of SO/sub 2/ bonding to transition metals, metal ligands, organic compounds, and ionic salts will facilitate the search for substrates. Infrared and Raman spectroscopy, x-ray crystallography, and thermal analyses are the major tools employed to both gain further insight into the problem and to assess a particular compound's utility as a SO/sub 2/ scavenger. Reactions of coordinated SO/sub 2/ with, for example, oxygen are also being carried out in order to examine the possibility of using cyclic multi-reaction schemes to scavenge SO/sub 2/.
RESULTS: The expected result of this project is basic research which will evaluate the feasibility of using compounds that bind SO/sub 2/ reversibly as substrates for a regenerative process for removal of SO/sub 2/ from flue gases. Promising compounds will be tested for all the basic requirements (e.g., stability toward flue-gas components other than SO/sub 2/).
PROJECT MILESTONES: The major project milestone is most certainly the discovery of an inexpensive substrate capable of binding SO/sub 2/ reversibly, preferably at temperatures above ambient, that meets the basic requirements for SO/sub 2/ scavenging. Two new classes of substrates have been discovered to date: the methyl phenyl phosphine copper(I) iodides and mercaptides; and a third class, the ionic iodides of large cations was developed. All show reversible SO/sub 2/ binding and have low SO/sub 2/ pressure at room temperature and high SO/sub 2/ decomposition pressures at greater than or equal to 100 degrees C.
KEYWORDS: AIR POLLUTION;ENVIRONMENT;CHEMICAL EFFLUENTS;SULFUR DIOXIDE;GASEOUS WASTES;REMOVAL;CHEMICAL REACTIONS;CHEMICAL BONDS;SCAVENGING;AIR;SCRUBBERS

<094002>
TITLE: Atmospheric Particle Chemistry and Sulfur-Emission Control Studies
PROJECT NUMBER: ANL 57504
PRINCIPAL INVESTIGATOR: Cunningham, P.T.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Epple, Robert P.
TELEPHONE: F233-3426
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$330,000
TECHNOLOGY: FOSSIL FUEL/Coal (80%);FOSSIL FUEL/Oil and Gas (20%)
ENERGY CYCLE: COMBUSTION IN SITU (60%);WASTE MANAGEMENT (40%)
POLLUTANTS: NOXIOUS GAS (60%);PARTICULATES (40%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;
PROJECT DESCRIPTION: (1) Atmospheric Particle Chemistry. The purpose of this study is to characterize the atmospheric pollutants, especially ammonium sulphate-sulfuric acid particles, and to elucidate the mechanisms by which they are formed and dispersed. (2) Sulfur-Emission Control Studies. The purpose of this study is to understand the basic processes involved in the cyclic use of solid absorbents as retainers of sulfur combustion products in the use of coal.
APPROACH: (1) Atmospheric Particle Chemistry. This study is carried out by developing rapid, quantitative analytical methods for collecting, characterizing and studying the mechanisms by which atmospheric particulate pollutants derived from the combustion of sulfur in fossil fuels are formed and dispersed in the atmosphere. (2) Sulfur-Emission-Control Studies. This study involves the application of thermodynamic and kinetic studies to high temperature systems in which dolomite is used as a scavenger for sulfur oxides. Regeneration of the absorbent is one of the important goals of this program for both economic and environmental considerations.
RESULTS: (1) Atmospheric Particle Chemistry. A knowledge of the factors affecting the formation and transport of ammonium sulfate particles associated with the combustion of fossil fuels. (2) Sulfur-Emission Control Studies. An understanding of the processes by which dolomite or limestones can be used to fix the oxides of sulfur formed in the combustion of fossil fuels.
PROJECT MILESTONES: (1) Atmospheric Particle Chemistry. Among the milestones projected for this study are: (a) Knowledge of detailed kinetics of chemical reactions, e.g., hydrolysis and oxidation of the sulfur-oxides and their salts. (b) Knowledge of the factors affecting the transport of particulate pollutants and their lifetime in the atmosphere. (2) Sulfur-Emission-Control Studies. (a) The development of a method for the rapid economical regeneration of the sulfur absorbent. (b) The development of basic knowledge relating the morphology of absorbent-pollutant structures to their efficiency.
KEYWORDS: AIR POLLUTION;AMMONIUM SULFATES;SULFURIC ACID;PARTICLES;SYNTHESIS;COAL;COMBUSTION;GASEOUS WASTES;SCAVENGING;SULFUR OXIDES;CHEMICAL REACTIONS;SULFUR COMPOUNDS;DIFFUSION;AEROSOLS;DISEASES;INHALATION;LUNGS

<094003>
TITLE: Actinide Chemistry
PRINCIPAL INVESTIGATOR: Edelstein, N.M.
ADDRESS: Lawrence Berkeley Laboratory - Materials and Molecular Research Division, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Burnett, John L.
TELEPHONE: F233-3613
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)

POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Actinides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Design of specific organic sequestering agents for the removal of actinide contaminants from humans and from aqueous media.
APPROACH: Preparation of various chelating agents for actinide ions. Characterization of organoactinide compounds as to chemical and physical properties and structure.
RESULTS: Development of new, actinide-specific chelating agents to be used in aqueous systems and agents compatible with the human biosystem.
PROJECT MILESTONES: Plutonium - specific sequestering agent for use with humans.
KEYWORDS: ACTINIDES;REMOVAL;MAN;AQUEOUS SOLUTIONS;DECONTAMINATION;CHELATING AGENTS;CHEMICAL PROPERTIES;PHYSICAL PROPERTIES;PLUTONIUM;SEPARATION PROCESSES;AMERICIUM;ORGANOMETALLIC COMPOUNDS

<094004>
TITLE: Atmospheric Pollution Monitoring by Diode Lasers
PRINCIPAL INVESTIGATOR: Yeung, E.S.
ADDRESS: Dept. of Chemistry, Iowa State University, Ames, IA 50011
AFFILIATION: Iowa State Univ. of Science and Technology, Ames (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Contract No.-W-7405-ENG-82
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Oil and Gas (30%);GEOTHERMAL/General (20%)
ENERGY CYCLE: COMBUSTION IN SITU (30%);WASTE MANAGEMENT (70%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/H/sub 2/S;NOXIOUS GAS/RCO;NOXIOUS GAS/RHCORH (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To establish the spectroscopic foundation for long-path infrared absorption monitoring of gaseous atmospheric pollutants using diode lasers, and to design and evaluate new measurement techniques based on the diode laser so that simple and reliable routine monitoring devices can be made.
APPROACH: Unlike present hit-and-miss approaches in determining the proper spectral regions for absorption measurements, we start from comprehensive spectroscopic information to predict where reliable spectral lines occur for each of the pollutants. A systematic search for all of these analytical lines is made and further refined by experimental measurements. For the continued development of the proper instrumentation for routine monitoring, we designed a unique double-beam technique where the background is automatically compensated for, so that more reliable measurements are possible.
RESULTS: We expect to compile and make available critical spectroscopic information for infrared absorption monitoring of the atmosphere for every pollutant of interest, particularly the oxides of nitrogen, the sulfur compounds, the simple hydrocarbons, aldehydes and ketones. With this information, we expect to be able to design and properly evaluate measurement techniques, to include existing methods and new concepts. Our predictions of the best analytical spectral lines will be immediately useful in existing monitoring schemes based on infrared absorption.
PROJECT MILESTONES: (1) FY 1977 Comprehensive results on nitrogen oxides. (2) FY 1979 Comprehensive results on sulfur compounds evaluation scheme for on-site measurements developed. (3) FY 1981 Comprehensive results on aldehydes and ketones scheme for combustion diagnostics developed. (4) FY 1983 Comprehensive results on simple hydrocarbons.
KEYWORDS: AIR POLLUTION;ENVIRONMENT;AIR POLLUTION MONITORS;DESIGN;NITROGEN OXIDES;SULFUR COMPOUNDS;HYDROCARBONS;MONITORING;AIR;INFRARED SPECTRA

<094005>
TITLE: Chemical Analysis
PRINCIPAL INVESTIGATOR: Giauque, R.D.;Clem, R.G.
ADDRESS: Lawrence Berkeley Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Contract No.-W-7405-ENG-48
77 FUNDING: Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;COASTS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To develop and expand upon our existing capabilities for measuring the levels of trace metals in various types of specimens. Methods developed are applicable to (1) air pollution studies, (2) water pollution studies, (3) evaluating the effects of trace metal pollutants on biological systems, and (4) geochemical studies.
APPROACH: Various methods of compensating for matrix effects in x-ray fluorescence analysis (XRYA) are being developed. These include (1) the application of thin specimen preparation techniques where matrix effects can be minimized and (2) the use of the Compton scattered excitation radiation intensity as a measure of the mass absorption coefficient to correct for matrix absorption effects when analyzing geochemical specimens. Study the release of heavy metals from naturally occurring organic matter after oxidation with ozone by anodic stripping voltametry (ASV).
RESULTS: Accurate XRTA methods will be established for trace analysis of both coal and geochemical specimens. Also we will continue to collaborate in ongoing air pollution and gas particle interaction studies. Ozone

will be developed as a general reagent for the oxidation of trace organic matter prior to the analysis of trace metals by ASV and other techniques.
KEYWORDS: METALS;TRACE AMOUNTS;ENVIRONMENT;AIR POLLUTION;WATER POLLUTION;SAMPLING;QUANTITATIVE CHEMICAL ANALYSIS;MEASURING METHODS;X-RAY FLUORESCENCE ANALYSIS;X-RAY FLUORESCENCE ANALYZERS;DESIGN;AEROSOLS;OXIDATION;WATER;ELECTROCHEMISTRY

<094006>
TITLE: The Chemistry and Physics of Condensation Nuclei Formation in Gas-to-Particle Reactions
PROJECT NUMBER: ANL 54300, Part U
PRINCIPAL INVESTIGATOR: Gordon, S.
ADDRESS: 9700 S. Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Molecular, Mathematical and Geosciences, Division of Physical Research
MONITOR: Kandel, Richard J.
TELEPHONE: F233-5008
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (75%);GENERAL SCIENCE (25%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (90%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Extremely complex, sunlight-initiated reactions of trace gas pollutants form condensation nuclei (cn) which eventually become the sulfate, nitrate and organic aerosols which are responsible for many detrimental effects to man and his environment. The key to improved characterization of gas-to-particle processes is the quantitative description of the chemical reactions leading to nuclei formation, the chemical and physical properties of nuclei and their subsequent evolution. We are involved in a comprehensive study of these nuclei-forming reactions initiated under controlled conditions in gases excited by UV-light and ionizing radiation, using both pulsed and steady-state sources. These studies have developed into a unique method for determining gas phase reactivities of many important transient species involved in atmospheric chemistry.
APPROACH: The nuclei detection instrumentation we have developed over the past four years places us in a unique position to study gas-to-particle processes. We are able to detect, size, and count embryonic nuclei of near-molecular dimensions (5 A to 100 A) whereas other nuclei counters are seldom reliable even down to 500 A. It is specifically those aerosols in the submicron region which are of greatest biological significance. The research on rate constants of atmospheric reactions measurable by this technique is related to measurements of radical rate constants by pulse radiolysis.
RESULTS: The original version of the Argonne cn discriminator (ACND-I) gave quantitative results only with mono-disperse nuclei distributions (10 to 250 A dia) and thus has been abandoned in favor of ACND-II which is able to discriminate any nuclei distribution between 5 and 1000 A sizes. Considerable modifications and improvements to ACND-II have been effected. The reproducibility and high resolution allows us to obtain detailed kinetic results for the reaction of OH or HO/sub 2/ radicals in nuclei-forming reactions with SO/sub 2/ by competitive kinetics. The change in nuclei yield in the presence of inhibitors is yielding rate data for OH plus SO/sub 2/, CO, CH/sub 4/ and H/sub 2/, and HO/sub 2/ plus SO/sub 2/, NO and NO/sub 2/, each an important process in atmospheric chemistry.
PROJECT MILESTONES: Results of this research are presented at appropriate scientific meetings and published in scientific journals as appropriate units of the work are completed.
KEYWORDS: AEROSOLS;SULFATES;NITRATES;AIR POLLUTION;PARTICLES;NUCLEI;RADIOINDUCTION;PHOTOCHEMISTRY;DIFFUSION;ENVIRONMENT;AIR;CHEMICAL EFFLUENTS;PLUMES;MEASURING INSTRUMENTS

<094007>
TITLE: Chemistry of Radioiodine in High Radiation Fuel Separation
PROJECT NUMBER: NT 04 02 01 0
PRINCIPAL INVESTIGATOR: Mailen, J.C.;Clark, W.E.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Stevenson, F. Dee
TELEPHONE: F233-3167
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The purpose of this program is to develop an understanding of the chemistry of iodine and other selected fission products in aqueous and organic systems. Specific concerns involve: (1) the determination of the quantities and chemical forms of significant fission product species in aqueous process solutions; (2) an examination of possible interactions among various fission product species in process streams; and (3) the development of alternate, more efficient methods for fission product control as a result of expanded understanding of the chemistries of the fission products.
APPROACH: Fruitful research areas are identified in close consultation with personnel in the LWR and LMFBR fuel reprocessing projects.
RESULTS: The ultimate goal of this effort is to develop improved methods for minimizing radioactive effluents from nuclear fuel reprocessing plants.
PROJECT MILESTONES: Technical information generated in this project is disseminated through widely available technical journals and, where applicable, through patents. Papers which will appear or be completed within the next 12 months concern a process for electrolytic trapping of iodine from gas streams, a method for

the prediction of the operation of the Iodox iodine trapping system based on equilibrium and kinetic principles, a process for removal of iodine from reactor fuel solutions by precipitation as insoluble palladium iodide, and the oxidation of organic compounds by hyperazeotropic nitric acid.
KEYWORDS: RADIOACTIVE EFFLUENTS;LIQUID WASTES;FISSION PRODUCTS;SEPARATION PROCESSES;IODINE ISOTOPES;REMOVAL;RADIOACTIVE WASTES;WASTE PROCESSING;FUEL REPROCESSING PLANTS;AIR;WATER

<094008>
TITLE: Collection of Noble Gases with Oxidizing Salts
PROJECT NUMBER: ANL 54500, Part D
PRINCIPAL INVESTIGATOR: Stein, L.
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AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA); Bureau of Mines, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Stevenson, F. Dee;Holub, Robert
TELEPHONE: F233-5008;F234-4421
TYPE OF FUNDING: Contract No.-BOM H0252019;Interagency agreement-ERDA-BOM
77 FUNDING: Energy Research and Development Administration FY77:$30,000; Bureau of Mines FY77:$36,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To utilize the results of many years of basic research on the chemical reactions of fluorine with inorganic materials to develop solid absorbents for radon and xenon and to apply these absorbents to problems associated with uranium mining and to other portions of the nuclear fuel cycle where emissions of radioactive rare gases must be measured or controlled.
APPROACH: Chemical methods have recently been developed for the collection of radon and xenon, the two heaviest noble gases. This approach has a number of advantages as compared to physical methods, such as cryogenic distillation, charcoal adsorption, solvent extraction and permselective-membrane diffusion, which have been known for some time. The gases can be collected at ambient temperature, for example, in small beds of reagents. They can also be separated from each other and from lighter noble gases by selective oxidation. These new methods, which are potentially useful for analyzing radon and xenon isotopes in the atmosphere, reducing emissions from nuclear power plants and fuel reprocessing plants, recovering stable xenon isotopes, and trapping xenon-133 in nuclear medical facilities, are currently being investigated at Argonne.
RESULTS: We have now developed a new method for analyzing radon gas in uranium mine atmospheres. Present methods of analysis for the gas are cumbersome and inaccurate, requiring that the radon concentrations be inferred from the radioactivity of the daughters in the radon decay chain. In the new method, an air sample is drawn through a tube of drying agent and a small plastic cartridge containing 1-2 g of O/sup +//sub 2/SbF/sup -//sub 6/. The radon is quantitatively captured. The gamma emission of the cartridge is then measured with a scintillation counter. In developing this method, five types of cartridge were designed and tested with samples of air containing 5 to 15,000 pCi/l of radon-222 to determine the effect of height, volume and reagent loading upon collection and counting characteristics. The method was shown to have a precision of approximately 2% which is comparable to that of the best laboratory method now in use for measurement of radon.
PROJECT MILESTONES: Results of this research are presented at appropriate scientific meetings and published in scientific journals as appropriate units of the work are completed.
KEYWORDS: RADIOACTIVE EFFLUENTS;AIR;SEPARATION PROCESSES;RADON;XENON 133;ENVIRONMENT;URANIUM MINES;AIR SAMPLERS;REMOVAL;INHALATION;MINING;SAFETY

<094009>
TITLE: Combustion and Pollution Chemistry: Gas Phase Radiolysis
PROJECT NUMBER: ANL 54300, Part T
PRINCIPAL INVESTIGATOR: Gordon, S.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Molecular, Mathematical and Geosciences, Division of Physical Research
MONITOR: Kandel, Richard J.
TELEPHONE: F233-5008
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS (50%);SPECIFIED OTHER POLLUTANTS/Free radicals (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To utilize pulse radiolysis methods to study free radical reactions occurring in the combustion of organic compounds.
APPROACH: The combustion process is complex, involving competing, sequential and branching reactions. With our pulse radiolysis technique we can isolate for study, individual reactions involving chain carriers such as OH and HO/sub 2/, and follow the buildup and decay of the individual transient species. We can also examine end products of the simplified reactions using a sensitive mass spectrometric technique. Our techniques simultaneously give us information related to the more efficient combustion of fossil fuels and to understanding and minimizing the consequent pollution effects. Although these radicals are generated photochemically in the atmosphere, pulse radiolysis is the most effective technique for studying their reactions in the laboratory.
RESULTS: Rate constants reported for the very important atmospheric reaction HO/sub 2/ + HO/sub 2/ yields H/sub 2/O/sub 2/ + O/sub 2/ have varied by more than a factor of two. We have determined that the reported discrepancies can be explained by the presence of water vapor, since HO/sub 2/ and water form a relatively stable complex which influences the rate of recombination of HO/sub 2/ radicals. Work is continuing on this reaction in the presence of third bodies of varying polarity. We are beginning research on the reactions of HO/sub 2/ with SO/sub 2/, NO and NO/sub 2/ and are extending our program to determine the

reactivity of OH and HO/sub 2/ with organic compounds.
PROJECT MILESTONES: Results of this research are presented at appropriate scientific meetings and published in scientific journals as appropriate units of the work are completed.
KEYWORDS: RADIOACTIVE EFFLUENTS;AIR;SEPARATION PROCESSES;RADON;ENVIRONMENT;URANIUM MINES;AIR SAMPLERS;REMOVAL;XENON 133;AIR;RADICALS;RADIOLYSIS;COMBUSTION

<094010>
TITLE: Cyclic Separations Process Research
PRINCIPAL INVESTIGATOR: Hill, F.B.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Studies
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$105,000
TECHNOLOGY: NUCLEAR/Fission (50%);NUCLEAR/Fusion (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This program consists of a study of the application of cyclic separation processes to problems arising in the technology of energy production and utilization. The cyclic processes of interest include pressure swing adsorption, heatless adsorption, parametric pumping, cycling zone adsorption, and various forms of preparative chromatography. Applications presently under study involve isotope separations of interest in nuclear reactor technology. Of special interest is the development of cyclic separations processes for the removal of tritium from reactor fuel processing plant effluents, heavy water moderator, and CTR streams.
APPROACH: The program involves process design studies, experimental measurement of equilibrium and kinetic properties of selected fluid-solid separation systems, and measurement of characteristics of cyclic separation processes employing these systems.
RESULTS: Processes will be developed to the bench- or pilot-scale stage for tritium removal from fuel processing plant effluent, heavy water moderator, and CTR streams.
PROJECT MILESTONES: Measurements will be made of the T-H equilibrium separation factor between H/sub 2/-HT and vanadium monohydride and of the kinetics of the exchange reaction in flow systems by September 30, 1977. The performance of a single stage of the heatless adsorption process for tritium separation using the vanadium hydride-hydrogen system will be examined by September 30, 1978.
KEYWORDS: RADIOACTIVE EFFLUENTS;TRITIUM;SEPARATION PROCESSES;CHROMATOGRAPHY;SAMPLE PREPARATION;REMOVAL;RADIOACTIVE WASTES;CONTROL

<094011>
TITLE: Formation of Oxyacids of Sulfur from SO2
PROJECT NUMBER: EC-04-02-01
PRINCIPAL INVESTIGATOR: Connick, R.E.;Meyer, C.B.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Studies
MONITOR: Stevenson, F. Dee
TELEPHONE: F233-3167
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (80%);GENERAL SCIENCE (20%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Our goal is to work out the basic chemistry of sulfur dioxide and chemicals formed from it under conditions that are relevant to the emission of SO/sub 2/ from the burning of coal and oil. This will include the basic chemistry appropriate to various methods of removing SO/sub 2/ from stack gases.
APPROACH: The studies to date have centered on the aqueous solution chemistry of SO/sub 2/. Raman and ultraviolet spectroscopy are being used to characterize species and to determine equilibrium constants. Nuclear magnetic resonance will be used to measure exchange rates. The rates and products of disproportionation and oxidation reactions will be studied. A limited amount of effort has been devoted to the reaction of SO/sub 2/ with ammonia.
RESULTS: The results should provide a firm chemical basis for the modification, improvement and development of processes for removal of SO/sub 2/ from stack gases.
KEYWORDS: COAL;OILS;COMBUSTION;CHEMICAL EFFLUENTS;SULFUR DIOXIDE;REMOVAL;GASEOUS WASTES;ENVIRONMENT;STACK DISPOSAL;SCRUBBERS

<094013>
TITLE: Mass Spectrometry Research for Organic and Inorganic Analysis
PROJECT NUMBER: 000112
PRINCIPAL INVESTIGATOR: Carter, J.A.
ADDRESS: Analytical Chemistry Division, ORNL, P.O. Box X, Oak Ridge, TN 37830
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Studies
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167

TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: FOSSIL FUEL/General (75%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (30%);ORGANICS (60%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To perform research and development of analytical methodology in the identification and quantification of constituents in fossil fuel processes which may be hazardous to environmental health and safety.
APPROACH: Samples will be obtained from private sources and collaborating agencies. These, in conjunction with synthetic mixtures, will be used to develop the techniques for analyzing classes of organic compounds in any complex and/or natural matrix as well as for trace metals. Identification of organic materials will be made using low and high resolution mass spectrometers coupled with gas chromatographs (GCMS). Identification and analysis of trace metals will be made using spark source mass spectrometric isotope dilution techniques (IDSSMS).
RESULTS: Methods for the analysis of possibly harmful organic materials in fossil fuel conversion systems should be developed with confirmation by mass spectral analysis using a combination of GCMS. Multielement capability of trace metals in both organic and aqueous systems is expected using IDSSMS techniques.
PROJECT MILESTONES: (1) Development and improvement of ion sources for low resolution organic mass spectrometry. The ''dry spike'' method of isotope dilution spark source mass spectrometry will be further investigated. (2) Methods will be developed by GCMS for the identification and analysis of organic components in complex mixtures. (3) Analysis of organic mixtures and chromatographic effluents will be studied by field ionization techniques. (4) Investigate the use of a channel electron multiplier array (CEMA) electro-optic ion detection system for spark source mass spectrometry (SSMS). (5) Analysis of trace metals by SSMS using the CEMA electrical detection system.
KEYWORDS: ENVIRONMENT;ORGANIC WASTES;COAL;ORGANIC COMPOUNDS;CHEMICAL ANALYSIS;FOSSIL FUELS;CHEMICAL EFFLUENTS;METALS;TRACE AMOUNTS;LEAD;CADMIUM;ZINC;THALLIUM;MOLYBDENUM;ARSENIC;ANTIMONY;HYDROCARBONS;SYNTHETIC FUELS;WATER;MASS SPECTROSCOPY

<094014>
TITLE: Metastable Fluids
PROJECT NUMBER: 057505
PRINCIPAL INVESTIGATOR: Blander, M.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Systems
MONITOR: Epple, Robert P.
TELEPHONE: F233-3426
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (60%);CONSERVATION/Energy storage (40%)
ENERGY CYCLE: STORAGE (40%);PROCESSING, CONVERSION (60%)
POLLUTANTS: NOXIOUS GAS (10%);ORGANICS (60%);HEAT, THERMAL (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To carry out basic study of homogeneous and heterogeneous bubble nucleation and explosive boiling, and measurement and calculations of the properties of metastable fluids. The purpose is to understand the properties of metastable liquids and the mechanisms of contact-vapor explosions which are of concern in the operation of nuclear reactors, in metallurgical and smelt processing, and in the transport and storage of liquefied natural gas (essentially methane).
APPROACH: The measurement of the pressure-volume-temperature properties of stable and metastable fluids will permit the devising of equations of state for the study of explosions in the complex systems of interest.
RESULTS: Equations of state for metastable liquids near critical temperature. These results, all of which could be reliably extrapolated to the thermodynamic limit of superheat, have shown that the thermodynamic limit of superheat was significantly higher than the kinetic limit.
PROJECT MILESTONES: Two reviews of bubble nucleation in liquids have been completed, which detail the relation of bubble nucleation to contact-vapor explosions and other phenomena. Three equations of state have been devised for liquid argon, ethane and hexane near the critical temperatures. These efforts will continue and will be extended to more complete coverage of hazardous systems.
KEYWORDS: CHEMICAL EXPLOSIONS;INDUSTRIAL PLANTS;ACCIDENTS;PAPER;PRODUCTION;METHANE;STORAGE;HIGH PRESSURE;CHEMICAL REACTIONS;BOILING;SAFETY;OIL SPILLS

<094015>
TITLE: Partitioning and Concentration of Long-Lived Radioelements from Reactor Wastes
PROJECT NUMBER: ANL 54400, Part C
PRINCIPAL INVESTIGATOR: Horwitz, E.P.
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AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Molecular, Mathematical and Geosciences, Division of Physical Research
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$215,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: RADIATION/Actinides and fission products (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: On the basis of waste compositions, half-lives and biological effects, it is concluded that the major long-term biological hazards in reactor wastes will be Pu-239 and Am-243, the former far

outweighing the latter in impact. This is based on the fact that when taken into the body, these elements are extremely potent bone-seeking carcinogens. They are present in the wastes because approximately 0.5% of the plutonium and essentially all of the americium and curium are left behind in the processing of spent fuel as currently practiced. Our objective is to develop methods for removing these nuclides (and other actinides and long-lived fission products) from wastes so that these materials can be handled more simply as separated wastes or utilized for practical purposes.
APPROACH: Our approach to a solution of this problem is to attempt to develop a specific reagent or a series of reagents to be used in a liquid-liquid extraction (LLE) system requiring no prior preparation of the waste solutions. Through use of such a reagent (or reagents), maximum removal of the transuranics can be achieved without increasing the volume of waste (excess water may be evaporated off, if desired) and without the use of additives with their economic and practical drawbacks. In our approach, the elements chosen for primary investigation for extractability are plutonium and americium. (An accompanying secondary study of curium is made and certain long-lived fission products may eventually be studied in a similar fashion.)
RESULTS: Some of the new extractants that we have prepared and studied show efficiencies equal to or exceeding those for our previously reported extractants which removed >99.99% of the ''non-extractable'' plutonium in a single contact. Some of these new extractants also show great improvement in the rate of reaching the maximum extraction value. Some of our new other formulations, especially those of (GO)(ClCH/sub 2/)P(O)OH-type, have been shown to be orders of magnitude more efficient in removing Am, Cm and selected M(III) lanthanides than extractants previously investigated. Studies to determine the degree of polymerization of plutonium in both aqueous and extractant-organic phases and to determine the effect of other polymeric metal species on the extraction of plutonium have been initiated.
PROJECT MILESTONES: Research results are reported at scientific meetings and published in the literature as appropriate segments of the work are completed.
KEYWORDS: REACTORS;RADIOACTIVE EFFLUENTS;LIQUID WASTES;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;PLUTONIUM 239;AMERICIUM 243;CHEMICAL COMPOSITION;BIOLOGICAL EFFECTS;SEPARATION PROCESSES;REMOVAL;ENVIRONMENT;ACTINIDES;FISSION PRODUCTS;SOLVENT EXTRACTION

<094016>
TITLE: Photochemistry of Materials in the Stratosphere, Lawrence Berkeley Laboratory
PROJECT NUMBER: ERDA EC 04-01-01
PRINCIPAL INVESTIGATOR: Johnston, H.S.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Physical Research/Molecular, Mathematical and Geosciences
MONITOR: Kandel, Richard J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Contract No.-W-7405-Eng-48
77 FUNDING: Energy Research and Development Administration FY77:$105,000; Department of Transportation
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/ (75%);SPECIFIED OTHER POLLUTANTS/Organic chlorides (25%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) Characterization, measurement, and monitoring: A ground-based method is being developed that may be able to measure the total vertical column and the approximate vertical distribution of nitrogen dioxide in the stratosphere. (2) Environmental transport-physical and chemical processes and effects: The objective is to obtain an improved understanding of the global effect of stratospheric pollution, in particular from stratospheric aircraft, from organic chlorides, and from nitrous oxide.
APPROACH: (1) A small telescope, spectrometer, optical multichannel analyzer, and minicomputer are used to follow light directly from the sun and from Rayleigh-scattered zenith sky light during sunrise or sunset. (2) Laboratory studies are made of elementary chemical and photochemical reactions for which rate constants are needed for model calculations in the atmosphere, and such model calculations are made.
RESULTS: (1) By the end of calendar 1976, we hope to have established the feasibility (or not) of the method being used. (2) The results expected are new rate constants for reactions involving HO, HOO, Cl, ClO, and NO/sub 3/ free radicals and for molecular N/sub 2/O/sub 5/.
PROJECT MILESTONES: (1) If the method is feasible, the apparatus will be simplified to a maximum possible extent, and another simpler system will be built. (2) Each new or better rate constant is a goal in itself, and it can be entered in tables of such values used by modelers of atmospheric reactions or of other processes involving the same reactions.
KEYWORDS: AIR POLLUTION;MONITORING;NITROGEN OXIDES;STRATOSPHERE;AIR POLLUTION MONITORS;REMOTE SENSING;PHOTOCHEMISTRY;DESIGN;DIFFUSION;AIR;ULTRAVIOLET SPECTRA

<094017>
TITLE: Research in Chemical Kinetics
PRINCIPAL INVESTIGATOR: Rowland, F.S.
ADDRESS: Department of Chemistry, University of California, Irvine, Irvine, CA 92717
AFFILIATION: California Univ., Irvine (USA). Dept. of Chemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Kandel, Richard J.
TELEPHONE: C(301)353-5008
TYPE OF FUNDING: Contract No.-AT(04-3)-34, P.A. 126
77 FUNDING: Energy Research and Development Administration FY77:$128,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Understanding of the chemical processes involved in the solar photolysis of chlorcfluorocarbon compounds, and the subsequent consequences of this introduction and removal of chlorine and other halogen atoms into the stratosphere. One major effect involves the reactions of chlorine species with ozone, and the possibility of substantial depletion of the natural ozone in the stratosphere.
APPROACH: (1) Laboratory measurement of the cross-sections for absorption of solar ultraviolet and visible radiation by molecules of stratospheric interest, including CCl/sub 2/F/sub 2/, CCl/sub 3/F, CClFO,

ClONO/sub 2/, etc. (2) Laboratory measurement of chemical reaction rates pertinent to stratospheric chlorine chemistry. (3) Computer calculations of atmospheric profiles for various chemical compounds, including CCl/sub 2/F/sub 2/, CCl/sub 3/F, CClFO, etc. (4) Consideration of the physicochemical processes for removal of halogen-containing molecules from all parts of the atmosphere.
ESULTS: (1) Completion of above tasks. (2) Formulation of new problems in response to results and/or interpretations of experiments described above. The results should aid in control decisions on the possible ban of certain chlorofluorocarbon compounds (and exclusion of others) because of the hazard of stratospheric ozone depletion.
PROJECT MILESTONES: (1) No scheduled decision dates. (2) No dates scheduled for completion of particular instruments, or for particular research tasks among those listed above. (3) Next scheduled project report: September, 1977. (4) Reports on completed phases of the scientific work as each phase reaches a suitable stage of completion.
KEYWORDS: STRATOSPHERE;CHLORINE COMPOUNDS;CHEMICAL REACTIONS;OZONE;PHOTOCHEMISTRY;AIR;CLIMATES;RADIOISOTOPES;ULTRAVIOLET RADIATION;ORGANIC CHLORINE COMPOUNDS;FLUORINE

<094018>
TITLE: Research in Nuclear Chemistry
PRINCIPAL INVESTIGATOR: Choppin, G.R.
ADDRESS: Chemistry Department, Florida State University, Tallahassee, FL 32306
AFFILIATION: Florida State Univ., Tallahassee (USA). Dept. of Chemistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Burnett, John L.
TELEPHONE: F233-3613
TYPE OF FUNDING: Contract No.-EY-76-S-05-1797
77 FUNDING: Energy Research and Development Administration FY77:$20,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Actinides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Develop an understanding of environmental actinide chemistry
APPROACH: Characterization of the behavior of the actinide elements under carefully controlled laboratory conditions applicable to the environment.
RESULTS: An increased understanding of actinide environmental chemistry.
KEYWORDS: ACTINIDES;CHEMICAL REACTIONS;ENVIRONMENT;AIR POLLUTION;DIFFUSION;AMERICIUM;PLUTONIUM

<094020>
TITLE: Solvent Extraction Studies Using High-Molecular Weight Amines
PROJECT NUMBER: E(40-1)-4535
PRINCIPAL INVESTIGATOR: McDonald, C.W.
ADDRESS: Department of Chemistry, Texas Southern University, Houston, TX 77004
AFFILIATION: Texas Southern Univ., Houston (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
DIVISION: Oak Ridge Operations Office
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Contract No.-E(40-1)-4535
77 FUNDING: Energy Research and Development Administration FY77:$5,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: EXTRACTION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS/Cadmium;METALS/Zinc;METALS/Mercury;METALS/Lead (100%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: (1) To develop highly selective methods of separation of certain metals for use in analytical procedures. (2) To determine extraction constants for new metal extraction systems. (3) To develop laboratory procedures which have potential of being scaled up for rapid, simple and inexpensive methods of detoxification and removing impurities from industrial waste water. (4) To determine various properties of metal complex-HMWA compounds such as their solubilities and stabilities.
APPROACH: (1) Screen various toxic metal ions such as Cd, Zn, Pb and Hg with commercially available high molecular weight amines. (2) Develop laboratory methods for systems which show promise from screening studies. (3) Apply the developed methods to the detoxification of actual industrially polluted water on the laboratory scale.
RESULTS: Methods to be recommended which can be scaled up to economically remove cadmium, zinc, lead and mercury ions from industrial waste water.
PROJECT MILESTONES: Much of the basic research has been completed. Two research papers have been published.
KEYWORDS: WATER POLLUTION;CADMIUM;ZINC;LEAD;MERCURY;CHEMICAL EFFLUENTS;SEPARATION PROCESSES;REMOVAL;WASTE WATER;WASTE PROCESSING;TOXINS

<094021>
TITLE: Study of Atmospheric Trace Gases CO, NO/sub x/, Halogenated Hydrocarbons and Free Radicals by Mass Spectroscopy
PROJECT NUMBER: ANL 54800
PRINCIPAL INVESTIGATOR: Stevens, C.M.
ADDRESS: 9700 S. Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Molecular, Mathematical and Geosciences, Division of Physical Research
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$110,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)

POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Ours is an experimental program for determining the concentration, and in some cases th isotopic composition, of the trace gases, studied as far as possible in minimally polluted atmospheres. The ultimate objective is to contribute information for understanding of the natural cycle of each of these gases in order to be able to assess the effect of technological emissions on the troposphere and stratosphere. One need is to carry out accurate determinations of the concentration of the trace gases. These measurements are difficult to make because of the extremely low concentrations in which the gases occur, and in some cases because of chemical reactivity.
APPROACH: In the case of gases, mass spectrometric methods are generally the most reliable and accurate of all analytical methods. Determinations of the isotopic composition of the gases are made, where possible and useful, for establishing the sources to the atmosphere, whether natural or anthropogenic. The Argonne 100-inch radius research mass spectrometer is a particularly valuable tool in this connection.
RESULTS: The first part of the carbon monoxide program consists of completing the development of a mass spectrometric method for the determination of carbon-14 in milligram quantities of carbon. This technique will then be applied to the analysis of carbon extracted from atmospheric CO in order to provide an added tool for deducing the source and life cycle of the gas. The second part of our program consists of systematic seasonal studies of atmospheric CO in both the northern and southern hemispheres. The results for the northern hemisphere will be valuable for comparison with the data from our studies in 1969-1971 in showing the effects of emission controls introduced in the U.S. Measurements of the concentration of N/sub 2/O in a small number of stratospheric air samples collected between 1971-1975 have also been carried out. The results are valuable in fixing the vertical eddy diffusion mixing coefficient in the stratosphere, an important factor in models of the stratospheric ozone cycle.
PROJECT MILESTONES: Results of this research are presented at appropriate scientific meetings and published in scientific journals as appropriate units of the work are completed.
KEYWORDS: FATE;AIR POLLUTION;GASEOUS WASTES;CHEMICAL EFFLUENTS;QUANTITATIVE CHEMICAL ANALYSIS;TRACE AMOUNTS;CARBON MONOXIDE;NITROGEN OXIDES;AIR;RADICALS;MASS SPECTROSCOPY

<094023>
TITLE: Tritium Separation Technology
PROJECT NUMBER: EE 03 02 02
PRINCIPAL INVESTIGATOR: Watson, J.S.;Clinton, S.D.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Studies
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (20%);NUCLEAR/Fusion Magnetic;NUCLEAR/Fusion Laser (80%)
ENERGY CYCLE: ELECTRICITY GENERATION (90%);WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of the program is to obtain fundamental information on separation of tritium from materials associated with thermonuclear (fusion) or fission reactors. The hazards of tritium will impose restraints on future nuclear reactors and will have an especially large impact on the applications of fusion reactors where the quantities of tritium involved will be several orders of magnitude greater than those for fission reactors. Concentrations of tritium in the blanket and coolant materials of fusion reactors must be maintained very low (less than 1 ppm) to prevent embrittlement of structural materials, to hold inventories to acceptable levels, and to limit the rate at which tritium is released to the environment.
APPROACH: This program incorporates fundamental studies of techniques needed for separating and handling tritium for fusion reactors, but many of the results are also useful to fission reactor programs. Guidance and direction for this program is provided by mission-oriented development efforts for an experimental fusion power reactor which is currently in progress at ORNL. Those applied development programs frequently encounter needs for fundamental data and studies which are appropriate for this program. Fusion reactors are particularly new and novel devices, and the needs for such studies are numerous.
RESULTS: Current efforts are providing information for evaluating methods for recovering tritium from liquid lithium blankets and from solid blankets of aluminum and sintered aluminum product (SAP), containment of tritium permeating through metal vessels and piping, and transfer of tritium via deep sorption beds. These results are having immediate impact on conceptual designs of reactor systems.
PROJECT MILESTONES: This project includes a variety of studies reported in open literature papers and reports. Each paper represents a near term milestone. Long range goals of this project include providing some of the fundamental information needed to meet milestones in the applied development programs. The fusion reactor program plans to build an experimental power reactor in the 1980's and a demonstration reactor in the 1900's.
KEYWORDS: TRITIUM;SEPARATION PROCESSES;THERMONUCLEAR REACTORS;RADIOACTIVE WASTES

<094024>
TITLE: Waste Stream Processing Studies (EE 03 02 02)
PRINCIPAL INVESTIGATOR: Lloyd, M.H.
ADDRESS: Oak Ridge National Laboratory, Union Carbide Nuclear Division, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Studies
MONITOR: Haubach, Walter J.
TELEPHONE: F233-3167
TYPE OF FUNDING: Contract No.-W7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$225,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (75%);GENERAL SCIENCE (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: RADIATION (100%)

CHARACTER OF STUDY: RESEARCH/Laboratory (80%);DEVELOPMENT/Laboratory scale (20%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The purpose of this program is to provide basic technical information required for treating waste streams in nuclear fuel reprocessing plants. The Nuclear Fuel Cycle and Production Division of ERDA has established a program at ORNL on Waste Management Analysis for Nuclear Fuel Cycles, and an important aspect of the evaluation is to investigate the feasibility of removing the long-lived, hazardous materials (primarily actinides) from wastes generated in the nuclear fuel cycle for commercial power reactors. The program described here will provide supplementary information needed for developing feasible process methods. Studies will include (1) investigation of ''inextractable'' plutonium, (2) control of neptunium and plutonium valences, (3) application of fused salt processing methods for treating solids, and (4) methods for removing americium and curium from high-level waste.
APPROACH: Small-scale experiments will be carried out in hot cells with high-burnup fuel and in laboratories with non-radioactive, synthetic process solutions.
RESULTS: Basic technical information on the chemical behavior of actinides and fission products will be published.
PROJECT MILESTONES: Research results are reported and published as appropriate.
KEYWORDS: RADIOACTIVE WASTE PROCESSING;ACTINIDES;SEPARATION PROCESSES;PLUTONIUM;AMERICIUM;CURIUM;FISSION PRODUCTS;NEPTUNIUM

<094031>
TITLE: Investigation of the Removal of Hydrogen Sulfide from Simulated Geothermal Brines by Reaction with Oxygen
PRINCIPAL INVESTIGATOR: Wilson, J.S.
ADDRESS: Texas Division, Dow Chemical, Freeport, TX 77541
AFFILIATION: Dow Chemical Co., Freeport, Tex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Geothermal Energy
MONITOR: Loose, Ronald R.
TELEPHONE: F233-4905
TYPE OF FUNDING: Contract No.-E(11-1)-2797
77 FUNDING: Energy Research and Development Administration FY77:$395,000
TECHNOLOGY: GEOTHERMAL/General (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (20%);DEVELOPMENT/Pilot plant (80%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Control of H/sub 2/S emissions from geothermal brines.
APPROACH: Reduction of H/sub 2/S content of hot brine through oxidation to free sulfur and sulfate by direct addition of oxygen.
RESULTS: H/sub 2/S control system definition to apply to geothermal brine sources.
PROJECT MILESTONES: Process verification/final report 10/76. Phase I final report, April 1977.
KEYWORDS: GEOTHERMAL FLUIDS;BRINES;HYDROGEN SULFIDES;SEPARATION PROCESSES;SULFUR;OXIDATION;REMOVAL;CHEMICAL EFFLUENTS;CONTROL EQUIPMENT

<094032>
TITLE: Removal of Hydrogen Sulfide from Geothermal Steam by Catalytic Oxidation
PRINCIPAL INVESTIGATOR: Walkup, P.C.
ADDRESS: Battelle Blvd., Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Geothermal Energy
MONITOR: Loose, Ronald R.
TELEPHONE: F233-4905
TYPE OF FUNDING: Contract No.-E(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: GEOTHERMAL/General (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: H/sub 2/S removal from geothermal steam.
APPROACH: Contacting steam with an activated carbon catalyst to reduce H/sub 2/S to sulfur.
RESULTS: Development of an H/sub 2/S removal process based upon metal oxide sorbent.
PROJECT MILESTONES: Determination of operating condition limits and catalyst configuration, October 1977.
KEYWORDS: NATURAL STEAM;GEOTHERMAL FLUIDS;HYDROGEN SULFIDES;SEPARATION PROCESSES;CHEMICAL EFFLUENTS;SCRUBBERS;CONTROL EQUIPMENT;ACTIVATED CARBON;CATALYSTS

<094033>
TITLE: Control of Hydrogen Sulfide Emission From Geothermal Power Plants
PRINCIPAL INVESTIGATOR: Brown, F.C.
ADDRESS: 55 Chapel Street, Newton, MA 02158
AFFILIATION: Eic, Inc., Newton, Mass. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Geothermal Energy
MONITOR: Loose, Ronald R.
TELEPHONE: F233-4905
TYPE OF FUNDING: Contract No.-E(11-1)-2730
77 FUNDING: Energy Research and Development Administration FY77:$100
TECHNOLOGY: GEOTHERMAL/General (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (20%);DEVELOPMENT/Pilot plant (80%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Control of hydrogen sulfide emissions from geothermal steam.

APPROACH: Scrubbing of H/sub 2/S from steam using a copper sulfate solution.
RESULTS: Design of H/sub 2/S removal system.
PROJECT MILESTONES: (1) Process feasibilty 6/76. (2) Demonstration of process on geothermal steam 11/76. (3) System design and analysis complete 12/77.
KEYWORDS: CONTROL TECHNOLOGY;GEOTHERMAL HEATING SYSTEMS;POWER PLANTS;HYDROGEN SULFIDES;REMOVAL;SEPARATION PROCESSES;WASTE PROCESSING;NATURAL STEAM;CHEMICAL EFFLUENTS;SCRUBBERS

<094041>
TITLE: Fusion Magnet Safety Studies, Superconducting
PRINCIPAL INVESTIGATOR: Powell, J.R.
ADDRESS: Associated Universities, Inc., Upton, Long Island, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Magnetic Fusion Energy
MONITOR: Baublitz, John E.
TELEPHONE: F233-4956
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop the capability to analyze the various designs proposed for Magnetic Fusion Energy Magnet Systems from the point of view of safety, so that safety concepts may be incorporated in the proposed designs.
APPROACH: (1) Identification of potential safety problems. (2) Collection, review and evaluation of information relevant to magnet safety. (3) Participation in the development of recommended safety criteria. (4) Development of standard safety analysis procedures and formats for large superconducting magnet projects.
RESULTS: (1) Reports on magnet safety studies, loss of coolant, earthquake effects, fault detection, energy removal, etc. (2) Comprehensive detailed catalogue of experimental data for magnet safety analysis. (3) Report formats and fault tree methodology charts.
PROJECT MILESTONES: (1) Complete survey of existing superconducting magnet protection systems and failures November 1975. (2) Complete magnet safety report formats: (a) Low radioactivity inventory systems October 1978 and (b) High radioactivity inventory systems September 1980. (3) Complete fault trees for most likely accidents, large fusion magnets September 1980.
KEYWORDS: THERMONUCLEAR REACTORS;SUPERCONDUCTING MAGNETS;DESIGN;SAFETY;MECHANICAL PROPERTIES;FAILURES;COMPUTER CODES;MAGNETIC FIELDS

<094042>
TITLE: Environmental Effects
PRINCIPAL INVESTIGATOR: Young, J.R.
ADDRESS: Battelle Boulevard, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Magnetic Fusion Energy
MONITOR: Baublitz, John E.
TELEPHONE: F233-3437
TYPE OF FUNDING: Contract No.-AT(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$10,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: EXTRACTION (20%);PROCESSING, CONVERSION (10%);ELECTRICITY GENERATION (60%);WASTE MANAGEMENT (10%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The project objective is to conduct an environmental analysis of the impact of the fusion energy development program.
APPROACH: Each of the principal types of fusion reactors will be examined, and the general nature of the environmental impacts will be estimated. These impacts then will be compared to the impacts for other power plants expected to be operating at the time fusion power plants are introduced. Potentially adverse impacts will be studied to determine (1) the research and development efforts necessary for defining impacts, and (2) possible methods for reducing impacts.
RESULTS: An environmental analysis report will be published, summarizing the results of the project. This will be supplemented by a series of topical reports, each providing more detailed information in specific areas of the analysis and providing reference and guidance for future R and D.
PROJECT MILESTONES: (1) Issue draft environmental analysis December 1975. (2) Complete publication of Topical Reports November 1976. (3) Issue environmental Analysis Report December 1976.
KEYWORDS: THERMONUCLEAR REACTORS;ENVIRONMENTAL EFFECTS;RADIATION HAZARDS;TRITIUM;TOROIDAL THETA PINCH DEVICES;LASER IMPLOSIONS;TOKAMAK DEVICES;MAGNETIC MIRRORS;RADIOACTIVE EFFLUENTS;MAGNETIC FIELDS;SAFETY;ENVIRONMENT

<094051>
TITLE: Solar Energy Program Assessment
PRINCIPAL INVESTIGATOR: Sansom, R.L.
ADDRESS: 1701 N. Ft. Meyer Drive, Suite 1211, Arlington, VA 22209
AFFILIATION: Energy and Environmental Analysis, Inc., Arlington, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Solar Energy
MONITOR: Koomanoff, F.A.
TELEPHONE: C(202)376-4472
TYPE OF FUNDING: Contract No.-E(49-18)-2323
77 FUNDING: Energy Research and Development Administration FY77:$70,000

TECHNOLOGY: POSSIL FUEL/General (5%);NUCLEAR/General (5%);SOLAR/General (90%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
LLUTANTS: NOXIOUS GAS (10%);METALS (10%);PARTICULATES (10%);ORGANICS (10%);RADIATION (5%);NOISE, VIBRATION (5%);HEAT, THERMAL (10%);VISUAL AESTHETICS (10%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (30%)
ARACTER OF STUDY: RESEARCH (30%);ANALYTICAL (70%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To complete an Environmental Impact Assessment (EIA) for the Solar Heating and Cooling of Buildings (SHACOB) Program. (1) Assess the environmental implications of the widespread deployment of solar technologies. (2) Construct comprehensive environmental development plans. (3) Assist ERDA decision makers in reaching budget decisions and project choices.
APPROACH: (1) Collection of environmental data related to solar technologies. (2) Environmental and socio-economic assessment of solar technologies. (3) Comparative analysis of various supply technologies. A general Environmental Assessment has been completed for the SHACOB program and will be used as the basis for the EIA of that program.
RESULTS: (1) Program plan for environmental assessments. (2) Expansion of the decision variables available to management.
PROJECT MILESTONES: Final report due September 7, 1976.
KEYWORDS: SOLAR ENERGY;ECONOMICS;ENVIRONMENTAL EFFECTS;FORECASTING;TECHNOLOGY ASSESSMENT

<094053>
TITLE: Environmental Studies Related to the Operation of Wind Energy Conversion Systems
PRINCIPAL INVESTIGATOR: Rogers, S.E.
ADDRESS: Battelle Memorial Institute, Columbus Labs., Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Solar Energy, Wind Energy Conversion
MONITOR: Teague, Donald D.
TELEPHONE: C(202)376-4451
TYPE OF FUNDING: Grant No.-E(11-1)-0092
77 FUNDING: National Science Foundation FY77:$87,900
TECHNOLOGY: SOLAR/Ocean, wind (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (25%);ANALYTICAL (75%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Investigate environmental problems associated with wind energy conversion systems.
APPROACH: Analytic studies; field studies.
RESULTS: Description of key environmental problems associated with wind conversion systems.
PROJECT MILESTONES: Draft Final Report distributed for review.
KEYWORDS: FAUNA;FLORA;WIND;ENERGY CONVERSION;ENVIRONMENTAL EFFECTS;ANIMALS;PLANTS

<094060>
TITLE: Potential Effects of Solar System Working Fluids as Ecosystem Contaminants
PRINCIPAL INVESTIGATOR: Wilson, D.
ADDRESS: Los Alamos Scientific Laboratories, Albuquerque OPS Office, Albuquerque, NM
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, J.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-W-7405-ENG-36
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: SOLAR/Direct heat - cool (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Fluids and additives (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the transport and effects of fluids and additives in soils, and to analyze the paths for entry of fluids into groundwater supplies.
APPROACH: (1) Estimate the capacity of various soils to absorb the fluids and additives, and the effects of these fluids on soil chemistry and microbiology. (2) Investigate the effects of working fluids on vegetation, particularly those plants commonly grown near residential and commercial buildings. (3) Determine the movement of fluids through various soils, geologic formations, and groundwater supplies. (4) Estimate the concentration of working fluids expected in groundwater supplies following leakage from heating and cooling systems, and the risk of contaminating municipal and private water supplies. (5) Determine the effect of working fluids on residential septic systems. (6) Consider the pattern of working fluid leakage expected from normal operations, overheating, and fire.
RESULTS: (1) As a protection for human health, estimates of the potential danger of working fluids leakage to septic systems, municipal and private well systems will be available. (2) The effect of leaked fluids on lawns, gardens, and natural vegetation near residential and commercial buildings utilizing solar heating and cooling will be available to mitigate potentially expensive damage to flora.
KEYWORDS: SOILS;GROUND WATER;PLANTS;WORKING FLUIDS;ENVIRONMENTAL EFFECTS;ADDITIVES;SOLAR ENERGY CONVERSION;LEAKS

<094061>
TITLE: Environmental and Fire Hazard of Heat Transfer Fluids and Storage Media-Solar Heating, Cooling
PRINCIPAL INVESTIGATOR: Brannon, P.J.
ADDRESS: Sandia Laboratory, Albuquerque, NM
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA). Office of Solar, Geothermal and Advanced Energy Systems
DIVISION: Environmental Control Technology
MONITOR: Boehm, D.
TELEPHONE: C(301)353-5511;F233-5511
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$175,000
TECHNOLOGY: SOLAR/General (90%);SOLAR/Direct heat - cool (10%)
ENERGY CYCLE: STORAGE (33%);PROCESSING, CONVERSION (33%);COMBUSTION OR END USE (34%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Working fluids (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY:OS
PROJECT DESCRIPTION: To identify and to promulgate a list of acceptable material, heat transfer fluids and storage media used in solar home heating and cooling units.
APPROACH: (1) For FY 1977 the list of candidate materials will be reviewed for acceptability of toxicity, flammability, economics, and engineering properties as defined in the literature. A publication, identifying those acceptable materials, will be made available to the public. (2) For FY 1978 those materials which required experimental confirmation of acceptability will be reviewed and a supplementary publication will be prepared.
RESULTS: Resolution of a major uncertainty related to solar home heating and cooling units.
KEYWORDS: SOLAR AIR CONDITIONERS;SOLAR HEATING SYSTEMS;WORKING FLUIDS;TOXICITY;FLAMMABILITY;ECONOMICS

<094062>
TITLE: Environmental Development Plans for Solar Energy
PRINCIPAL INVESTIGATOR: Holmes, J.
ADDRESS: 1701 North Fort Myer Dr., Suite 1211, Arlington, VA 22209
AFFILIATION: Energy and Environmental Analysis, Inc., Arlington, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Solar Energy
MONITOR: Riches, M.R.
TELEPHONE: F376-4471
TYPE OF FUNDING: Contract No.-EG-77-C-01-4054
77 FUNDING: Energy Research and Development Administration FY77:$109,000
TECHNOLOGY: SOLAR/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All solar issues (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Site specific All USA;HYDROGRAPHIC AREAS/Deep ocean;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: To prepare for the eight Solar Technologies and Environmental Development Plan which will be used as a chapter in their respective program planning documents.
APPROACH: A team from ERAB, the technology and the contractor will participate in the preparation and review of EDPs. Each EDP will review the status of the technology and any relative environmental and safety research. Further, environmental and safety issues will be outlined, and a research plan presented to develop needed information. The research plan and legislative environmental requirements will then be folded into the technology development plans.
RESULTS: The EDP will provide an environmental research plan that is in step with the technology. Thus most environmental and safety issues will be identified early in the R and D phase of the technology so mitigation or control can be developed before widespread rise.
KEYWORDS: SOLAR ENERGY;SAFETY;ENVIRONMENTAL IMPACTS;PLANNING;PHOTOVOLTAIC CELLS;OCEAN THERMAL ENERGY CONVERSION;SOLAR ENERGY CONVERSION;HEATERS;SOLAR HEATING SYSTEMS;SOLAR AIR CONDITIONERS;AGRICULTURE;INDUSTRY;PROCESS HEAT;WIND POWER;WIND TURBINES

<094063>
TITLE: Preliminary Assessment of the Impact of Solar Collectors on Desert Ecosystems
PRINCIPAL INVESTIGATOR: Patten, D.T.
ADDRESS: Arizona State Universty, Tempe, AZ 85281
AFFILIATION: Arizona State Univ., Tempe (USA). Dept. of Botany and Microbiology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Solar, Geothermal and Advanced Energy Systems
MONITOR: Frankel, Eugene
TELEPHONE: F376-4478
77 FUNDING: Energy Research and Development Administration FY77:$20,000
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) To develop methodological guidelines for the systematic evaluation of the impacts of solar collectors on desert ecosystems. (2) To develop a research plan to monitor ecological impacts at a collector site or simulated model of collector array.
APPROACH: This will be a planning study to evolve a detailed research plan. The investigator will determine: (1) The instruments, measurements, and experiments required and the results expected from each. (2) The advantages and disadvantages of building a simulation model vs. monitoring an actual site. (3) Methods for monitoring the effects of construction and routine operations. (4) Detailed characteristics of a simulation model should one be required. Investigator will search existing literature and meet with officials responsible for solar thermal electric demonstration plants at Albuquerque and Barstow.
RESULTS: ERAB intends to fund an extensive monitoring program to determine the effects of arrays of solar collectors on the desert ecology. This study will enable us to take the most intelligent approach and resolve certain methodological problems at an early date.
KEYWORDS: SOLAR COLLECTORS;TERRESTRIAL ECOSYSTEMS;DESERTS;ENVIRONMENTAL IMPACTS;MONITORING;SIMULATION;EVALUATION;ECOLOGY

<094064>
TITLE: Assessment of Environmental and Occupational Health Effects of Photovoltaic Cell Manufacturing
PRINCIPAL INVESTIGATOR: Boeniger, M.
ADDRESS: 4676 Columbia Parkway, Cincinnati, OH 45226
AFFILIATION: National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Solar, Geothermal and Advanced Energy Systems
MONITOR: Frankel, Eugene
TELEPHONE: F376-4478
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: SOLAR/General (100%)
POLLUTANTS: NOXIOUS GAS (40%);METALS (30%);PARTICULATES (30%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the levels of emissions of toxic chemicals in the manufacture of silicon, cadmium sulfide and gallium arsenide solar cells. To determine the health effects of these emissions at the manufacturing plant and the immediate surroundings. To recommend control options for reducing emissions and preventing exposure.
APPROACH: Investigators will perform, at minimum, the following tasks: (1) Doping Compounds Emissions, Concentrations, and Effects Evaluation for Silicon Cells. (a) Ambient air levels of boron trichloride (BCl3) and phosphine (PH3) in and around photovoltaic silicon cell manufacturing plants shall be monitored and potential levels of exposure on and off-site estimated. (b) Health effects studies (literature review and laboratory research) will be carried out to identify chronic exposure effects of these compounds at or near the observed concentrations. (c) If ambient levels are commensurate with potential adverse effects, control options for reducing emissions or preventing exposure will be evaluated. (2) Integrated Analysis of the Cadmium Emissions Associated with Cadmium Sulfide Cell Production. (a) For each step in CdS cell manufacturing--mining, purification, CdS production, and cell fabrication--an inventory of cadmium use and associated emissions to air, water, and solid waste will be prepared. Where adequate estimates of emissions are not available, emission sampling will be performed. The inventory will show the amount of emissions and the physical and chemical form of the emissions. (b) Ambient monitoring of cadmium air levels within these facilities will be carried out and representative exposure for workers and nearby residents estimated. (c) Long-term CdS inhalation toxicity studies will be performed at levels commensurate with those identified
RESULTS: Occupational health effects due to exposure to toxic emissions in the manufacturing process are among the most serious environmental impacts of solar cell technology. This project will provide a generic environmental and occupational health assessment of the principal photovoltaic cell manufacturing processes. It will help fulfill ERAB's obligation to monitor and suggest control measures for important environmental effects of solar energy development.
KEYWORDS: PHOTOVOLTAIC CELLS;EMISSION;SILICON SOLAR CELLS;CADMIUM SULFIDE SOLAR CELLS;GALLIUM ARSENIDE SOLAR CELLS;HEALTH HAZARDS;MANUFACTURING;RECOMMENDATIONS;AIR POLLUTION CONTROL;BORON CHLORIDES;PHOSPHINES;ARSENIC COMPOUNDS;TOXICITY

<094065>
TITLE: Over-Temperature and Fire Hazard Investigation of Residential Solar Heating-Cooling Systems (SHAC)
PRINCIPAL INVESTIGATOR: Benjamin, I.
ADDRESS: National Bureau of Standards
AFFILIATION: National Bureau of Standards, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Safety, Standards and Compliance
MONITOR: Weintraub, Arnold
TELEPHONE: F353-5610
TYPE OF FUNDING: Interagency agreement-ERDA
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: SOLAR/General (100%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (10%);PARTICULATES (10%);SPECIFIED OTHER POLLUTANTS/Toxic liquids (30%)
PROJECT DESCRIPTION: To analyze the structural characteristics and operational functions of various heating and cooling designs under consideration by ERDA in order: (1) To determine the potential for seepage or introduction of toxic or hazardous substances into areas accessible to people in over-temperature conditions and before, during, or after a fire. (2) To develop countermeasures, where necessary, to safeguard the occupants and the dwelling.
APPROACH: (1) Conduct engineering analysis of 8 to 10 different systems under development, either partially or wholly by ERDA. (2) Subject systems to over-temperature and fire conditions to identify design features that could result in system or component failures leading to: (a) Seepage or introduction of toxic or hazardous substances into living or working areas. (b) Ignition of roof or other portion of building structure. (3) Determine nature of design and/or material defects. (4) Develop recommendations to improve design and/or upgrade materials to withstand the adverse effects of over-temperature and fire.
RESULTS: The safety of residential SHAC systems with respect to over-temperature and fire will be documented as adequate or the method for upgrading their safety to an acceptable level will be developed. Data for development of improved safety standards will be available.
KEYWORDS: SOLAR HEATING SYSTEMS;SOLAR COOLING SYSTEMS;FIRES;HAZARDS;MATERIALS;SAFETY;DESIGN;SAFETY ENGINEERING;HEAT;DEFECTS

<094066>
TITLE: Solar Heating and Cooling of Buildings
PRINCIPAL INVESTIGATOR: Luna, R.
ADDRESS: Sandia Laboratories
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Safety, Standards and Compliance
MONITOR: Stubblefield, Ferman
TELEPHONE: C(301)353-5625
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$35,000
TECHNOLOGY: SOLAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (50%);SPECIFIED OTHER POLLUTANTS/Toxic liquids (50%)
CHARACTER OF STUDY: RESEARCH (100%)

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;OS
PROJECT DESCRIPTION: To evaluate methods of treatment, packaging, interim storage, transporting and disposal or recycling of selected toxic or hazardous chemicals, e.g., transfer fluids, that have completed their service life in Solar Heating and Cooling (SHAC) systems.
APPROACH: 1. Evaluate the safety of proposed methods to be used for treatment, packaging, interim storage, transporting, disposal or recycling of the acceptable working fluids. 2. Identify the need for new or improved methods to meet the objective.
RESULTS: At the present time, there are no established means of disposal of the finite lifetime chemicals of SHAC systems. As a result, toxic liquids may be discarded in municipal sewage systems or directly on the ground.
KEYWORDS: SOLAR HEATING SYSTEMS;SOLAR COOLING SYSTEMS;WORKING FLUIDS;STORAGE;TRANSPORT;WASTE DISPOSAL;PACKAGING;TOXICITY;HAZARDS

<094067>
TITLE: Potential Effects of Solar System Working Fluids as Ecosystem Contaminants
PROJECT NUMBER: RPH-2684 and 2568
PRINCIPAL INVESTIGATOR: Wilson, D.
ADDRESS: Los Alamos Scientific Laboratory, Los Alamos, NM 87115
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Jacobson, J.S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-W-7405-eng-36;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$75,000
TECHNOLOGY: SOLAR/Direct heat - cool (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The fastest-growing application of solar energy is in the heating and cooling of homes and commercial buildings. This proposal aims at determining the toxicity of working fluids which may be released to the environment accidentally.
APPROACH: Solar heating and cooling working fluids will be screened for their effects on vegetation, on soil microflora and on the chemical composition of ground water.
RESULTS: The results of these toxicity tests will be to evaluate the different working fluids and develop guidelines for their handling, disposal and detoxification after accidental releases.
PROJECT MILESTONES: Final report is to be prepared in 1979.
KEYWORDS: SOLAR HEATING SYSTEMS;SOLAR COOLING SYSTEMS;ENVIRONMENTAL IMPACTS;WORKING FLUIDS;GROUND WATER;TOXICITY;ACCIDENTS;AIR POLLUTION;LAND POLLUTION;WATER POLLUTION

<094068>
TITLE: Broadcast Interference by Windmills
PROJECT NUMBER: E(11-1)-2846
PRINCIPAL INVESTIGATOR: Senior, T.B.A.
ADDRESS: Radiation Laboratory, Ann Arbor, MI 48109
AFFILIATION: Michigan Univ., Ann Arbor (USA). Radiation Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Solar Energy and Wind Systems
MONITOR: Teague, Donald D.
TELEPHONE: C(202)376-4451
TYPE OF FUNDING: Contract No.-E(11-1)-2846
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: SOLAR/Ocean, wind (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Interference signals (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (50%);ANALYTICAL (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: Develop and test methodology to evaluate effects of electromagnetic waves reflected by wind turbines on radio and TV reception.
APPROACH: Determine effects of reflected interference signal on primary signal amplitude and phase; derive criteria to assess impact of reflected signals on receiver performance, given various wind turbine, transmitter and receiver geometries; validate techniques in field using 100 kw wind turbine prototype.
RESULTS: Criteria and methodology for determining interference potential, presented in guidebook and final report form.
PROJECT MILESTONES: Guidebook to aid in site selection, final report describing methodology used--for distribution.
KEYWORDS: ELECTROMAGNETIC RADIATION;WIND TURBINES;ENVIRONMENTAL IMPACTS;SIGNAL DISTORTION;RADIO NOISE;TELEVISION;MEASURING METHODS;MANUALS;MAGNETIC FIELDS;COMPUTER CODES;COMMUNICATIONS

<094069>
TITLE: Health Effects of Materials Used in Solar Heating and Cooling Systems-Assess Using Bio Systems
PRINCIPAL INVESTIGATOR: McClellan, R.O.
ADDRESS: Institute of Inhalation Toxicology, Lovelace Laboratory, Albuquerque, NM 87101
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Minthorn, Martin
TELEPHONE: C(301)353-3681
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: SOLAR/Direct heat - cool (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;OS
PROJECT DESCRIPTION: Conduct hazards assessment as needed to define and quantify health effects associated with the large-scale utilization of solar heating and cooling of buildings.

APPROACH: (1) The results of the preliminary toxicological survey will be reviewed and evaluated by toxicologists. (2) Toxicological testing will utilize a multi-tier approach employing a series of test systems of different biological complexity. To the extent possible, rapid screening in simple biological systems (microorganisms, Drosophila, or mammalian cell culture) and short-term testing in intact animals will be emphasized. (3) Quantitative dose-response data will be used to develop predictive models applicable to human exposures; to the extent possible, such models will be validated against human data.
RESULTS: Output from the testing effort will help to (1) develop human exposure guides, (2) define needs for control technology, (3) guide decisions regarding technology advancement, (4) develop cost/risk/benefit analyses, and (5) prepare comprehensive environmental impact statements.
KEYWORDS: SOLAR HEATING;COOLING SYSTEMS;HEALTH HAZARDS;BUILDINGS;TOXICITY;TESTING;DOSE-RESPONSE RELATIONSHIPS;MATHEMATICAL MODELS;CONTROL;COST BENEFIT ANALYSIS;ENVIRONMENTAL IMPACT STATEMENTS;ANIMALS

<094070>
TITLE: Chemistry of Transuranium Elements and Compounds
PRINCIPAL INVESTIGATOR: Hahn, R.L.
ADDRESS: Oak Ridge National Lab., Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Basic Energy Sciences
MONITOR: Burnett, John L.
TELEPHONE: F233-3613
TYPE OF FUNDING: Contract No.-W-7405-eng-26
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Actinides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Basic research to develop an understanding of actinide solution chemistry as it pertains to the environment.
APPROACH: Characterization of the behavior of the actinide elements under carefully controlled laboratory conditions applicable to the environment.
RESULTS: An increased understanding of actinide environmental chemistry.
KEYWORDS: TRANSURANIUM ELEMENTS;TRANSURANIUM COMPOUNDS;ACTINIDES;CHEMICAL REACTIONS;ENVIRONMENTAL EFFECTS

<094071>
TITLE: Safety Studies of EPR Conceptual Designs
PRINCIPAL INVESTIGATOR: Charak, I.
ADDRESS: Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Magnetic Fusion Energy
MONITOR: Baublitz, John E.
TELEPHONE: F233-4956
TYPE OF FUNDING: Contract No.-W-31-109-ENG-38
77 FUNDING: Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: EXTRACTION (5%);TRANSPORTATION (5%);ELECTRICITY GENERATION (70%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (10%);RADIATION (90%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Identification of potential safety problems in fusion power reactors, development of a methodology for the analysis of such problems, development of safety-related design criteria, and the identification of R and D needs.
APPROACH: To provide a focus and degree of specificity to efforts, concentrate on safety analysis of the ANL prototype EPR design.
RESULTS: Information will be developed on identifying tritium release mechanisms, associated impacts, and design options to minimize tritium inventories; on major magnet malfunctions which could have serious operational or economic consequences and design options to reduce either the probability or consequences of such malfunctions; and on the thermal consequences of a localized plasma dump.
PROJECT MILESTONES: Complete safety analysis of ANL prototype EPR design September 1977.
KEYWORDS: THERMONUCLEAR REACTORS;SAFETY;DESIGN;TRITIUM;ENVIRONMENTAL EFFECTS;MAGNETS;ECONOMICS;THERMONUCLEAR REACTIONS

<094072>
TITLE: Safety of Fusion Reactors
PRINCIPAL INVESTIGATOR: Okrent, D.
ADDRESS: University of California, Los Angeles, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Magnetic Fusion Energy
MONITOR: Baublitz, John E.
TELEPHONE: F233-4956
TYPE OF FUNDING: Contract No.-EY-77-C-03-0010
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: EXTRACTION (5%);TRANSPORTATION (5%);ELECTRICITY GENERATION (70%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (10%);RADIATION (90%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To identify and analyze safety problems associated with conceptual designs of fusion Experimental Power Reactors (EPRs) and the UWMAK-III conceptual design.
APPROACH: Analyze three conceptual designs for fusion EPRs and one recent fusion power plant design to identify hazards, significant accident sequences, potential operational safety problems and major gaps in safety-related information.
RESULTS: Identification of potential hazards and accidents for recent conceptual fusion reactor designs and

comparison with earlier designs, along with identification of information gaps in these designs related to environment and safety.
PROJECT MILESTONES: Complete identification of hazards and significant accident sequences, and analysis of significant accident sequences for the specified fusion conceptual reactor designs--September 1977.
KEYWORDS: THERMONUCLEAR REACTORS;SAFETY;DESIGN;HAZARDS;REACTOR ACCIDENTS;TRITIUM

<094073>
TITLE: Reactor Safety Studies
PRINCIPAL INVESTIGATOR: Kazimi, M.S.
ADDRESS: Massachusetts Institute of Technology, Cambridge, MA 02139
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Magnetic Fusion Energy
MONITOR: Baublitz, John E.
TELEPHONE: F233-4956
TYPE OF FUNDING: Contract No.-EG-77-S-02-2431
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: EXTRACTION (5%);TRANSPORTATION (5%);ELECTRICITY GENERATION (70%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (10%);RADIATION (90%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Develop techniques for assessment of accident risk in fusion reactor plants.
APPROACH: The methodology developed for the Reactor Safety Study (WASH-1400) will be modified, as necessary, and applied to evaluating the potential risks of fusion power. Particular attention will be paid to those risks which are peculiar to fusion, such as tritium and lithium.
RESULTS: Computer code modeling of the consequences of fusion reactor accidents, for use in safety analysis and risk assessment.
PROJECT MILESTONES: Complete preliminary computer model development for predicting the consequences of lithium spills and tritium releases--September 1977.
KEYWORDS: THERMONUCLEAR REACTORS;SAFETY;HAZARDS;TRITIUM;LITHIUM;ENVIRONMENTAL EFFECTS;COMPUTER CODES;REACTOR ACCIDENTS;RADIOACTIVE WASTES;FORECASTING

<094074>
TITLE: Lithium Spill Studies
PRINCIPAL INVESTIGATOR: Muhlestein, L.D.
ADDRESS: Hanford Engineering Development Laboratory, Richland, WA 99352
AFFILIATION: Hanford Engineering Development Lab., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Magnetic Fusion Energy
MONITOR: Baublitz, John E.
TELEPHONE: F233-4956
TYPE OF FUNDING: Contract No.-EY-76-C-14-2170
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (20%);DEVELOPMENT/Laboratory scale (80%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Characterize the reaction of liquid lithium with materials likely to be present in fusion facilities and develop materials and methods for extinguishing lithium fires and for removing lithium smoke from the atmosphere.
APPROACH: Perform lab and bench scale tests to characterize the reaction of lithium with air, nitrogen, argon, carbon dioxide, concrete and selected insulating materials. Perform tests to evaluate effectiveness of various lithium fire extinguishing agents and methods. Perform tests with various cleanup systems for removal of lithium smoke and aerosols.
RESULTS: Experimental data characterizing reaction of lithium with air, other gases, concrete, and insulating materials. Recommended procedures and materials for extinguishing lithium fires. Recommended methods and equipment for removing lithium smoke aerosols from ventilation systems. Computer codes to model lithium reactions for safety analysis.
PROJECT MILESTONES: (1) Complete correlation of lithium and sodium hazards September 1979. (2) Complete aerosol air cleaning development September 1980. (3) Complete lithium fire extinguishment tests September 1981. (4) Complete large scale verification tests of lithium spill codes September 1982.
KEYWORDS: LITHIUM;THERMONUCLEAR REACTORS;FIRES;AIR POLLUTION;AIR;NITROGEN;ARGON;CARBON DIOXIDE;CONCRETES;CLEANING;AEROSOLS;CHEMICAL REACTIONS;COMPUTER CODES;SAFETY;SODIUM;HEALTH HAZARDS;THERMONUCLEAR REACTIONS

<094075>
TITLE: Fusion Systems Safety Analysis
PRINCIPAL INVESTIGATOR: Willenberg, H.J.
ADDRESS: Battelle Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Magnetic Fusion Energy
MONITOR: Baublitz, John E.
TELEPHONE: F233-4956
TYPE OF FUNDING: Contract No.-AT(45-1)-1830
77 FUNDING: Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: EXTRACTION (5%);TRANSPORTATION (5%);ELECTRICITY GENERATION (70%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (10%);RADIATION (90%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: To develop recommendations for an Environment and Safety Program Plan for Magnetic Fusion.
APPROACH: Based on information developed in previous, related work in analyzing potential environmental impacts of fusion power, identify key R and D needs and the timing of results needed as input to facility design, safety analysis or environmental impact assessment.
RESULTS: Recommendations for MFE environment and safety program plan, and identification of criteria

specified for environment and safety aspects of fission which may be applicable to fusion. Preparation of draft Environmental Development Plan for Magnetic Fusion.
PROJECT MILESTONES: Complete draft Environmental Development Plan and preliminary identification of applicable safety criteria--October 1977.
KEYWORDS: MAGNETIC FIELDS;ELECTROMAGNETIC RADIATION;SAFETY;RADIATION PROTECTION;TRITIUM;RADIOACTIVE WASTE MANAGEMENT;THERMONUCLEAR REACTIONS;ENVIRONMENTAL IMPACTS;RECOMMENDATIONS;DESIGN

<094076>
TITLE: Definition of Environment and Safety Programs for Magnetic Fusion
PRINCIPAL INVESTIGATOR: Powell, J.R.
ADDRESS: Associated Universities, Inc., Upton, Long Island, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Magnetic Fusion Energy
MONITOR: Baublitz, John E.
TELEPHONE: F233-4956
TYPE OF FUNDING: Contract No.-E(30-1)-16
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/Fusion Magnetic (100%)
ENERGY CYCLE: EXTRACTION (5%);TRANSPORTATION (5%);ELECTRICITY GENERATION (70%);WASTE MANAGEMENT (20%)
POLLUTANTS: METALS (10%);RADIATION (90%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY:OS
PROJECT DESCRIPTION: To carry out a comprehensive review and evaluation of the environmental and safety aspects of fusion reactors, and to identify R and D needs.
APPROACH: A series of comprehensive position papers is being prepared on waste management, tritium management, blanket protection and safety, and magnet protection and safety. These will define important factors and problems in each area and will identify R and D programs to develop solutions.
RESULTS: Recommendations will be made for input to an overall MFE environment and safety program plan.
PROJECT MILESTONES: Project completion in FY 1977.
KEYWORDS: THERMONUCLEAR REACTORS;SAFETY;WASTE MANAGEMENT;TRITIUM;MAGNETS;RESEARCH PROGRAMS;RECOMMENDATIONS;ENVIRONMENTAL EFFECTS;THERMONUCLEAR REACTIONS

<094077>
TITLE: Seismic Monitoring at the Geysers Geothermal Field
PRINCIPAL INVESTIGATOR: Bufe, C.G.
ADDRESS: U.S. Geological Survey, Office of Earthquake Studies, Menlo Park, CA 94025
AFFILIATION: Geological Survey, Menlo Park, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Geothermal Energy
MONITOR: Jelacic, Allan J.
TELEPHONE: C(202)376-4905
TYPE OF FUNDING: Interagency agreement-U.S. ERDA
77 FUNDING: Energy Research and Development Administration FY77:$87,000
TECHNOLOGY: GEOTHERMAL/General (100%)
ENERGY CYCLE: EXTRACTION (20%);WASTE MANAGEMENT (80%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Far West
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: (1) Determine attenuation and source characteristics of earthquakes occurring at the Geysers. (2) Differentiate between earthquakes natural to the geothermal area and those induced by production activities. (3) Define active faults at the Geysers, determine cumulative slip with time, and predict cumulative slip if microearthquake activity continues at its present level.
APPROACH: Monitor seismic activity at the Geysers using the Geysers-Clear Lake automated seismograph network augmented by 3 additional stations. Obtain wide band spectral information from 4 three-component seismographs. Collect data over four-month period. Analyze results to determine possible seismic discriminants.
RESULTS: (1) Updated hypocenter map of the Geysers. (2) Magnitude distributions of earthquakes in and out of the geothermal production zone. (3) Temporal variation of seismicity. (4) Fault plane solutions. (5) Seismic moment deformation rates. (6) Source characteristics, rupture propagation, and seismic attenuation.
PROJECT MILESTONES: Submit draft final report--12/30/77.
KEYWORDS: GEOTHERMAL FIELDS;EARTHQUAKES;SEISMIC DETECTION;GEYSERS;MONITORING;SEISMOGRAPHS;DATA ACQUISITION;SEISMOLOGY

Energy Research and Development Administration/Nuclear Energy AA

<095001>
TITLE: Waste Utilization Program, Sludge Thermoradiation
PRINCIPAL INVESTIGATOR: Sivinski, H.D.
ADDRESS: Division 5445, Sandia Laboratories, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Nuclear Research and Applications Division
MONITOR: Remini, William C.
TELEPHONE: F233-3182
TYPE OF FUNDING: Interagency agreement-ERDA/EPA
77 FUNDING: Energy Research and Development Administration FY77:$500,000
HNOLOGY: NUCLEAR/General (100%)
RGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (50%);SPECIFIED OTHER POLLUTANTS/Sludge (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All;HYDROGRAPHIC AREAS/Continental shelf

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The long-term objective is to develop the necessary technology for cost beneficial use of a maximum amount of radioactive waste. New developments have radically altered the cost picture. Sandia develcped process for separating radioisotopes from radioactive waste may compare in cost with current calcining process and the radiation technology developed makes possible sewage sludge treatment a cost-effective way of destroying pathogens.
APPROACH: Technical approach is to be achieved through two major task areas. (1) Task A, Development of a Radiation Applications Technology: (a) Subtask 1, waste resources utilization program for sewage sludge treatment; and (b) Subtask 2, studies of other potential applications. (2) Task B, Separation Technology and Source Development: (a) Subtask 1, development of a separation technology; and (b) Subtask 2, source development.
RESULTS: Successful use of cesium-137 from reactor waste to eliminate pathogens from sewage sludge. The sludge can then be safely used as a fertilizer or possibly an animal feed supplement. Scale up to pilot plant facility based on determined process, accurate cost/beneficial results. Based on operating experience with the pilot plant, engineering data and advice will be provided for the construction of full-scale treatment facility
PROJECT MILESTONES: (1) Develop treatment parameters to kill bacteria, viruses and parasites by end of FY 1978. (2) Complete cost benefit studies by mid FY 1977. (3) Complete pilot plant facility end FY 1978 operation through FY 1980. (4) Begin construction of full-scale plant FY 1979-80. (5) Complete separation technology end FY 1978. (6) Source development of Cs-137 end FY 1979.
KEYWORDS: THERMORADIATION;NUCLEAR ENERGY;SLUDGES;LAND POLLUTION;LAND USE;WASTE DISPOSAL;PUBLIC HEALTH;RADIOACTIVE WASTES;USES;ENVIRONMENTAL EFFECTS;COST BENEFIT ANALYSIS;RADIOISOTOPES;MATERIALS RECOVERY;CESIUM 137;GAMMA RADIATION;HEAT;DISEASES;SEWAGE;PATHOGENESIS

<095002>
TITLE: Marine Environmental Test Program
PRINCIPAL INVESTIGATOR: Kawahara, F.K.
ADDRESS: U.S. Navy Ocean Systems Center, San Diego, CA 92132
AFFILIATION: Naval Undersea Research and Development Center, San Diego, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISICN: Nuclear Research and Applications Division
MONITOR: Ogburn, George H., Jr.
TELEPHONE: F233-5367
TYPE OF FUNDING: Contract No.-E(49-15)-3058
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Far West;COASTS/Southeast;COASTS/Far West;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To generate meaningful data on the in-situ marine effects on nuclear fuels for the space program which may be inadvertently deposited in the ocean due to a space mission abort; and to determine effects of heat and radiation on the marine life in proximity to these nuclear fuels.
APPROACH: Long-term, in-situ ocean exposure of solid nuclear fuels samples, clad and unclad, is conducted by placing pellets in perforated cages at shallow depths. Natural occurring and implanted marine life in the cages is periodically sampled and analyzed. The pellets are periodically extracted and examined and after long exposure are returned to laboratory for analysis of effects. Various types of fuels of interest to the space program are placed in the program as they become available.
RESULTS: Data generated in the program is used to assess the risk of utilizing nuclear space systems and to provide information for reducing the risk by inputs to safety design of the hardware.
PROJECT MILESTONES: Results are issued quarterly.
KEYWORDS: IN-SITU;NUCLEAR FUELS;SEAS;SPACE FLIGHT;AQUATIC ORGANISMS;HAZARDS;SAFETY;ENVIRONMENTAL EFFECTS;POLLUTION;AGE DEPENDENCE;PLUTONIUM;WEATHERING;ENVIRONMENTAL TRANSPORT;WATER POLLUTION;RADIONUCLIDE MIGRATION

<095003>
TITLE: Environmental and Radiological Safety Studies
PRINCIPAL INVESTIGATOR: Waterbury, G.R.
ADDRESS: Los Alamos Scientific Laboratory, P.O. Box 1663, Los Alamos, NM 87544
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Nuclear Research and Applications
MONITOR: Dobry, Thaddeus J., Jr.
TELEPHCNE: F233-5367
TYPE OF FUNDING: Contract No.-Eng-36
77 FUNDING: Energy Research and Development Administration FY77:$400,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);FULL SCALE DEMONSTRATION (50%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To generate meaningful data on the environmental effects of the radiation and heat from radioisotope heat sources and radioisotope fuels used for power sources in the space program.
APPROACH: Envircnmental chambers and aquariums are utilized to permit selection of parameters to be tested and to ensure control over them. The effects of these parameters on the fuel material and simulation of different climates, soils, and water compositions are evaluated. Quarterly reports are issued to indicate progress of the program.
RESULTS: Data generated in the program is used to assess the risk of utilizing nuclear space power systems and to provide information for safety design improvements of the hardware.
PROJECT MILESTONES: Results issued quarterly.
KEYWORDS: FATE;ENVIRONMENTAL CHAMBERS;SAFETY;RADIOISOTOPES;RADIOISOTOPE HEAT SOURCES;NUCLEAR FUELS;SPACE FLIGHT;ENERGY SOURCES;ENVIRONMENTAL EFFECTS;SOILS;WATER;DATA;HAZARDS;AIR;CONTAMINATION;RADIOACTIVE AEROSOLS;AGE DEPENDENCE;WEATHERING;CLIMATES;COMPUTER CODES;PLUTONIUM;RADIONUCLIDE MIGRATION

<095005>
TITLE: Atmospheric Effects of Nuclear Energy Centers
PROJECT NUMBER: OH104
PRINCIPAL INVESTIGATOR: Eissenberg, D.M.
ADDRESS: Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Nuclear Research and Applications Division and Division of Biomedical and Environmental Research
MONITOR: Savage, William F.;Moses, Harry
TELEPHONE: F233-5402
TYPE OF FUNDING: Agency in house effort
77 FUNDING: Energy Research and Development Administration FY77:$862,000
TECHNOLOGY: MULTITECHNOLOGY (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To determine the effects on the atmosphere of large heat releases from cooling towers at energy centers and to develop methods to mitigate the adverse impacts of such releases.
APPROACH: The basic approach is to develop and validate atmospheric models through the use of flight test data and gathering of data on present thermal release situations which approach those of energy centers. The combined efforts of ORNL, ATDL (NOAA), PNL, ANL, RAND Corp. and Penn State University are applied to this effort.
RESULTS: The major result is a viable atmospheric model so as to predict the impact of heat release on the atmosphere and weather. Additionally recommended procedures for mitigating such releases will be developed.
PROJECT MILESTONES: (1) Complete initial atmospheric model 1978. (2) Model operation 1979. (3) Program completion 1981.
KEYWORDS: NUCLEAR FACILITIES;COOLING TOWERS;THERMAL EFFLUENTS;ENVIRONMENTAL EFFECTS;EARTH ATMOSPHERE;MATHEMATICAL MODELS;CLIMATES;PLUMES;WASTE WATER;WEATHER;THERMAL POLLUTION;WASTE HEAT

<095006>
TITLE: Seismic Studies
PROJECT NUMBER: SU013
PRINCIPAL INVESTIGATOR: Olsen, H.F.
ADDRESS: P.O. Box 81608, San Diego, CA 92138
AFFILIATION: General Atomic Co., San Diego, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Reactor Programs, Nuclear Research and Applications Division
MONITOR: Erb, D.E.
TELEPHONE: F233-4291
TYPE OF FUNDING: Contract No.-E(04-3)-167
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION/Fission products (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (60%);ANALYTICAL (40%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To demonstrate the safety of the seismic design of the HTGR core.
APPROACH: Test a scale model of the core to determine dynamic characteristics under excitation in the principal horizontal and vertical directions. Compare results with GA private test program and design codes predictions. Improve design codes using test data.
RESULTS: Data on the adequacy of HTGR core seismic design. Improved design codes.
PROJECT MILESTONES: Complete dowel and socket strength tests 10/1/77.
KEYWORDS: HTGR TYPE REACTORS;REACTOR CORES;SEISMIC EFFECTS;DESIGN;MOCKUP;PERFORMANCE TESTING;COMPUTER CODES;REACTOR SAFETY

<095007>
TITLE: HTGR Accident Initiation and Progression Analysis
PROJECT NUMBER: SU018
PRINCIPAL INVESTIGATOR: Houghton, W.J.
ADDRESS: P.O. Box 81608, San Diego, CA 92138
AFFILIATION: General Atomic Co., San Diego, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Reactor Programs, Nuclear Research and Applications Division
MONITOR: Erb, D.E.
TELEPHONE: F233-4291
TYPE OF FUNDING: Contract No.-E(04-3)-167
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION/Fission products (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To provide guidance for safety research and development programs for high temperature gas cooled reactors.
APPROACH: Identify accident event trees, estimate frequency of event. Estimate consequences of events. Assess related risks. Identify key event sequences. Identify areas needing R and D work.
RESULTS: Identification of key accidents in HTGRs requiring additional R and D. A methodology for HTGR risk assessment.
PROJECT MILESTONES: Update risk assessment based on AIPA 10/1/77.
KEYWORDS: RISK ASSESSMENT;HTGR TYPE REACTORS;REACTOR SAFETY;RESEARCH PROGRAMS;REACTOR ACCIDENTS

<095008>
TITLE: High Temperature Gas Reactor (HTGR) Safety Research
PROJECT NUMBER: SU029
PRINCIPAL INVESTIGATOR: Joksimovic, V.
ADDRESS: General Atomic Company, P.O. Box 81608, San Diego, CA 92138
AFFILIATION: General Atomic Co., San Diego, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Nuclear Research and Applications (NRA)
MONITOR: Emon, Donald E.
TELEPHONE: F233-3661
TYPE OF FUNDING: Contract No.-E(04-3)-167
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
POLLUTANTS: NOXIOUS GAS/Noble gases;NOXIOUS GAS/Halogens;NOXIOUS GAS/Volatile oxides (10%);METALS/Cesium;METALS/Ruthenium;METALS/Other fission products (20%);PARTICULATES/UC/sub 2/;PARTICULATES/ThC/sub 2/;PARTICULATES/Other fission products (20%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (40%);DEVELOPMENT/Laboratory scale (20%);ANALYTICAL (40%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Provide information to accurately predict release of fission products to the environment and the effect on public safety during HTGR accident conditions. (2) Determine the need for test facilities to better measure the potential hazard to the public from accident and off-normal HTGR conditions. (3) Develop analytical models and experimental data to better predict HTGR containment atmosphere response during HTGR blowdown accidents. (4) Develop methods to verify the seismic adequacy of critical HTGR components.
APPROACH: (1) Prepare program plan for fission product studies and tests based on a literature search, accident analysis studies, and small-scale scoping tests. (2) Conduct desorption and lift-off tests on material samples removed from the decommissioned Peach Bottom HTGR. (3) Based on the above program plan, survey existing and planned out-of-pile test loops and make a recommendation based on facility cost-effectiveness. (4) Select suitable and important HTGR components appropriate both for analysis and subsequent full-scale testing.
RESULTS: (1) Develop an analytical model which combines fission product release, diffusion, vaporization, gas phase transport, adsorption and desorption from both graphite and metal surfaces...all at high temperatures and low flow rate conditions. Priority effort will be on the release, transport and plateout of iodine in the HTGR environment. (2) Develop a knowledge of blowdown jet and plume behavior among helium, steam and air in the HTGR containment environment. Develop knowledge on forced-convection flow patterns and means to assess the heat transfer coefficients throughout the HTGR containment during accident blowdown conditions.
PROJECT MILESTONES: (1) Issue report on preliminary fission product plateout model Jan. 1977. (2) Complete fuel particle release rate Phase II tests, issue report May 1977. (3) Prepare containment atmospheric response test program Apr. 1977. (4) Design and plan integral loop tests for core heatup Sept. 1977.
KEYWORDS: HTGR TYPE REACTORS;REACTOR SAFETY;REACTOR ACCIDENTS;RESEARCH PROGRAMS;FISSION PRODUCTS;CONTAINMENT SYSTEMS;RADIATION HAZARDS;ENVIRONMENTAL EFFECTS;PLUMES;RADIONUCLIDE MIGRATION;BLOWDOWN

<095013>
TITLE: GCFR Safety Aspects of Fuel and Core
PROJECT NUMBER: 01353
PRINCIPAL INVESTIGATOR: Avery, R.;Sevy, R.H.
ADDRESS: Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Nuclear Research and Applications
MONITOR: Emon, Donald E.
TELEPHONE: F233-3661
77 FUNDING: Energy Research and Development Administration FY77:$680,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
POLLUTANTS: NOXIOUS GAS/Noble gases;NOXIOUS GAS/Halogens;NOXIOUS GAS/Volatile oxides (10%);METALS/Cesium;METALS/Ruthenium;METALS/Other fission products (20%);PARTICULATES/UO/sub 2/;PARTICULATES/PuO/sub 2/;PARTICULATES/Other fission products (20%);RADIATION/From all of the above (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (25%);ANALYTICAL (25%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) The assessment of GCFR safety related fuel and core features under normal and accident conditions to pinpoint safety and design related concerns. (2) The assessment of GCFR core and reactor structure response to core-disruptive type accidents. (3) The evaluation of accident consequences (radiological) to the outside of a GCFR containment building. (4) The formulation of a GCFR safety test program. (5) The design, procurement and assembly of GCFR test trains for in-pile safety tests.
APPROACH: The GCFR designer (General Atomic) will identify the abnormal operations, component malfunctions, and system faults which could lead to a radioactive material release to the reactor containment building. Under this project, CA048, ANL will be developing concurrently a matrix of reactor accidents' consequences in terms of core and/or containment structure damage sequences as a function of the accident energy and time. The General Atomic sets of accident conditions will be the input to ANL's matrix of consequences, i.e., when any specific set of accident conditions is over-laid on the ANL matrix of consequences, a particular set of bounding consequences will be shown.
RESULTS: The following information will be obtained from the code development and analytical efforts, and from the laboratory-scale and engineering-scale test programs funded under this project: (1) fuel motion after loss of cooling; (2) disrupted core behavior; (3) core debris characteristics; (4) post-accident heat removal; (5) inherent shutdown mechanisms; and (6) radiological material transport and effects (consequences to the public).
PROJECT MILESTONES: (1) Modify SAS-3A (major LMFBR Safety Analysis Code) for GCFR application Dec. 1975. (2) Complete report on the GCFR Safety Test Program Plan July 1976. (3) Initial PCRV Structural Response Analysis July 1976. (4) Begin ANL/ORNL fission product release in helium from GCFR fuel Jan. 1978. (5) Begin major post-accident heat removal test program July 1978. (6) Begin transient in-pile tests of GCFR fuel in helium Jan. 1979. (7) Factor-in the results of GCFR in-pile and out-of-pile test results into the GCFR safety analysis codes and results July 1980.
KEYWORDS: ACCIDENT ANALYSIS;RISK ASSESSMENT;GCFR TYPE REACTORS;REACTOR SAFETY;REACTOR CORE DISRUPTION;REACTOR CORES;FUEL PINS;PLUTONIUM

<095014>
TITLE: Gas Reactor In-Pile Safety Test (GRIST)
JECT NUMBER: 00520
NCIPAL INVESTIGATOR: Arbtin, E.
ADDRESS: Idaho National Engineering Laboratory (INEL), 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: Aerojet Nuclear Co., Idaho Falls, Idaho (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Nuclear Research and Applications (NRA)
MONITOR: Emon, Donald E.
TELEPHONE: F233-3661
TYPE OF FUNDING: Contract No.-41-1375-1-308
77 FUNDING: Energy Research and Development Administration FY77:$550,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
POLLUTANTS: NOXIOUS GAS/Noble gases;NOXIOUS GAS/Halogens;NOXIOUS GAS/Volatile oxides (10%);METALS/Cesium;METALS/Ruthenium;METALS/Other fission metals (20%);PARTICULATES/UO/sub 2/;PARTICULATES/PuO/sub 2/;PARTICULATES/Other fission products (20%);RADIATION/From all of the above (50%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);FULL SCALE DEMONSTRATION (70%);ANALYTICAL (10%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Develop the conceptual design for a gas reactor in-pile safety test loop including definition of system and handling requirements, definition of major design features, completion of safety and environmental impact reports. (2) Design, procure and assemble all hardware for the test loop and its supporting systems. (3) Develop all check-out and proof-test procedures, operating procedures, operator training, and the experimental test and examination procedures. (4) Operation of the test facility; reduction and reporting of the test data.
APPROACH: (1) Review the GCFR safety test program formulated by Argonne National Laboratory. (2) Evaluate various test reactors as potential test locations for the in-pile tests. (3) Perform configuration and cost trade-off studies of the in-pile tube and of the external test loop for the test reactor selected. (4) Develop cost-estimates and schedules to support the construction, procurement and/or modification of the test facility and support equipment. (5) Provide management and inspection of construction activities for the test loop. (6) Train the operating and maintenance personnel. (7) Conduct the required tests; reduce and report the test data.
RESULTS: (1) Demonstrate the time and mode of fuel rod failure for the loss-of-flow (coolant circulator failure or flow blockage) accident and for a transient over-power accident, both without scram. (2) Demonstrate the fuel motion and inter-element behavior after loss of cooling. (3) Demonstrate inherent reactivity shutdown mechanisms such as fuel vapor, fission product vapor, or coolant dispersal of fuel. (4) Demonstrate radiological material transport.
PROJECT MILESTONES: (1) Provide conceptual design and management report for a steady-state GRIST loop design based on use of the Experimental Test Reactor June 1976. (2) Provide costs and schedule for FY 1978 line item funding of the steady-state GRIST loop design June 1976. (3) Start conceptual design study for a transient GRIST loop design July 1976. (4) Complete conceptual design and management report for the transient GRIST design Oct. 1977. (5) Begin design of a steady-state or transient GRIST loop design March 1978. (6) Begin construction and long-lead time component procurement Jan. 1979. (7) Complete construction: transient facility Jan. 1981; steady state facility Jan. 1982.
KEYWORDS: ACCIDENT TESTING;NUCLEAR FUEL;GCFR TYPE REACTORS;REACTOR SAFETY;LOSS OF FLOW;LOSS OF COOLANT;TEST FACILITIES

<095015>
TITLE: Gas Cooled Fast Breeder Reactor (GCFBR) Accident Initiation and Progression Analysis
PROJECT NUMBER: 00589
PRINCIPAL INVESTIGATOR: Broido, J.H.
ADDRESS: General Atomic Company, P.O. Box 81608, San Diego, CA 92138
AFFILIATION: General Atomic Co., San Diego, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Nuclear Research and Applications (NRA)
MONITOR: Emon, Donald E.
TELEPHONE: F233-3661
TYPE OF FUNDING: Contract No.-E(04-3)-167
77 FUNDING: Energy Research and Development Administration FY77:$660,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
POLLUTANTS: NOXIOUS GAS/Noble gases;NOXIOUS GAS/Halogens;NOXIOUS GAS/Volatile oxides (10%);METALS/Cesium;METALS/Ruthenium;METALS/Other fission products (20%);PARTICULATES/UO/sub 2/;PARTICULATES/PuO/sub 2/;PARTICULATES/Other fission products (20%);RADIATION/From all of the above (50%)
CHARACTER OF STUDY: RESEARCH/Theoretical (50%);ANALYTICAL (50%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Identify and evaluate various high risk accidents for the GCFBR. (2) Apply this information to identify practical improvements in reactor system design or operating procedures to reduce these risks. (3) Apply this information to provide guidelines and priorities for selecting safety-based R and D for GCFBR's. (4) Maintain close liaison and input to other organizations performing safety testing and/or analysis on GCFBR for ERDA and NRC.
APPROACH: (1) Develop and apply methods for the collection, evaluation and retrieval of component failure rate data applicable to GCFBR plants. (2) Refinement of probabilistic methods to better estimate the high risk failure sequences of plant components and systems. (3) Develop analytical methods to describe the behavior of fuel and control elements under severe reactivity transient and undercooling accident conditions. (4) Develop methods for the integration of safety targets into the GCFR engineering effort and to integrate the results of safety tests and studies into the GCFR licensing reviews.
RESULTS: (1) Detailed fault-tree and event-tree diagrams defining the high risk failure sequences which result from various accident initiators. (2) Analytical methods (code development) to define the thermal-hydraulic behavior of GCFBR fuel under various accident conditions. (3) Determination and dynamic characterization of various fuel failure mechanisms and scram reliability. (4) Determination of the licensability, reliability and operability of a fast breeder reactor in a utility power grid.
PROJECT MILESTONES: (1) Preliminary report on GCFR initiating accident events and accident sequences June 1975. (2) Summary report on GCFR accident analysis July 1976. (3) Annual reports on further studies of accident initiators and progression analysis Sept. 1977, Sept. 1978, etc. (4) Planning of fuel element ductwall melting analysis Sept. 1976. (5) initiation of fuel element ductwall melting experiments Oct. 1977. (6) Complete GCFR Safety Program Plan, Sept. 1977.
KEYWORDS: ACCIDENT ANALYSIS;RISK ASSESSMENT;GCFR TYPE REACTORS;REACTOR SAFETY;REACTOR ACCIDENTS;RESEARCH PROGRAMS;PLUTONIUM

<095016>
TITLE: Gas Cooled Fast Reactor (GCFR) Safety Experiments
PROJECT NUMBER: 00354
PRINCIPAL INVESTIGATOR: Hanson, D.L.
ADDRESS: Los Alamos Scientific Laboratory (LASL), P.O. Box 1663, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Nuclear Research and Applications (NRA)
MONITOR: Emon, Donald E.
TELEPHONE: F233-3661
TYPE OF FUNDING: Contract No.-W-7405-Eng-36
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (20%);DEVELOPMENT/Laboratory scale (70%);ANALYTICAL (10%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;OS
PROJECT DESCRIPTION: (1) To understand the GCFR fuel element duct melt-through and fall-away phenomena for the loss-of-flow (LOF) accident with scram. (2) To perform fuel cladding melting and relocation tests for the LOF accident without scram. (3) To perform similar GCFR accident simulation tests on test assemblies representing the GCFR control element.
APPROACH: (1) All tests will be run out-of-pile using direct electrical heating (DEH) equipment available at LASL from the ROVER program. (2) The DEH equipment will be used to simulate the decay heating for an LOF accident with scram in fuel element models of approximately full-section and full-size in the GCFR fuel element. (3) For the test condiion representing an LOF accident without scram, the test assemblies will use a partial-section of a full-size GCFR fuel element in order to drive the simulated fuel rods at heating rates corresponding to several times full power operation.
RESULTS: (1) Determine where and when the fuel element will be melted through by direct radiation and conduction heating. (2) Determine whether and when the fuel elements will drop freely from the core assembly when their ducts are completely melted through. (3) Determine whether the molten fuel cladding will freeze at the core-blanket interface region, and if it does, whether molten cladding will flow radially against the fuel duct. (4) Determine similar accident condition behavior for the GCFR control elements.
PROJECT MILESTONES: (1) Complete design of partial-section test assembly for decay power level tests Feb. 1977. (2) Complete design of full-section test assembly for full power level tests Sept. 1977. (3) Complete design for fuel element drop-out testing Jan. 1988. (4) Complete test of partial-section test assembly at decay power level Sept. 1977. (5) Complete test of full-section test assembly at full power level May 1978. (6) Complete test of fuel element drop-out test Sept. 1978. (7) Complete reports on all tests with safety design recommendations March 1979.
KEYWORDS: ACCIDENT TESTING;GCFR TYPE REACTORS;REACTOR SAFETY;RESEARCH PROGRAMS;LOSS OF FLOW;FUEL ELEMENTS;MELTDOWN;TEST FACILITIES;NUCLEAR FUELS

<095020>
TITLE: Airborne Waste R and D
PROJECT NUMBER: KK090403
PRINCIPAL INVESTIGATOR: Several, E.P.C.
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Waste Management
MONITOR: Oertel, Goetz
TYPE OF FUNDING: Contract No.-KK090402;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$3,205,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: PARTICULATES (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To develop technology for the collection of tritium and iodine; for filtering particulates, fixation of collected airborne wastes to provide stable solid forms and packaging for long-term storage.
APPROACH: Hot pilot scale demonstrations will be carried out on each fixation process. Process demonstrations will be carried out at the ERDA facilities where the technology is needed.
RESULTS: Technology to cope with airborne radioactive waste for proper management.
PROJECT MILESTONES: (1) Issue report on demonstration of tritium immobilization process and waste form using polymer-concrete Sept. 1977.
KEYWORDS: TRITIUM;IODINE;AEROSOLS;AIR POLLUTION;SOLIDIFICATION;RADIOACTIVE WASTES;MANAGEMENT

<095021>
TITLE: Defense Waste Processing R and D
PROJECT NUMBER: KK090402
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Waste Management
MONITOR: Oertel, Goetz
TYPE OF FUNDING: Contract No.-KK090402;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$12,905,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (30%);DEVELOPMENT/Pilot plant (30%);FULL SCALE DEMONSTRATION (20%);PRODUCTION (20%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To store solidified high level radioactive waste indefinitely in tanks or removal of waste from the present tanks and convert to an acceptable form for terminal storage.
APPROACH: To develop technology to reduce the volume of waste, immobilize the residue and package the waste

in a manner acceptable for interim and terminal isolation.
RESULTS: Develop technology for high level radioactive waste management and terminal isolation.
PROJECT MILESTONES: (1) Demonstrate retrieval process July 1977. (2) Demonstrate incinerator technology for TRU contaminated waste Sept. 1977.
YWORDS: RADIOACTIVE WASTES;SOLIDIFICATION;STORAGE;VOLUME;MANAGEMENT;WASTE PROCESSING;PLUTONIUM

<095022>
TITLE: Commercial Nuclear Waste Management Terminal Storage Research and Development
PROJECT NUMBER: KU0302
PRINCIPAL INVESTIGATOR: Office, o.W.I.
ADDRESS: P.O. Box E, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Waste Management
MONITOR: Heath, Colin
TELEPHONE: F233-4068
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$30,225,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (30%);DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To assure the timely availability of repositories in geological formations for terminal storage of radioactive wastes from commercial sources for which Federal custody is required.
APPROACH: Conduct geoscience studies in promising crystalline, shale, and salt formations in order to identify sites for terminal storage repositories. Construct pilot plant repositories.
RESULTS: To construct and have available repositories to store radioactive wastes.
PROJECT MILESTONES: (1) Select site for pilot plant 1 August 1976. (2) Draft ''EIS'' for pilot plant by October 1978. (3) Conceptual design for pilot plant 1 by November 1978. (4) Begin Title 1 design February 1980. (5) Begin pilot plant construction November 1987.
KEYWORDS: NUCLEAR ENERGY;LAND POLLUTION;CONTAMINATION;RADIOACTIVE WASTE STORAGE;GEOLOGIC STRUCTURES;GEOCHEMISTRY;SITE SELECTION;PILOT PLANTS;ENVIRONMENTAL EFFECTS;GEOLOGICAL SURVEYS;HEALTH HAZARDS;PLUTONIUM

<095023>
TITLE: Commercial Radioactive Waste Processing Research and Development
PROJECT NUMBER: KK0302
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Waste Management
MONITOR: Oertel, Goetz
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$24,115,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (40%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (10%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To develop technology that can be used in the commercial nuclear fuel cycle industry to reduce the volumes of waste that must be managed, and to convert liquid, solid and gaseous wastes to stable packaged forms for transport to and acceptance at terminal storage facilities.
APPROACH: Development of processes to convert high-level liquid waste to a calcine or vitrified glass waste form and package it in corrosion resistant canisters.
RESULTS: Technology for commercial use.
PROJECT MILESTONES: (1) Issue waste vitrification program plan June 1976. (2) Complete design data for commercial calcination plant July 1979. (3) Complete design of waste vitrification process July 1979. (4) Begin plant scale application of calcination/vitrification process June 1984.
KEYWORDS: RADIOACTIVE WASTE PROCESSING;FUEL CYCLE;NUCLEAR FUELS;GASEOUS WASTES;LIQUID WASTES;SOLID WASTES;STORAGE;PLUTONIUM

<095024>
TITLE: Defence Rad Waste R and D, Terminal Storage
PROJECT NUMBER: KK090401
PRINCIPAL INVESTIGATOR: Several, E.p.c.
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Waste Management
MONITOR: Heath, Colin
TELEPHONE: F233-4068
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$5,900,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH (20%);DEVELOPMENT/Pilot plant (80%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
OJECT DESCRIPTION: To demonstrate the geological isolation of transuranium contaminated waste.
PROACH: To perform necessary geoscience investigations in Southeast New Mexico to allow selection and characterization of a site in bedded salt for the terminal storage of existing and future ERDA generated TRU contaminated wastes.
RESULTS: Construction of a terminal storage site for radioactive waste.

PROJECT MILESTONES: (1) Select study area for geological explorations Apr. 1976. (2) Acquire land, oil, gas and mineral rights by Mar. 1978. (3) Start conceptual design Oct. 1976. (4) Start Title I and II Sept. 1977. (5) Start construction Mar. 1978. (6) Start pilot plant demonstration Jan. 1983.
KEYWORDS: LAND USE;RADIOACTIVE WASTES;GEOLOGICAL SURVEYS;LAND POLLUTION;CONTAMINATION;NEW MEXICO;RADIOACTIVE WASTE DISPOSAL;RADIOACTIVE WASTE STORAGE;NUCLEAR ENERGY;ENVIRONMENTAL EFFECTS;PLUTONIUM

<095030>
TITLE: Environmental Effects of Advanced LMFBR Fuels
PROJECT NUMBER: OH107
PRINCIPAL INVESTIGATOR: Tennery, V.J.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Reactor Development and Demonstration
MONITOR: Sherwood, George L., Jr.
TELEPHONE: F233-3481
TYPE OF FUNDING: Contract No.-0022
77 FUNDING: Energy Research and Development Administration FY77:$298,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: TRANSPORTATION (10%);PROCESSING, CONVERSION (30%);ELECTRICITY GENERATION (50%);WASTE MANAGEMENT (10%)
POLLUTANTS: TOXIOUS GAS (10%);RADIATION (90%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Assess the environmental impact of the use of alternate fuels instead of mixed-oxide fuel for the LMFBR and its supporting fuel cycle.
APPROACH: Analyze expected effluents and control technology requirements for substituting alternate fuels for mixed-oxide fuel in LMFBR fuel cycle. Estimate resulting environmental impacts, using existing computer codes.
RESULTS: Information required for evaluating the environmental effects of using advanced fuels for the LMFBR fuel cycle.
PROJECT MILESTONES: (1) Initial report on C-14 studies 5/76. (2) Final report on C-14 studies 9/80. (3) Environmental statement/assessment 1/79.
KEYWORDS: NUCLEAR FUELS;LMFBR TYPE REACTORS;FUEL CYCLE;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;COMPUTER CODES;RADICISOTOPES;SAFETY;RADIOACTIVE WASTES

<095032>
TITLE: Meteorological Studies (NOAA)
PROJECT NUMBER: HH009
PRINCIPAL INVESTIGATOR: Van der Hoven, I.;Dickson, C.R.
ADDRESS: Air Resources Laboratory, 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: National Oceanic and Atmospheric Administration, Idaho Falls, Idaho (USA). Air Resources Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Reactor Development and Demonstration (ERDA)
MONITOR: Sherwood, George L., Jr.
TELEPHONE: F233-3481
TYPE OF FUNDING: Contract No.-NRC AT(49-25)-1004;ERDA AT(49-5)-1289, e-ERDA (and NRC)
77 FUNDING: Energy Research and Development Administration FY77:$233,000; Nuclear Regulatory Commission FY77:$165,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Research on meteorological dispersion, to obtain dispersion parameters for a variety of types of sites, particularly LMFBR program and potential reactor sites.
APPROACH: Field measurements of downwind tracer gas concentrations and related meteorological parameters over a wide range of distances, terrain, weather conditions and source configurations.
RESULTS: Validated dispersion parameters and improved calculational models.
PROJECT MILESTONES: (1) Complete building wake effects studies 1978. (2) Complete measurements of long distance atmospheric dispersion parameters 1979. (3) Complete measurements of concentration profiles in the vertical 1979.
KEYWORDS: LMFBR TYPE REACTORS;SITE SELECTION;METEOROLOGY;AIR;COMPUTER CODES;RADIOACTIVE EFFLUENTS;MEASURING INSTRUMENTS;DISPERSIONS

<095033>
TITLE: Evaluation of Models for Assessment of LMFBR Radioactivity Releases
PROJECT NUMBER: OH136
PRINCIPAL INVESTIGATOR: Kaye, S.K.;Hoffman, F.O.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Reactor Development and Demonstration
MONITOR: Sherwood, George L., Jr.
TELEPHONE: C(301)353-3481
TYPE OF FUNDING: Contract No.-0022
77 FUNDING: Energy Research and Development Administration FY77:$214,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: Recommend those models and parameters best suited for predicting individual and population exposures resulting from routine and accidental LMFBR radioactivity discharges and verify such

models to the extent possible.
APPROACH: (1) Compilation and comparison of existing models. (2) Preliminary evaluation of models. (3) Comprehensive testing of selected models. (4) Recommend models and parameters for LMFBR dose assessments. (5) Development of standard LMFBR dose assessment code (tentative).
RESULTS: Verified model or models for predicting individual and population exposures resulting from routine and accidental LMFBR radioactivity discharges.
PROJECT MILESTONES: (1) Preliminary evaluation of models 9/77. (2) Comprehensive testing of selected models 9/79. (3) Complete development of standard LMFBR dose assessment code 9/80 (tentative).
KEYWORDS: LMFBR TYPE REACTORS;RADIOACTIVE EFFLUENTS;HUMAN POPULATIONS;RADIATION DOSES;MATHEMATICAL MODELS;FORECASTING;COMPUTER CODES;METEOROLOGY;SAFETY;TOXICITY

<095034>
TITLE: Chalk Point Cooling Tower Project (CPCTP)
PROJECT NUMBER: CX021
PRINCIPAL INVESTIGATOR: Nietubicz, R.S.
ADDRESS: CPCTP, c/o Bureau of Air Quality and Noise Control, O'Connor Bldg., 201 Preston St., Baltimore, MD 21201
AFFILIATION: Maryland Dept. of Natural Resources, Annapolis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Nuclear Research and Applications
MONITOR: Dizmura, A.P.
TELEPHONE: C(301)353-3707
TYPE OF FUNDING: Contract No.-E(11-1)-2381 (ERDA)
77 FUNDING: Energy Research and Development Administration FY77:$50,000; Environmental Protection Agency FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil and Gas (30%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (40%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES/Salt drift (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Other hydrographic areas Estuaries
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Provide a demonstration of the drift performance of large natural draft cooling towers fitted with improved drift eliminators.
APPROACH: (1) Direct measurements of drift rates at the large hyperbolic natural draft salt water cooling tower at the Chalk Point Power Station (Unit No. 3) using suitable techniques (such as isokinetic sampling, sensitive paper, etc.). (2) Detailed meteorological measurements of the cooling tower plume itself to thoroughly characterize plume rise. (3) Analyses of data obtained during the course of the field measurement study.
RESULTS: Favorable drift performance, along with evidence (from other ongoing studies) that expected drift levels will not have unacceptable environmental impacts, will enhance the acceptability of such salt water cooling towers systems for use in future power plants, and will facilitate the siting of power plants in areas where water supplies have high salt content.
PROJECT MILESTONES: (1) Experiment design and equipment fabrication 7/74. (2) Baseline measurements 3/75. (3) Continuous monitoring 10/75. (4) Seasonal intensive testing 12/76. (5) Final report 6/78.
KEYWORDS: COOLING TOWERS;PERFORMANCE;PLUMES;DIFFUSION;METEOROLOGY;THERMAL EFFLUENTS

<095035>
TITLE: Analysis of Submerged Diffuser Discharges
PROJECT NUMBER: CA044
PRINCIPAL INVESTIGATOR: Harrison, W.;Ditmars, J.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Nuclear Research and Applications
MONITOR: Dizmura, A.P.
TELEPHONE: C(301)353-3707
TYPE OF FUNDING: Contract No./0038
77 FUNDING: Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/Coal (30%);FOSSIL FUEL/Oil and Gas (30%);NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (40%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Great Lakes;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Verification of models used to predict the size and shape of thermal plumes resulting from waste heat discharges from steam-electric power plants using submerged diffusers.
APPROACH: (1) Theoretical evaluations of existing models. (2) Testing of existing computer codes. (3) Measurements of thermal plumes at operating power plants (mostly on the Great Lakes) using submerged diffusers. (4) Physical (hydraulic) model studies of submerged diffusers. (5) Analyses of results.
RESULTS: Verified model(s) to predict the size and shape of thermal plumes resulting from submerged diffuser discharges.
PROJECT MILESTONES: (1) Completion of measurements 10/76. (2) Comparisons of models 9/77. (3) Final Reports 9/77.
KEYWORDS: DIFFUSER;THERMAL POWER PLANTS;THERMAL EFFLUENTS;DIFFUSION;MATHEMATICAL MODELS;FORECASTING;COMPUTER CODES;WATER

<095036>
TITLE: LMFBR Safety Program
PRINCIPAL INVESTIGATOR: Griffith, J.D.
ADDRESS: Energy Research and Development Administration, Germantown, MD 20767
AFFILIATION: Energy Research and Development Administration, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Reactor Development and Demonstration Division
MONITOR: Griffith, Jerry D.
TELEPHONE: F233-3424
77 FUNDING: Energy Research and Development Administration FY77:$52,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (75%);DEVELOPMENT/Laboratory scale (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective of the LMFBR Safety Program is to support future decisions regarding construction of demonstration or prototype breeder reactor plants and, ultimately, regarding the commercialization of the Breeder reactor. The supportive objectives are: To provide technical information on safety approaches so that LMFBR designers can make rational choices while considering cost, safety and performance. To provide analytical tools and data base for plant safety analysis of LMFBR's. To support LMFBR licensing applications. To develop risk assessment methodology tailored to LMFBR's. To reduce uncertainties in the LMFBR radiological dose and effects estimation. To complete the engineering, procurement and construction of new facilities (or facility modifications) that will provide the test environment for doing safety experiments.
APPROACH: The approach being used is a defense in depth approach. The first level addresses the prevention of accidents through the intrinsic features of the design of the plant and the quality, redundancy, testability, inspectability and foul-safe features of the components of the reactor and plant. The second level concerns providing protection against potential accidents through the use of reliable shutdown systems and devices that assure any such incident will be prevented, arrested, or accommodated safely. The third level supplements the first two through features which add margin in the plant design as additional assurance that protection to the public is provided even in the event of the occurrence of extremely unlikely and unforeseen circumstances.
RESULTS: A family of analytical models, computer codes, and experimental confirmation will be developed and documented for use by reactor designers, licensing authorities, and other interested parties to permit assessments of the safety of LMFBR's to be made.
PROJECT MILESTONES: To provide documentation of the status of safety technology for LMFBR's to reactor designers with sufficient technical information to ensure that the above objectives are met to the satisfaction of licensing and regulatory requirements with acceptable impact on plant cost and performance. Specific dates at which the technology data base will be developed and documented will be tied tc project schedules as they become available.
KEYWORDS: RISK ASSESSMENT;LMFBR TYPE REACTORS;REACTOR SAFETY;COMPUTER CODES;PLUTONIUM

Energy Research and Development Administration/Conservation AA

<096008>
TITLE: Technology Assessment of Alternative Transportation Fuels, Phase I
PROJECT NUMBER: E(04-3)-1115
PRINCIPAL INVESTIGATOR: Dickson, E.M.
ADDRESS: Stanford Research Institute, Menlo Park, Menlo Park, CA 94025
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Conservation, Division of Transportation Energy Conservation
MONITOR: Maxfield, Daniel P.
TELEPHONE: C(202)376-4616;F376-4616
TYPE OF FUNDING: Contract No.-EY-76-C-03-1115
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$396,000
TECHNOLOGY: FOSSIL FUEL/Coal (75%);FOSSIL FUEL/Oil and Gas (5%);FOSSIL FUEL/Oil Shale (20%)
ENERGY CYCLE: EXTRACTION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub x/ (5%);PARTICULATES (5%);SPECIFIED OTHER POLLUTANTS/Mined lands, water availability, socioeconomic, energy flow (90%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;COASTS/Alaska;HYDROGRAPHIC AREAS/Other hydrographic areas Colcrado and Upper Missouri Basins
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Characterize a large synfuels industry able to provide substantial (10 x 10/sup 6/ BPDE) substitutien for petroleum in 1980 - 2000 time frame, identify impacts critical to the achievement of that industrial capacity, and examine in detail those economic, social, environmental energetic (net energy) impacts that are crucial to constraining its growth. Recommend policy actions for mitigation of adverse impacts.
APPROACH: Technology assessment: standard systems analysis techniques, stakeholder analysis, critical impacts and, air quality/dispersion modeling, growth (population) modeling, scenario construction, capital formation of discounted cash flow analysis, net energy analysis, resource depletion/cost analysis, etc.
RESULTS: Know clearly what range of impacts constrain development of a significant industrial capacity for synfuels in the 1900-2000 time frame, evaluate mitigation strategies in terms of modifying rates of growth, scales of development, and potential siting configurations. Examine in detail the resource depletion/cost relationships to determine long-term viability of coal as a resource base for fuels.
PROJECT MILESTONES: (1) October 1976 Publish Phase I final report: Synthetic Liquid Fuels Development: Assessment of Critical Factors ERDA 76-129. (2) May 1977 Publish Phase II: ERDA 76-129/3: ''Regionalized Industry Social Impact Coal Resource Depletion, and 76-129/4: Energy/Economic Comparison of Coal-Based Automotive Energy Supply Systems.'' (3) December 15, 1975 ''Impact of Alternative Fuels Development - A Technology Assessment'', Michigan State University, Bozeman, Montana. (4) December 16, 1976 ''Impact of Alternative Fuels Development - A Technology Assessment'', University of Montana, Missoula, Montana. (5)

June 13 - 17, 1976 Homestead Inn, Glen Arbor, Michigan: "The Future of Alternative Fuels-Impacts and Options" (Federal research review). (6) September 13-14, 1976, Billings, Montana (same title) (public review).
KEYWORDS: SYNTHETIC FUELS;ENVIRONMENTAL EFFECTS;ENERGY CONSUMPTION;ENERGY DEMAND;FORECASTING;INDUSTRY;TECHNOLOGY TRANSFER;TECHNOLOGY ASSESSMENT

<096009>
TITLE: Electric Car Impact Assessment
PROJECT NUMBER: E(04-3)-1180
PRINCIPAL INVESTIGATOR: Hamilton, W.F.
ADDRESS: P. O. Box 3587, Santa Barbara, CA 93105
AFFILIATION: General Research Corp., Santa Barbara, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Conservation, Division of Transportation Energy Conservation
MONITOR: Maxwell, Daniel P.
TELEPHONE: C(202)376-4616;F376-4616
TYPE OF FUNDING: Contract No.-EY-76-C-03
77 FUNDING: Energy Research and Development Administration FY77:$365,000
TECHNOLOGY: CONSERVATION/End use (30%);CONSERVATION/Improved conversion efficiency (50%);CONSERVATION/Energy storage (20%)
ENERGY CYCLE: TRANSPORTATION (20%);STORAGE (20%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%);ELECTRICAL TRANSMISSION (20%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/;NOXIOUS GAS/NO/sub x/ (50%);ORGANICS/HC (20%);SPECIFIED OTHER POLLUTANTS/Energy impacts (30%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) 1974-75: EPA-originated impacts analysis of utilizing electric cars in LA. (2) 1975: impacts on St. Louis and Philadelphia. Examined air quality, energy economics for different technologies (batteries and vehicles) or different driving cycles, for varying quantities of electric cars. (3) 1976-78: Impacts on Honolulu, characterizing many battery technologies, improve air quality analysis and apply to national level. Complete commercialization analysis. Examined opportunity/risk, institutional factors, incentives and material aspects of electric and hybrid vehicle commercialization. Input to PL-413, Sec. 13 reports to Congress.
APPROACH: Future case-study approach examining particular cities in assessing air quality, economic and energy benefits of using electric cars. Some diffusion modeling, scenario construction, engineering economics and systems analysis. National level methodology developed. Marketing/incentives analysis.
RESULTS: Understand how useful electric cars may be in improving air quality and reducing fuel consumption, especially petroleum. Begin to decide which vehicle/battery/performance characteristics are optimal for which benefit/risk combinations, and how these may be ultimately manufactured and sold.
PROJECT MILESTONES: (1) 1974 Publish Los Angeles study. (2) 1975 Publish St. Louis and Philadelphia studies. (3) 1976 Publish national level methods, Honolulu study and improved characterization. (4) 1977 Workshop on electric car feasibility. (5) 1977 Publish full national analysis and release report to Congress. (6) 1978 Publish summary findings and commercialization analysis.
KEYWORDS: EMISSIONS;COMMERCIALIZATION;ELECTRIC-POWERED VEHICLES;AUTOMOBILES;ENVIRONMENTAL EFFECTS;ELECTRIC BATTERIES;ENERGY STORAGE SYSTEMS;TECHNOLOGY ASSESSMENT;AIR QUALITY;ENERGY CONSERVATION;TRANSPORTATION SYSTEMS;FEASIBILITY STUDIES;ECONOMICS;NOISE

Energy Research and Development Administration/Planning & Analysis AA

<097001>
TITLE: Energy Model Data Base
PRINCIPAL INVESTIGATOR: Hoffman, K.C.
ADDRESS: Upton, NY
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Planning, Analysis and Evaluation, Office of Analysis
MONITOR: Pechan, E.H.
TELEPHONE: C(202)376-9417
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: FOSSIL FUEL/General (20%);NUCLEAR/General (20%);GEOTHERMAL/General (20%);SOLAR/General (20%);CONSERVATION/General (20%)
ENERGY CYCLE: EXTRACTION (16%);COMBUSTION IN SITU (12%);TRANSPORTATION (12%);STORAGE (12%);PROCESSING, CONVERSION (12%);COMBUSTION OR END USE (12%);ELECTRICITY GENERATION (12%);ELECTRICAL TRANSMISSION (12%)
POLLUTANTS: NOXIOUS GAS (16%);METALS (16%);PARTICULATES (20%);ORGANICS (16%);RADIATION (16%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (16%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Develop capability to exercise on selected set of environmental analysis tools to be applied to selected energy-related issues. Models and/or data sources include the Energy Model Data Base, Energy System Network Simulator, and Regional Projection System.
APPROACH: Data development, model development, policy analysis.
RESULTS: Various computer generated outputs, reports, etc.
KEYWORDS: EMISSIONS;AIR;WATER;COMPUTER CODES;CHEMICAL EFFLUENTS;ENVIRONMENT

<097005>
TITLE: Rural Climatological Dispersion Model
PRINCIPAL INVESTIGATOR: Thurston, G.
ADDRESS: 9190 Red Branch Road, Columbia, MD 21045
AFFILIATION: Hittman Associates, Inc., Columbia, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Analysis, Office of Planning, Analysis and Evaluation
MONITOR: Pechan, E.H.
TELEPHONE: C(202)376-9417
TYPE OF FUNDING: Contract No.-EX-77-C-03-1296
77 FUNDING: Energy Research and Development Administration FY77:$19,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Montana
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This is a modified version of the Climatological Dispersion Model. This version can process data for rural as well as urban airsheds. Inputs are taken from source-specific emission inventories.
APPROACH: Air quality diffusion models.
RESULTS: Computer-generated outputs as specified by the user, including preparation of isopleths.
KEYWORDS: EMISSIONS;AIR;COMPUTER CODES;DIFFUSION;CLIMATES;MATHEMATICAL MODELS;CHEMICAL EFFLUENTS

<097006>
TITLE: Toxic Pollutant Data Development
PRINCIPAL INVESTIGATOR: Mendis, M.
ADDRESS: 9190 Red Branch Road, Columbia, MD 21045
AFFILIATION: Hittman Associates, Inc., Columbia, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Analysis, Office of Planning, Analysis and Evaluation
MONITOR: Pechan, E.H.
TELEPHONE: C(202)376-9417
TYPE OF FUNDING: Contract No.-EX-77-C-03-1296
77 FUNDING: Energy Research and Development Administration FY77:$69,000
TECHNOLOGY: FOSSIL FUEL/General (20%);FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (10%);FOSSIL FUEL/Oil and Gas (5%);FOSSIL FUEL/Oil Shale (5%);NUCLEAR/Fission Converters (20%);GEOTHERMAL/General (20%);SOLAR/General (20%)
ENERGY CYCLE: EXTRACTION (16%);COMBUSTION IN SITU (12%);TRANSPORTATION (12%);STORAGE (12%);PROCESSING, CONVERSION (12%);ELECTRICITY GENERATION (12%);ELECTRICAL TRANSMISSION (12%);WASTE MANAGEMENT (12%)
POLLUTANTS: NOXIOUS GAS (20%);METALS (20%);PARTICULATES (20%);ORGANICS (20%);RADIATION (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Specify present and emerging energy technologies with respect to discharges of toxic and trace element materials. This data is being integrated into the Energy Model Data Base and will be available for a variety of analysis purposes.
APPROACH: Literature review.
RESULTS: Energy model data base format.
KEYWORDS: EMISSIONS;AIR;WATER;COMPUTER CODES;CHEMICAL EFFLUENTS

<097007>
TITLE: Explore Governmental and Industry Interfaces Concerning Socioeconomic Impacts and Plan a Conference
PRINCIPAL INVESTIGATOR: Gilmore, J.
ADDRESS: University Park, Denver, CO 80210
AFFILIATION: Denver Research Inst., Colo. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Planning, Analysis and Evaluation
MONITOR: Burton, E.S.
TELEPHONE: F376-9417
77 FUNDING: Energy Research and Development Administration FY77:$50,000
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest
PROJECT DESCRIPTION: (1) Surveying existing institutions for mitigating impacts and existing institution constraint and preparing a discussion paper. (2) Planning the organization of a conference to address the issues.
KEYWORDS: SOCIO-ECONOMIC FACTORS;USA;PLANNING;MEETINGS;ORGANIZING;INDUSTRY;SOCIAL IMPACT;ECONOMIC IMPACT;EVALUATION;ENVIRONMENTAL IMPACTS

<097008>
TITLE: Handbook for Private Sector Involvement in Mitigating Socioeconomic Impacts
PRINCIPAL INVESTIGATOR: Frankel, M.L.
ADDRESS: Suite 465, 1120 Connecticut Avenue, NW, Washington, DC 20036
AFFILIATION: Centaur Management Consultants, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Planning, Analysis and Evaluation
MONITOR: Pechan, E.H.
TELEPHONE: F376-9417
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: The purpose of the project is to define and illustrate the types of aid which communities can expect from energy developers, including utilities, private companies, government, and co-ops.
RESULTS: The output of the project will be an action handbook to provide guidance for local officials. The

chapters of the report will be I--Introduction; II--Community Plan; III--Evaluation of Public Sector Mitigation Options; IV--Evaluation of Private (Corporate) Mitigation Options; V--Strategy Development; and VI--Cas Studies.
KEYWORDS: COMMUNITIES;PLANNING;INDUSTRY;PLANNING;SOCIO-ECONOMIC FACTORS;PUBLIC UTILITIES;MANUALS;EVALUATION;ENERGY SOURCE DEVELOPMENT;HUMAN POPULATIONS

<097009>
TITLE: Socio-Economic Impact of the ERDA Gaseous Diffusion Plant Expansion (Portsmouth, Ohio)
PRINCIPAL INVESTIGATOR: Stacey, G.S.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Energy Research and Development Administration, Oak Ridge, Tenn. (USA). Oak Ridge Operations Office
MONITOR: Peitzsch, F.C.
TELEPHONE: F850-4391
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: GENERAL SCIENCE (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest
PROJECT DESCRIPTION: This is a major study of the social and economic impacts from the construction of a large add-on gaseous diffusion uranium enrichment plant near Portsmouth, Ohio.
APPROACH: The principal emphasis is on determination of potential financial impacts to the local political entities in the event that they would need to supply new or additional public services. Among these services being studied are: housing, transportation, education, health care, water, sewer, police and fire protection, and recreation.
RESULTS: Teams are currently meeting with representatives in these areas and preparing baseline descriptive information.
KEYWORDS: PORTSMOUTH GASEOUS DIFFUSION PLANT;CONSTRUCTION;ENVIRONMENTAL IMPACTS;SAFETY;SOCIAL IMPACT;ECONOMIC IMPACT;PUBLIC HEALTH;OHIO;COMMUNITIES;URANIUM;ISOTOPE SEPARATION;ENERGY MODELS;SIMULATION;LAND USE;HUMAN POPULATIONS;POPULATION DYNAMICS

<097010>
TITLE: Evaluation of Effectiveness of Nontechnological Component to Project Weatherization
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Conservation Research and Technology
MONITOR: Collins, L.
TELEPHONE: F376-4711
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: CONSERVATION/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: A project will be conducted in cooperation with CSA and FEA to evaluate the effectiveness of building an educational/motivational component into Project Weatherization, a multi-million dollar effort to improve the energy efficiency of low income homes through physical modifications.
KEYWORDS: WEATHERSTRIPPING;THERMAL INSULATION;HOUSES;EVALUATION;MODIFICATIONS;ENERGY CONSERVATION;ENERGY EFFICIENCY;INCOME;ECONOMICS;SOCIOLOGY;EDUCATION;PUBLIC OPINION;BEHAVIOR

<097011>
TITLE: Strategies to Assist Occupants of Public Housing to Conserve Energy
PRINCIPAL INVESTIGATOR: Annis, A.P.
ADDRESS: 1100 Glendon Avenue, Los Angeles, CA 90024
AFFILIATION: Annis (Arthur P.) and Associates, Inc., Los Angeles, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Conservation Research and Technology
MONITOR: Collins, L.
TELEPHONE: F376-4711
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: CONSERVATION/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: A combination of behavioral strategies to assist residents of public housing to save energy such as provision of educational information, feedback and group decisionmaking has been tested by the Atlanta Housing Authority.
APPROACH: Arrangement will be made with another housing authority to further refine and test optimal approach. Effectiveness will be carefully documented and the most successful ''packaged'' for transfer to other housing authorities in cooperation with HUD.
KEYWORDS: SOCIO-ECONOMIC FACTORS;ENERGY CONSERVATION;RESIDENTIAL SECTOR;INFORMATION;EDUCATION;DECISION MAKING;PUBLIC OPINION;BEHAVIOR;ATLANTA;HUMAN POPULATIONS

<097012>
TITLE: Psychological Strategies to Reduce Energy Consumption
PRINCIPAL INVESTIGATOR: Seligman, C.
ADDRESS: Center for Environmental Studies, Princeton, NJ 08540
AFFILIATION: Princeton Univ., N.J. (USA). Center for Environmental Studies
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Research and Technology
MONITOR: Collins, L.
TELEPHONE: F376-4711
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: CONSERVATION/General (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: Application of behavioral science theory and findings to the task of assisting consumers to utilize energy more efficiently offers significant potential for energy savings.
APPROACH: In FY 1976, a contract was initiated with Princeton University psychologists to begin to test promising strategies which are not dependent upon technology and which might later be utilized on a large scale. The major effort of the first year was a feedback experiment conducted in the planned unit development of Twin Rivers, NJ, which indicated that provision of information to homeowners about their household energy consumption can be an effective means of encouraging reduction in consumption for both

heating and cooling. In FY 77 Princeton will further develop the feedback strategy, including testing a ''money meter.''
KEYWORDS: ENERGY CONSERVATION;INFORMATION;SOCIO-ECONOMIC FACTORS;RESIDENTIAL SECTOR;EDUCATION;PUBLIC OPINION;ENERGY EFFICIENCY;ENERGY CONSUMPTION;SPACE HEATING;AIR CONDITIONING;NEW JERSEY;EXPERIMENT PLANNING;HUMAN POPULATIONS;BEHAVIOR;CONSUMPTION RATES;MODIFICATIONS

<097013>
TITLE: Energy Conservation Technology Education Program
PRINCIPAL INVESTIGATOR: Webber, I.
ADDRESS: 1736 M. Street, NW, Washington, DC 20036
AFFILIATION: League of Women Voters Education Fund, Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Buildings and Community Systems
MONITOR: Wrabel, M.M.
TELEPHONE: F376-4708
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: CONSERVATION/General (100%)
PROJECT DESCRIPTION: The League of Women Voters, through its Education Fund, will manage a pilot project to educate residential consumers on energy conservation applications.
APPROACH: Three to four of the League's local chapters will be chosen to participate in this project. This audience will be reached in four ways: (1) through public meetings on energy-conservation techniques; (2) through ''how-to'' clinics or do-it-yourself installation of energy-conserving features in the dwelling; (3) through a local clearinghouse to which individuals can come to get information; and (4) through publicity campaigns to promote all of the above. Findings will be reported at the 6-month point and at the conclusion of the 12-month contract.
RESULTS: The final report will serve as a model for developing and managing other energy conservation activities directed toward this consumer audience.
KEYWORDS: EDUCATION;ENERGY CONSERVATION;SIMULATION;RESIDENTIAL SECTOR;HOUSES;INFORMATION;ENERGY MODELS;MANAGEMENT;ENERGY CONSUMPTION;ENERGY EFFICIENCY;SOCIO-ECONOMIC FACTORS;BEHAVIOR

<097014>
TITLE: Energy Systems for Islands
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Conservation Research and Technology
MONITOR: Monetta, D.J.
TELEPHONE: F376-4605
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Site specific Guam
PROJECT DESCRIPTION: Establish a planning model applicable to all semi-remote (rural areas, islands, etc.) regions using the island of Guam as a model.
KEYWORDS: ISLANDS;ENERGY SOURCES;SOCIO-ECONOMIC FACTORS;ENERGY CONSERVATION;DECISION MAKING;ENERGY MODELS;RURAL AREAS;GUAM

<097015>
TITLE: Strategy/Economic Analyses on Transition From Oil and Gas to Alternate Fuels in Energy Conversion Devices
PRINCIPAL INVESTIGATOR: Shipman, H.B.
ADDRESS: Alexandria, VA
AFFILIATION: Sante Fe Corp., Alexandria, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Conservation Research and Technology
MONITOR: Burnett, W.
TELEPHONE: F376-4943
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: This study contains the tasks necessary to develop and implement an analytical methodology for use by CONRT management in program strategy formulation. Santa Fe, under previous contract to ERDA, developed the strategy concept of a smooth transition from oil and gas to alternate fuels in conversion devices. An analytical methodology will be developed which allows any development effort to be measured or evaluated in terms of its contribution to accomplishing this strategy.
APPROACH: To accomplish the above objective, three specific tasks will be undertaken. The first task is an economic evaluation of the impact of energy efficiency on industrial productivity. The second task consists of the actual methodology development. The final task in this effort will consist of the application of the methodology developed in Task 2 to the CONRT program.
KEYWORDS: ECONOMICS;MANAGEMENT;ENERGY CONSERVATION;SIMULATION;ENERGY MODELS;PETROLEUM;NATURAL GAS;EVALUATION;ENERGY EFFICIENCY;INTERCHANGEABILITY;ENERGY CONVERSION;INDUSTRY;ENERGY SOURCES

<097016>
TITLE: Analysis of the Role of Energy Storage Power Systems in National Transportation
PRINCIPAL INVESTIGATOR: O'Connell, L.G.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Energy Storage Systems
MONITOR: Pezdirtz, G.F.
TELEPHONE: F376-4884
77 FUNDING: Energy Research and Development Administration FY77:$600,000
TECHNOLOGY: GENERAL SCIENCE (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: This study's objective is to analyze the role of energy storage devices in future transportation systems.
APPROACH: Assess the ability of storage technologies to meet power systems requirements of future vehicles as well as investigate the potential socio-economic impact derived from the use of transportation energy

storage power systems.
RESULTS: The study will conclude with R and D program recommendations.
KEYWORDS: ENERGY STORAGE SYSTEMS;TRANSPORTATION SYSTEMS;SOCIO-ECONOMIC FACTORS;ENERGY CONSERVATION;TRANSPORTATION SECTOR;SYSTEMS ANALYSIS;EVALUATION;DECISION MAKING;RECOMMENDATIONS;PLANNING;ENERGY MODELS

<097017>
TITLE: R and D Project Evaluation
PRINCIPAL INVESTIGATOR: Kennedy, A.S.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Energy Storage Systems
MONITOR: Pezdirtz, G.F.
TELEPHONE: F376-4884
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: R and D Project Evaluation will establish a uniform framework to estimate and evaluate the commercial potential of energy storage systems as well as societal benefits realized from federal R and D investments in storage technologies.
APPROACH: Techniques will be developed to incorporate estimates of storage systems' market size and penetration rates with their technical success probability. By converting both benefits and costs into present values, R and D Project Evaluation will provide decision-makers with methods to maximize the returns from public investments in storage R and D.
KEYWORDS: EVALUATION;ENERGY MODELS;USA;SYSTEMS ANALYSIS;SIZE;COST BENEFIT ANALYSIS;DECISION MAKING;INVESTMENT;ENERGY STORAGE;SOCIO-ECONOMIC FACTORS;TRANSPORTATION SYSTEMS;ENERGY STORAGE SYSTEMS;ENERGY CONSERVATION;TRANSPORTATION SECTOR

<097018>
TITLE: Assessment of Impacts of Energy Production on Local, Regional and National Scales-Energy Related Regional Studies Program
PRINCIPAL INVESTIGATOR: Hoover, L.J.;Buffington, J.D.;Bright, R.;Krohm, G.;Habegger, L.;Hubb, K.;Wolsko, T.;Lundy, R.
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$1,500,000
TECHNOLOGY: FOSSIL FUEL/General (25%);CONSERVATION/General (25%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
KEYWORDS: DECISION MAKING;COAL INDUSTRY;COAL;SAFETY;SOCIO-ECONOMIC FACTORS;USA;WASTE MANAGEMENT;WATER RESOURCES;REGIONAL ANALYSIS;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL IMPACTS

<097019>
TITLE: Social Impact Method Evaluation: Pacific Northwest Plants
PRINCIPAL INVESTIGATOR: Schuller, C.R.;Merwin, D.J.;Goodnight, J.A.
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
REGIONS OF INTEREST: COASTS/Far West
PROJECT DESCRIPTION: Proposes that western sites be studied to examine the validity and generalizability of the impact assessment methodology under development. A second major objective is to identify and develop ways of measuring unique western regional problems which may have been overlooked or inadequately conceptualized in the assessment procedures devised to date. A third objective is to document social impacts actually experienced at impact areas in a representative mature energy site in the west.
KEYWORDS: SOCIAL IMPACT;ECONOMIC IMPACT;USA;ENERGY SOURCE DEVELOPMENT;ENERGY MODELS;POPULATION DYNAMICS;PLANNING;ENVIRONMENTAL IMPACTS;ENERGY SOURCES;MATHEMATICAL MODELS

<097020>
TITLE: Assessment of Social Values in Thermal Plant Siting
PRINCIPAL INVESTIGATOR: Fox, J.C.;Burnham, J.B.
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: The objective of this project is the development of methodology for concisely assessing the environmental, social and economic impacts of thermal power plant site and design alternatives on the potentially affected community.
APPROACH: The methodology incorporates procedures for making technical estimates on several criteria of impact including health/safety, aesthetics, air quality, economics, water quality, cultural/recreational opportunities and characteristics, and plant/animal life.
RESULTS: The methodology, when operational will provide a basis for decision making on power plant site and design options, supplementing the present adversarial mode of resolving environmental, social and economic conflicts.
KEYWORDS: COMMUNITIES;HUMAN POPULATIONS;THERMAL POWER PLANTS;ENVIRONMENTAL IMPACTS;DESIGN;SITE SELECTION;EVALUATION;LAND USE;SOCIO-ECONOMIC FACTORS;TECHNOLOGY ASSESSMENT;WATER QUALITY;CORRELATIONS;DECISION MAKING;ENERGY MODELS;SIMULATION;WASTE MANAGEMENT;SAFETY;AIR QUALITY

<097021>
TITLE: Social-Community Infrastructure
PRINCIPAL INVESTIGATOR: Ulrickson, G.U.;Copenhaver, E.D.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Coal regions
PROJECT DESCRIPTION: A hard-copy resource collection with accompanying computerized bibliography is proposed to provide the broad information base needed to assess the coal-related community and cultural infrastructure for the National Coal Assessment Program.
APPROACH: A background study has been performed and areas of emphasis determined. This resource collection will be housed in the Environmental Resource Center, Information Center Complex, Oak Ridge National Laboratory, and will be available to research personnel through the Resource Center. Areas of emphasis include: (1) relevant models for community infrastructure and boom town predictors; (2) methodology for including the ''human factor'' into the equations used to analyze cost-benefit relationships of energy-producing systems on the community infrastructure; (3) social and cultural effects of competing technologies of strip mining and deep mining; and (4) socio-cultural aspects of coal-mining communities.
KEYWORDS: COMMUNITIES;COAL DEPOSITS;DATA COMPILATION;COAL INDUSTRY;BIBLIOGRAPHIES;SOCIO-ECONOMIC FACTORS;ENVIRONMENTAL IMPACTS;ENERGY SOURCE DEVELOPMENT;ENERGY MODELS;RECOMMENDATIONS;COST BENEFIT ANALYSIS;COAL MINING;TECHNOLOGY ASSESSMENT;WATER RESOURCES;WASTE MANAGEMENT;SAFETY;SIMULATION;INFORMATION NEEDS;FORECASTING

<097022>
TITLE: Measurement and Analysis of Subjective Judgements Concerning Energy Development
PRINCIPAL INVESTIGATOR: Duffield, R.B.
ADDRESS: Los Alamos Scientific Laboratory, Los Alamos, NM
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest
PROJECT DESCRIPTION: Preparation and mailing of an open-ended questionnaire to a selected subset of the population. Correlation of subjective expectations with demographic variables. Consonance analysis of varying opinion response patterns. Establish weighted comparability of subjective impact judgments.
KEYWORDS: ENERGY SOURCE DEVELOPMENT;COAL INDUSTRY;OIL SHALE INDUSTRY;NATURAL GAS INDUSTRY;PETROLEUM INDUSTRY;POPULATION DYNAMICS;PUBLIC OPINION;LAND USE;WATER RESOURCES;WASTE MANAGEMENT;SOCIO-ECONOMIC FACTORS;ENVIRONMENTAL IMPACTS;DECISION MAKING

<097023>
TITLE: Social Impacts of Coal and Nuclear
PRINCIPAL INVESTIGATOR: Peelle, E.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
MONITOR: Fulkerson, W.
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: (1) Attitude survey: what are the correlates of support and opposition to power plant construction and operation. (2) Economic/demographic analysis: what changes in major population characteristics can be attributed to the generating facility. (3) Institutional arrangements: have there been any unique inter- or intra-governmental cooperative arrangements designed to solve problems or facilitate administration of problems specific to the facility sites. (4) Labor force/housing/services: how have labor force requirements for construction and operation been met. (5) Licensing permits: what are the state and local licenses or permits which are required for construction and operation. (6) Mitigation: what is the nature and scope of impact mitigation programs; how do these programs originate; and how lasting is their effect upon the community.
KEYWORDS: PUBLIC OPINION;FOSSIL-FUEL POWER PLANTS;NUCLEAR POWER PLANTS;SOCIAL IMPACT;POPULATION DYNAMICS;PLANNING;ECONOMIC IMPACT;LAND USE;GOVERNMENT POLICIES;LICENSING;SAFETY;COAL INDUSTRY

<097024>
TITLE: Economic and Energy Patterns
PRINCIPAL INVESTIGATOR: Bjornstad, D.J.;Kerley, C.R.;Rice, P.L.;Vogt, D.P.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/South
PROJECT DESCRIPTION: Concerned with the effects of alternative strategies for increased coal utilization on regional socio-economic and energy patterns and processes in the south. Work is part of the DBER-supported National Coal Assessment and covers: (1) national/census region energy and economic scenarios and (2) technology characterizations.
KEYWORDS: ENERGY;COAL;COAL INDUSTRY;SOCIO-ECONOMIC FACTORS;TECHNOLOGY UTILIZATION;USA;ENERGY CONSUMPTION;TECHNOLOGY ASSESSMENT;ENVIRONMENTAL IMPACTS;EMPLOYMENT;ENERGY SOURCE DEVELOPMENT;CONSUMPTION RATES

<097025>
TITLE: Population Futures about Coal Sites
PRINCIPAL INVESTIGATOR: Richey, P.N.;Loebl, A.S.
ADDRESS: Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: Population futures provide a base from which to develop estimates of the futures of likely health impacts, of labor force availability, and of housing, energy, and service demands about specific sites. To provide a population project model which yields total population futures and futures in age and sex detail at the subcounty level and which will enable planners and evaluators to project population while varying assumptions about future growth patterns. The population futures are inputs into evaluation programs on-going at ORNL.
KEYWORDS: POPULATION DYNAMICS;EVALUATION;COAL INDUSTRY;FORECASTING;USA;SOCIO-ECONOMIC FACTORS;ENERGY SOURCE DEVELOPMENT;PUBLIC HEALTH;LABOR;AVAILABILITY;SIMULATION;HUMAN POPULATIONS;HEALTH HAZARDS

<097026>
TITLE: Development and Maintenance of the LBL Socioeconomic Environmental Demographic Information System
PRINCIPAL INVESTIGATOR: Quong, C.
ADDRESS: Lawrence Berkeley Laboratory, Berkeley, CA
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESULTS: This proposal addresses the need to maintain and expand information and software not otherwise accessible to ERDA in an effort to provide better data management techniques for very large data bases and techniques for making this information available to other ERDA researchers.
KEYWORDS: INFORMATION SYSTEMS;MAINTENANCE;POPULATION DYNAMICS;SOCIO-ECONOMIC FACTORS;ENVIRONMENTAL EFFECTS;USA;LAWRENCE BERKELEY LABORATORY;TECHNOLOGY ASSESSMENT;ENERGY ANALYSIS;DATA ACQUISITION;DATA COMPILATION;COMPUTER CODES;PROGRAMMING;ENERGY;ENVIRONMENTAL IMPACTS;HUMAN POPULATIONS;LEGAL ASPECTS

<097027>
TITLE: IVEP Geothermal: Socioeconomic Assessment
PRINCIPAL INVESTIGATOR: Mendelsohn, M.L.;Morimoto, E.
ADDRESS: Lawrence Livermore Lab., Livermore, CA
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$600,000
TECHNOLOGY: GEOTHERMAL/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Far West
PROJECT DESCRIPTION: Impact Analysis of Imperial Valley Geothermal Development Issues/Problems: characterize and define the existing fiscal, electrical-energy, economic and social regimes of Imperial County.
APPROACH: Identify and characterize other county-level areas which have received major impact related to energy development, and for which sufficient information exists to compare historical trends. Analyze each detailed problem area identified in Task 4 and assess the impact of geothermal development on each.
RESULTS: Complete an assessment of the impact of geothermal energy development on the social, fiscal, and economic structure of Imperial County as a function of each identified development scenario.
KEYWORDS: IMPERIAL VALLEY;GEOTHERMAL FIELDS;CALIFORNIA;SOCIO-ECONOMIC FACTORS;ENERGY SOURCE DEVELOPMENT;COMPARATIVE EVALUATIONS;ENVIRONMENTAL IMPACTS;LAND USE

<097028>
TITLE: Assessment of Energy Development on Indian Lands
PRINCIPAL INVESTIGATOR: Kolstad, C.
ADDRESS: Los Alamos, NM
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
PROJECT DESCRIPTION: The purpose of this project is to assist ERDA to ensure the timely development of energy-related resources on Indian lands while preserving social, cultural and environmental values and providing economic development.
KEYWORDS: AMERICAN INDIANS;ENERGY SOURCE DEVELOPMENT;USA;SOCIO-ECONOMIC FACTORS;PLANNING;LAND USE;EMPLOYMENT;PUBLIC HEALTH;ENVIRONMENTAL IMPACTS;TECHNOLOGY ASSESSMENT

<097029>
TITLE: Programmatic Environmental Impact Statement, Synthetic Fuels Commercialization Program
PRINCIPAL INVESTIGATOR: Williams, M.
ADDRESS: 3026 Sansom Street, Philadelphia, PA 19104
AFFILIATION: Mitre Corp., Philadelphia, Pa. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Environmental and Socio-economic Programs
MONITOR: Lobe, N.
TELEPHONE: F375-9086
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (75%);GENERAL SCIENCE (25%)

CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
APPROACH: The socio economic component of this EIS utilizes an empirically based methodology for assessing, at the programmatic level, the socio economic impacts resulting from major synthetic fuels technologies with emphasis on fossil fuels. The study focuses on impacts in representative counties.
KEYWORDS: ENVIRONMENTAL IMPACT STATEMENTS;COMMERCIALIZATION;SYNTHETIC FUELS;LEGAL ASPECTS;SOCIOLOGY;SOCIO-ECONOMIC FACTORS;USA;COAL INDUSTRY;PETROLEUM INDUSTRY;OIL SHALE INDUSTRY;NATURAL GAS INDUSTRY;BIOMASS;AMERICAN INDIANS;WATER RESOURCES;SIMULATION;ENERGY SOURCE DEVELOPMENT;LAND USE

<097030>
TITLE: Rocky Mountain Regional Studies
ADDRESS: Los Alamos, NM
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Los Alamos Scientific Lab., N.Mex. (USA)
DIVISION: Los Alamos Scientific Laboratory
MONITOR: Duffield, R.B.
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$600,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southwest
PROJECT DESCRIPTION: Objective of the social and economic part of the study is how can a ''National Laboratory'' respond to the needs of federal energy planners but, also, serve local and regional planners. Socio-economic data will be needed on investment and labor costs in both the energy development activities and secondary effects in community and supporting services.
APPROACH: The data base task will accept socio economic impact inputs and make them accessible for modeling activities. Existing environmental and economic models will be extended and applied and integrated into the Regional Assessment Model.
KEYWORDS: ROCKY MOUNTAIN REGION;REGIONAL ANALYSIS;PLANNING;LABOR;COST;ENERGY MODELS;SIMULATION;SOCIO-ECONOMIC FACTORS;ENERGY SOURCE DEVELOPMENT;COMMUNITIES;AMERICAN INDIANS

<097031>
TITLE: Information as a Function of Plant Size and Criteria Appropriate for Optimum Plant Mix for a Synthetic Fuel Information Program
PRINCIPAL INVESTIGATOR: Nesbitt, D.M.
ADDRESS: Menlo Park, CA 94025
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Commercialization Policy
MONITOR: Bickel, H.G.
TELEPHONE: C(202)376-4153
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
PROJECT DESCRIPTION: The objective of this contract is to develop a framework for selecting from among a set of commercial demonstration plant proposals.
APPROACH: Specifically, the study seeks to answer the following questions: what should the mix of technologies be; for each technology, what should be the size and location of the plants.
KEYWORDS: EMPLOYMENT;LAND USE;WATER RESOURCES;DEMONSTRATION PROGRAMS;TECHNOLOGY ASSESSMENT;SIZE;SITE SELECTION;SYNTHETIC FUELS;ENERGY SOURCE DEVELOPMENT;SOCIO-ECONOMIC FACTORS;ENERGY MODELS;SIMULATION;USA;COMMERCIALIZATION;OIL SHALE INDUSTRY;OIL SHALES;GASIFICATION;DECISION MAKING;ROCKY MOUNTAIN REGION;OPTIMIZATION

<097032>
TITLE: TECNET (Transportation Energy Conservation Network)
PRINCIPAL INVESTIGATOR: Meyer, R.
ADDRESS: 7655 Old Springhouse Road, McLean, VA 22101
AFFILIATION: International Research and Technology Corp., McLean, Va. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Transportation Energy Conservation
MONITOR: Patterson, P.
TELEPHONE: C(202)376-4616
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: CONSERVATION/General (75%);GENERAL SCIENCE (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: This project will develop methods to look also at the indirect petroleum and energy consumption associated with manufacturing vehicles, producing fuels, building and maintaining transportation systems, and other related activities.
APPROACH: The direct plus indirect energy used by a given technology is the net energy. This project will use the dynamic INFORUM input-output model of the U.S. economy (as extended by EPA and Resources of the Future) to project inter-industry transactions associated with an exogenously supplied level of GNP out to the year 2025.
KEYWORDS: ENERGY MODELS;ENERGY CONSERVATION;NET ENERGY;GROSS NATIONAL PRODUCT;TRANSPORTATION SECTOR;TRANSPORTATION SYSTEMS;EMPLOYMENT;ECONOMICS;COMPUTER CODES;EVALUATION;SOCIAL IMPACT;INDUSTRY;FUELS;PRODUCTION;ENERGY CONSUMPTION;VEHICLES;CONSTRUCTION;MANUFACTURING;USA;I CODES

<097033>
TITLE: Institutional Aspects of Energy Centers
INCIPAL INVESTIGATOR: Kloman, E.H.
ADDRESS: 1225 Connecticut Avenue, NW, Washington, DC 20036
AFFILIATION: National Academy of Public Administration, Washington, D.C. (USA). Panel on Institutional Aspects of the Energy Centers Concept
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Nuclear Research and Applications
MONITOR: Savage, W.F.
TELEPHONE: C(301)353-5402
TYPE OF FUNDING: Grant No.
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (25%);NUCLEAR/General (25%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/Far West
PROJECT DESCRIPTION: This is a jointly funded program by FEA and ERDA. Its objective is to investigate the institutional problems which are foreseen relative to the implementation of energy centers with emphasis on intergovernmental relations and sociopolitical issues and to develop recommendations as to actions (legislative or other) to solve such problems.
APPROACH: Although the initial phase of the study will be generic in nature, study emphasis will be based on two sites in different states selected by NAPA and approved by ERDA and FEA (Pennsylvania and Washington).
RESULTS: The output of the investigation will be a report presenting the recommendations with backup papers relative to the various issues studied.
KEYWORDS: LEGAL ASPECTS;GOVERNMENT POLICIES;SOCIAL IMPACT;LEGISLATION;PENNSYLVANIA;WASHINGTON;EMPLOYMENT;SOCIO-ECONOMIC FACTORS;LAND USE;PLANNING;COAL;NUCLEAR POWER PLANTS;CO-GENERATION;TOTAL ENERGY SYSTEMS;FOSSIL-FUEL POWER PLANTS;ENERGY FACILITIES;IMPLEMENTATION;MANAGEMENT

<097034>
TITLE: National Coal Utilization Assessment/Local Socioeconomic Sensitivity Analysis
PRINCIPAL INVESTIGATOR: Stenehiem, E.J.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
DIVISION: EES DIvision
MONITOR: Hoover, L.J.
TELEPHONE: F388-5135
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
PROJECT DESCRIPTION: The objective of this study is to determine the sensitivity of local socioeconomic impacts to different types and levels of coal development and to variations in pre-impact economic, demographic, and geographic characteristics of the local impact areas in our 1207-county region.
APPROACH: By assessing the relative socioeconomic impacts across technologies and among alternative local areas, these factors can be considered directly in the siting and technology-mix choices facing national energy officials.
KEYWORDS: ARKANSAS;OKLAHOMA;HUMAN POPULATIONS;COAL INDUSTRY;SOCIO-ECONOMIC FACTORS;POPULATION DYNAMICS;COMMUNITIES;TECHNOLOGY UTILIZATION;ENERGY SOURCE DEVELOPMENT;REGIONAL ANALYSIS;SITE SELECTION;LAND USE;SOLID WASTES;TECHNOLOGY ASSESSMENT;ENVIRONMENTAL EFFECTS;PUBLIC HEALTH;EMPLOYMENT;MANAGEMENT

<097035>
TITLE: National Coal Utilization Assessment/Evaluation of Impact Mitigation and Management Policies
PRINCIPAL INVESTIGATOR: Stenehiem, E.J.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Argonne National Lab., Ill. (USA)
DIVISION: EES Division
MONITOR: Hoover, L.J.
TELEPHONE: F388-5135
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
PROJECT DESCRIPTION: The objective of this study is to evaluate alternative short- and long-term impact mitigation (or facilitation) strategies for dissimilar impact areas. In the long run communities and counties have a multitude of options to consider. These include: (1) using coal development to expand industrial development; (2) increasing infrastructure for their residents by shifting costs to consumers; (3) reducing taxes to residents by reallocating coal revenues; and (4) establishing trusts to redress social and environmental changes.
KEYWORDS: ENERGY POLICY;ARKANSAS;OKLAHOMA;LAND USE;PLANNING;COMMUNITIES;COAL INDUSTRY;ENERGY SOURCE DEVELOPMENT;COST;TAXES;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;GROWTH;USA;TECHNOLOGY ASSESSMENT;EVALUATION

<097036>
TITLE: Socio-economic Impacts Associated with Conservation Projects
RINCIPAL INVESTIGATOR: Dionigi, D.
ADDRESS: North West, Richland, WA
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Building and Community Services
MONITOR: Hock, J.
TELEPHONE: F376-4708
TYPE OF FUNDING: Contract No.

77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: CONSERVATION/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: To establish an analytical approach to collect and analyze data for specific energy conservation activities within the industrial, building and community service sectors, and determine the secondary impact of Federal program investments.
KEYWORDS: DATA ACQUISITION;HUMAN POPULATIONS;ENERGY MODELS;USA;ENERGY CONSERVATION;PLANNING;EVALUATION;INVESTMENT;BUDGETS;ECONOMIC IMPACT;INDUSTRY;COMMUNITIES;ENERGY CONSUMPTION;CONSTRUCTION INDUSTRY;SOCIAL IMPACT;EMPLOYMENT;WATER RESOURCES;SOLID WASTES

<097037>
TITLE: Energy Planning and Design, Guidelines for the New Alaska Capital
ADDRESS: Richland, WA
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Building and Community Services
MONITOR: Sewell, L.
TELEPHONE: F202-376-4717
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: CONSERVATION/General (25%);GENERAL SCIENCE (75%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Alaska
PROJECT DESCRIPTION: Integrate energy conservation technologies into the master plan for proposed new state capital.
APPROACH: Analysis will be made of the economic, social, institutional and technical tradeoffs to establish planning and design guidelines. For these analyses, sets of alternatives will be recommended along with cost/benefits of each. The deliverable will provide the methodology for energy planning and design guidelines for new communities using existing technologies.
KEYWORDS: RECOMMENDATIONS;COST BENEFIT ANALYSIS;ENERGY CONSERVATION;DESIGN;ENERGY ANALYSIS;ALASKA;ENERGY SUPPLIES;LEGAL ASPECTS;MANAGEMENT;PUBLIC UTILITIES;SOCIO-ECONOMIC FACTORS;COMMUNITIES;DECISION MAKING;PLANNING;ENERGY MODELS

<097038>
TITLE: Organizational Approaches to Energy Related Growth
PRINCIPAL INVESTIGATOR: Bailly, H.C.
ADDRESS: 1750 K St., NW, Washington, DC
AFFILIATION: Resource Planning Associates, Inc., Washington, D.C. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Building and Community Systems
MONITOR: Gillan, K.J.
TELEPHONE: F202-376-4819
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$300,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
PROJECT DESCRIPTION: The purpose of this contract is to develop organizational approaches for dealing with energy related growth. This research was an outgrowth of growing awareness that rapid development of domestic energy resources can create numerous problems for reaching communities. The following objectives therefore were put forth: (1) To determine the energy related problems of rapid community development in the U.S. (2) To identify and draw up on existing European and U.S. institutional solutions that would be applied to problems of energy related growth. (3) To test the feasibility of implementing these solutions in the U.S.
KEYWORDS: ORGANIZING;ENERGY SUPPLIES;GROWTH;ENERGY SOURCE DEVELOPMENT;COMMUNITIES;CONSTRUCTION;EUROPE;USA;IMPLEMENTATION;FEASIBILITY STUDIES;ECONOMICS;SOCIAL IMPACT;LEGAL ASPECTS

<097039>
TITLE: Comprehensive Community Energy Planning and Management
PRINCIPAL INVESTIGATOR: Bernstein, H.
ADDRESS: Columbia, MD
AFFILIATION: Hittman Associates, Inc., Columbia, Md. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Building and Community Systems
MONITOR: Sewell, I.
TELEPHONE: F202-376-4717
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$1,500,000
TECHNOLOGY: CONSERVATION/General (75%);GENERAL SCIENCE (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: The major objective of this contract is to develop energy conservation planning methodologies which can be placed at the disposal of selective communities for demonstration and testing during FY 1978.
APPROACH: An analytical tool will be developed capable of balancing energy and uses with the various energy distribution modes. The contractor will describe this analytical procedure in a mathematical format suitable for computerization for Phase II of this contract effort. As a result of numerous requests for technical assistance by communities to engage in community energy planning, this activity will explore approaches for optimizing energy consumption within the community.
KEYWORDS: ENERGY CONSERVATION;PLANNING;USA;COMMUNITIES;DEMONSTRATION PROGRAMS;ENERGY MODELS;ENERGY BALANCE;ENERGY ANALYSIS;COMPUTER CODES;ENERGY CONSUMPTION;OPTIMIZATION;SOCIAL IMPACT;ECONOMIC IMPACT

<097040>
TITLE: Design of a Methodology to Analyze Second Order Environmental and Economic Impact of Energy Conserving Technology
PRINCIPAL INVESTIGATOR: Deonigi, D.
ADDRESS: Northwest, Richland, WA
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Planning, Analysis and Evaluation
MONITOR: Hock, J.
TELEPHONE: C(202)376-4708
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: CONSERVATION/General (50%),GENERAL SCIENCE (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: Establish an analytical approach to allocate available research, development, and demonstration funds with a greater knowledge in ultimate economic, environmental and social benefits to the United States. There exists a need within the Buildings and Industry Section to induce greater rigor in the dispersion of available funds to achieve desirable levels of energy conservation. This need can be met by: (1) developing an analytical approach, (2) utilizing the approach in analyzing specific projects, and (3) recommending investment in Federal programs.
KEYWORDS: USA;SOCIO-ECONOMIC FACTORS;CONSTRUCTION INDUSTRY;ENERGY CONSERVATION;PLANNING;ENERGY MODELS;ENVIRONMENTAL IMPACTS;BUDGETS;INVESTMENT;SIMULATION

<097041>
TITLE: CRBRP Environmental Studies
PRINCIPAL INVESTIGATOR: Roll, J.
ADDRESS: Pittsburgh, PA
AFFILIATION: Westinghouse Electric Corp., Pittsburgh, Pa. (USA). Environmental Systems Dept.
MONITORING AGENCY: Clinch River Breeder Reactor Plant Project Office, Oak Ridge, Tenn. (USA)
DIVISION: CRBRP Project Office
MONITOR: Buhl, A.
TELEPHONE: F854-8420
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Far West
KEYWORDS: ENVIRONMENTAL ASSESSMENT;USA;LAND USE;ECONOMICS;REGIONAL ANALYSIS;ENVIRONMENT;SOCIO-ECONOMIC FACTORS

<097042>
TITLE: Society Interaction Assessment of CRBRP
PRINCIPAL INVESTIGATOR: Stansburg, E.E.
ADDRESS: Knoxville, TN
AFFILIATION: Tennessee Univ., Knoxville (USA)
MONITORING AGENCY: Clinch River Breeder Reactor Plant Project Office, Oak Ridge, Tenn. (USA)
DIVISION: CRBRP Project Office
MONITOR: Buhl, A.
TELEPHONE: F854-8420
TYPE OF FUNDING: Grant No.
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast
KEYWORDS: ENVIRONMENTAL ASSESSMENT;USA;LAND USE;ECONOMICS;REGIONAL ANALYSIS;ENVIRONMENT;SOCIO-ECONOMIC FACTORS

<097043>
TITLE: Analysis of Public Perception Related to Nuclear Fuel Cycle Activities
PRINCIPAL INVESTIGATOR: Schuller, C.R.
ADDRESS: Seattle, WA
AFFILIATION: Battelle Human Affairs Research Center, Seattle, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Waste Management, Production and Reprocessing
MONITOR: Spurgeon, D.
TELEPHONE: C353-4729
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: NUCLEAR/General (50%);GENERAL SCIENCE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: This task will provide an overview of public perceptions and concerns relating to nuclear fuel cycle activity.
KEYWORDS: NUCLEAR FUELS;FUEL CYCLE;HEALTH HAZARDS;PUBLIC OPINION

<097044>
TITLE: Transportation of Radioactive Materials
PRINCIPAL INVESTIGATOR: Schuller, C.R.
ADDRESS: Seattle, WA
AFFILIATION: Battelle Human Affairs Research Center, Seattle, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Waste Management, Production and Reprocessing
MONITOR: Spurgeon, D.
TELEPHONE: C353-4729
TYPE OF FUNDING: Contract No.
77 FUNDING: Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: NUCLEAR/General (100%)

CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
PROJECT DESCRIPTION: This work focuses strictly on the transportation issues which would be related to materials being shipped to and shipped from reprocessing plants.
KEYWORDS: NUCLEAR FUELS;SPENT FUELS;TRANSPORT;PUBLIC OPINION;FUEL REPROCESSING PLANTS;HEALTH HAZARDS

Energy Research and Development Administration/EPA Pass Thru to ERDA (AES)

<098001>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals--Effects of Environmental Pollutants on the Development of the Immune Response
PROJECT NUMBER: 004001
PRINCIPAL INVESTIGATOR: Jaroslow, B.N.
ADDRESS: 9700 S. Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$125,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Coal Conversion liquefaction (25%);FOSSIL FUEL/Oil Shale (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS/Hydrocarbons (80%);RADIATION/Hydrocarbons (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the effects of an environmental carcinogenic pollutant, benz(a)pyrene, on develcpment of cellular and humoral immunity. This program will provide information related to resistance to disease and carcinogenesis in populations exposed to this agent.
APPROACH: Mice will be treated with benz(a)pyrene at identificable stages in development of immune competence. The treatment will be in utero, perinatal, and postnatal. Their immune competence will be assayed both in vitro and in vivo to determine the rate of post-treatment development and the level of immunccompetence reached in comparison to untreated mice. This pollutant will be given at dose levels and frequencies to simulate industrial or environmental exposure.
RESULTS: I will identify the relative sensitivity to benz(a)pyrene of different stages in development of immune competence. In addition, I will determine the levels of frequency exposure that result in altered development or capacity of the immune response. I will then relate these changes to susceptibility to infection and carcinogenesis.
PROJECT MILESTONES: (1) Develop assay procedures and begin description of developmental stages of the immune response. 7/31/76. (2) Set up and begin treatment of experimental animal groups. 7/31/77/ (3) Continue the original protocol and add new groups as indicated by results of ongoing experiments. 7/31/78. (4) Continue as before and publish the results of the research project as appropriate. 9/30/78.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;HEALTH HAZARDS;ANIMAL CELLS;IMMUNOLOGY;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;BIOLOGICAL RECOVERY;TOXICITY;MICE;ANTIBODIES;COAL INDUSTRY;PETROLEUM INDUSTRY;IN VIVO;BENZOPYRENE;IMMUNE REACTIONS;AGING;CARCINOGENS

<098011>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals - Evaluation of the Tumorigenic Enhancing Potential in Liver of Polycyclic Aromatic Hydrocarbons
PROJECT NUMBER: 004011
PRINCIPAL INVESTIGATOR: Peraino, C.
ADDRESS: Division of Biological and Medical Research, Argonne National Laboratory, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS/Benz(a)anthracene/benzo(a)pyrene (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the applicability of the procedure for studying tumorigenic enhancement in rat liver as a screening procedure for testing fossil fuel combustion by-products (such as polycyclic aromatic hydrocarbons) for tumorigenic enhancing activity.
APPROACH: Rats are fed the liver carcinogen, 2-acetylaminofluorene (AAF), for 2.5 weeks. The test substances are then fed throughout the experimental period and tumor incidences in these rats are compared with that in rats given only the limited AAF treatment. Effects of the test substances on liver size and DNA synthesis are also compared. The first hydrocarbon to be tested is benz(a)anthracene.
RESULTS: Relative tumorigenic enhancing abilities of different energy-related pollutants will be estimated and correlated with their relative effects on liver DNA synthesis and liver size. An evaluation of the procedure as a method for screening pollutants for enhancing activity will be possible.
PROJECT MILESTONES: (1) Assessment of benzanthracene tumorigenic enhancing ability 12/30/76. (2) Initiate

tumorigenic enhancing study with bence pyrene 3/30/77. (3) Begin examinations for tumors 4/15/76. (4) Progress report on benz(a)anthracene study 8/1/76. Decision as to whether to test second hydrocarbon or modify test procedure to increase sensitivity.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;HEALTH HAZARDS;ANIMALS;NEOPLASMS;LIVER;ETIOLOGY;AIR POLLUTION;LAND POLLUTION;BENZOPYRENE;FOSSIL FUELS;RATS;COMBUSTION PRODUCTS;DNA;SYNTHESIS;BIOCHEMISTRY;CARCINOGENS

<098012>
TITLE: Detection and Characterization of Damage in Physiological, Cellular, and Molecular Systems; Chemical and Molecular Interactions of Toxic Pollutants with Biological Molecules
PROJECT NUMBER: 004012
PRINCIPAL INVESTIGATOR: Danyluk, S.S.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (70%);GENERAL SCIENCE (30%)
ENERGY CYCLE: COMBUSTION IN SITU (20%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (40%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/ (30%);METALS/Cadmium;METALS/Mercury;METALS/Beryllium;METALS/Arsenic (50%);ORGANICS/Benzanthracene;ORGANICS/Benzpyrene (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This study is concerned with providing fundamental information on damage production in key biological molecules by toxic pollutants at molecular levels. Among specific objectives are an identification of putative target sites on susceptible biomolecules, definition of chemical and conformational properties predisposing biomolecules to damage, and a correlation of toxicant properties with biological reactivity. Interactions of primary interest are those involving constituents from two key target sites, cell membranes and nucleic acids, and several classes of fossil fuel toxicants, nitrogen and sulfur oxides, and trace metals, protonic acids, and polycyclic hydrocarbons.
APPROACH: A two-fold approach involving investigation of chemical reactivity and structural properties will be employed. Reaction products of nucleic acid and membrane constituents with toxic pollutants (trace metals, aromatic carcinogens) will be prepared by bio-organic synthetic methods, and their chemical and structural properties confirmed by analytical and spectroscopic measurements. Detailed conformational studies are planned for all product molecules following magnetic resonance measurements (H-1, C-13) and computational procedures developed for nucleic acids.
RESULTS: Results of this study are expected to give an insight into reaction products of toxic effluents from fossil fuel combustion with nucleic acids and membrane constituents. Specifically, we expect to identify nucleic acid-trace metal covalent bonding interactions and the influence of these on structural and hydrogen-bonding properties of nucleic acids. Similar results are expected for nucleic acid-aromatic carcinogen systems. For membranes information will be developed on the dynamical motional properties of constituents as they are affected by trace metal and carcinogen incorporation.
PROJECT MILESTONES: (1) Isolation, chemical and structural characterization of nucleic acid-trace metal (Hg, Cd, Be) adducts 12/30/77. (2) Completion of study of heavy metal perturbations of bilayer membrane structure 9/30/78. (3) Chemical and structural characterization of complexes between nucleotides and aromatic carcinogens 6/30/77.
KEYWORDS: BENZANTHRACENE;BENZOPYRENE;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;HEALTH HAZARDS;NITROGEN OXIDES;SULFUR OXIDES;CADMIUM;MERCURY;BERYLLIUM;ARSENIC;TOXICITY;BIOPHYSICS;BIOCHEMISTRY;BIOCHEMICAL REACTION KINETICS;PHYSIOLOGY;MOLECULAR BIOLOGY;CHEMICAL EFFLUENTS;DNA;MEMBRANES

<098020>
TITLE: Labeled Molecules as Probes of Acute Pollutant Effects
PROJECT NUMBER: 004020
PRINCIPAL INVESTIGATOR: Wolf, A.P.
ADDRESS: Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Weyzen, W.W.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$77,000
TECHNOLOGY: FOSSIL FUEL/General (90%);GEOTHERMAL/General (10%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (10%);ORGANICS (80%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: We propose to develop methods to probe subtle changes in enzyme levels, modification of cell transport, destruction or modification of binding sites in vivo using non-invasive techniques so that acute changes which may lead to more serious chronic changes in humans can be assessed at very early stages of exposure to these body function-altering materials. The classes of compounds for intended study are hydrocarbons, compounds formed by the photooxidation of hydrocarbons from auto exhaust in the presence of nitric oxide (photochemical smog; such as formaldehyde, peroxyacetyl nitrate, acrolein, etc.), certain organometallics and the oxides of nitrogen. Incomplete combustion of hydrocarbon-containing fuels such as gasoline and oil and incomplete combustion of coal lead to a variety of organic and organometallic

compounds.
KEYWORDS: LABELLED COMPOUNDS;ORGANIC COMPOUNDS;ORGANOMETALLIC COMPOUNDS;RADIOACTIVATION;CATABOLISM;METABOLISM;HEALTH HAZARDS;HYDROCARBONS;NITRIC OXIDE;EXHAUST GASES;COAL;COMBUSTION PRODUCTS;GASOLINE;OILS;COAL INDUSTRY;PETROLEUM INDUSTRY;CARBON 13;CARBON 14;CARBON 11;ANIMALS;IN VIVO;LUNGS;TISSUES

<098023>
TITLE: Effects of Potentially Hazardous Agents Associated with Coal and Oil Shale Technologies on DNA Damage and Its Repair
PROJECT NUMBER: 4023
PRINCIPAL INVESTIGATOR: Setlow, R.B.
ADDRESS: Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);FOSSIL FUEL/Oil and Gas (10%);FOSSIL FUEL/Oil Shale (50%)
ENERGY CYCLE: EXTRACTION (30%);COMBUSTION IN SITU (30%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (20%)
POLLUTANTS: NOXIOUS GAS (40%);ORGANICS (30%);RADIATION (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The biological effects of physical and chemical mutagens and carcinogens, in all systems studied including man, depend to a great extent on the abilities of cells to repair DNA damage. Cells that are defective in one of the repair pathways are more sensitive to killing, mutation, and transformation. The chemicals associated with new energy technologies may be hazardous by themselves or may exacerbate the effects of already existing environmental hazards. Our goal is to evaluate these hazards.
APPROACH: We shall compare the amounts or excision and postreplication repair in bacterial and mammalian cells treated with combinations of chemical agents and UV radiation so as to determine whether they act independently, additively and synergistically. The effects of primarily volatile agents on protein function and conformation will be measured in terms of their effects (a) on purified repair enzymes acting in vitro, and (b) on the conformation of well characterized proteins by x-ray and neutron diffraction studies and by spectroscopic analyses. The latter work will suggest the mode of action of such compounds on other enzymes.
RESULTS: The results will give quantitative estimates of the chemical hazards in terms of UV damage. The latter has been well quantitated at the molecular and cellular levels and there exist good animal data for UV damage as well as extensive data for the effects on UV on the United States population.
PROJECT MILESTONES: (1) July 1977 Interaction between two known carcinogens will have been measured. (2) July 1978 Effect of inert gases on protein conformation will have been determined.
KEYWORDS: EXCISION;POSTREPLICATION REPAIR;COAL INDUSTRY;OIL SHALE INDUSTRY;HEALTH HAZARDS;CHEMICAL EFFLUENTS;SYNERGISM;ULTRAVIOLET RADIATION;BIOLOGICAL EFFECTS;BIOLOGICAL REPAIR;BACTERIA;MAMMALS;ANIMAL CELLS;BIOCHEMICAL REACTION KINETICS;DNA REPLICATION

<098024>
TITLE: Damage of DNA Synthesis by Trace Metals and Hydrocarbons
PROJECT NUMBER: 004024
PRINCIPAL INVESTIGATOR: Popenoe, E.A.
ADDRESS: Medical Department, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/General (10%);MULTITECHNOLOGY (70%);GENERAL SCIENCE (20%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: METALS (90%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The burning of fossil fuels, particularly coal, releases into the atmosphere a number of metals in the particulate discharge. Several of these have been implicated in carcinogenesis or mutagenesis. The goal of this project is to determine whether or not physiological concentrations of these metals will interfere with the action of the DNA polymerases, either by inhibiting them or by causing errors in transmission of the genetic message.
APPROACH: Using in vitro test systems, the ability of the various trace metals to inhibit the incorporation of radioactive deoxynucleotides into DNA by the principal DNA polymerases of human tissues will be measured. (Most metal ions will inhibit at sufficiently high concentrations.) By varying the concentrations of metal, template-primer, substrate, and required co-factors, the manner in which a metal exerts its effect will be determined and dissociation constants calculated. Similarly, using synthetic polynucleotide models of DNA, the ability of the metals to promote incorporation of incorrect bases will be measured.
RESULTS: This project is expected to yield quantitative knowledge of the effects of trace metals on the kinetic parameters of the DNA polymerase reaction. With this information, one will be able to calculate the tissue concentration of a metal which should cause concern with regard to DNA replication.
PROJECT MILESTONES: (1) September 30, 1976 Human polymerase alpha preparation to be injected into animals. Studies in avian erythrocyte nuclei to begin. (2) January 1, 1977 Studies on inhibitory action of antipolymerase beta to be completed.
KEYWORDS: AIR POLLUTION;COAL INDUSTRY;GASEOUS WASTES;ENVIRONMENTAL EFFECTS;HEALTH HAZARDS;CHROMIUM;COPPER;LEAD;NICKEL;TITANIUM;VANADIUM;TOXICITY;CHROMOSOMAL ABERRATIONS;MAN;CARCINOGENESIS;ANIMALS;GENETICS;HYDROCARBONS;SYNERGISM;AIR;DNA;METALS

<098025>
TITLE: Chemical Screening Test for Hydrocarbon Carcinogicity/Mutagenicity Using EPR
PROJECT NUMBER: 004025
PRINCIPAL INVESTIGATOR: Borg, D.C.
ADDRESS: Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (70%);GENERAL SCIENCE (30%)
ENERGY CYCLE: COMBUSTION IN SITU (5%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (65%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH (80%);DEVELOPMENT/Laboratory scale (20%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To develop information about putative free radical reactions involved in the molecular and cellular damage reactions of carcinogenic/mutagenic polyaromatic hydrocarbons and other organic pollutants derived from fossil-fueled energy conversion and utilization processes. (2) To use spin-label methods to provide a rapid measure of DNA binding of enzymatically activated test compounds as a cheap and easy prescreening assay for carcinogenic/mutagenic potential of pollutants.
APPROACH: (1) Continuous-flow reactors designed at BNL for EPR at Q band are used in a two-stage mixer version to detect and identify short-lived free radical addition compounds of nitroquinoline oxide, benz(a)pyrene, dimethylbenzanthracene, and other hydrocarbon derivatives with nucleic acids and their components. (2) Specifically spin-labeled test oligonucleotides will be synthesized to test binding of enzymatically activated test compounds which need not be individually prelabelled. It is anticipated that saturation-transfer (fast-passage EPR spectroscopy, ENDOR or ELDOR) will be needed to detect changes in spin-label motion with the large molecular complexes that will be used.
PROJECT MILESTONES: (1) Completion of EPT/flow facility for testing reactions of carcinogen free radicals: December 1976. (2) Test reactions of nitroquinoline oxide and benz(a)pyrene derivatives with DNA components: June 1977. (3) Extension to other carcinogen classes: December 1977. (4) Synthesis of appropriate spin labels: December 1977. (5) Evaluation of EPR/flow method as a predictor of DNA binding: June 1978. (6) Spin label tests with oligonucleotides and polynucleotides: June 1978. (7) Effects of activating enzyme systems on the spin-label assay: December 1978. (8) Final evaluation of spin-label method as a carcinogen/mutagen prescreen: June to October, 1978.
KEYWORDS: HYDROCARBONS;HEALTH HAZARDS;FOSSIL FUELS;METABOLISM;MUTAGENESIS;CARCINOGENESIS;RADICALS;RADIOACTIVATION;DNA;DIAGNOSTIC TECHNIQUES;LABELLED COMPOUNDS;BIOLOGICAL INDICATORS;BIOCHEMICAL REACTION KINETICS;CARCINOGENS;ANIMAL CELLS

<098030>
TITLE: Multi-Mode Scanning Electron Microscopic Analysis of Individual Pollutant Particles in Lung
PROJECT NUMBER: 004030
PRINCIPAL INVESTIGATOR: Hayes, T.L.
ADDRESS: Donner Laboratory, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (40%)
POLLUTANTS: NOXIOUS GAS (5%);PARTICULATES (90%);RADIATION (5%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the applicability of several advanced modes of scanning electron microscope operation (characteristic x-ray, cathodoluminescence, secondary electrons) to studies of the morphology and chemistry of energy related particulates and their effect of airways, lung macrophages and pulmonary lymph nodes.
APPROACH: A systematic study of each scanning electron microscope analytic mode will be made and the effectiveness of the SEM compared with electron probe and mass spectrometry methods. Materials will be lung tissue and leaf surfaces following exposure to selected atmospheric environments.
RESULTS: The results should indicate the most effective instrumentation and preparative methodologies for the study of lung surfaces by these techniques. Overall advantages for elemental mapping and rapid scanning of deposited particles can be estimated.
PROJECT MILESTONES: (1) 1 Nov. 1977 Determination of elemental distribution in lung macrophages and pulmonary lymph nodes by x-ray SEM completed. Effectiveness of this technique should be well determined. (2) 15 Jan. 1978 High resolution low temperature specimen facilities on new SEM should be operating at a level to produce true freeze-fracture in live time while viewing in SEM. (3) 1 June 1978 High voltage electron microscopy of lung sections completed and results compared to the scanning electron microscope data on this tissue.
KEYWORDS: LUNGS;ELECTRON MICROSCOPY;AIR POLLUTION;AEROSOLS;HEALTH HAZARDS;PATHOLOGICAL CHANGES;SEPARATION PROCESSES;ENVIRONMENT;X RADIATION;ION SPECTROSCOPY

<098033>
TITLE: Toxic Air Pollutants: Lung Disease
PROJECT NUMBER: 004033
PRINCIPAL INVESTIGATOR: Jones, H.B.
ADDRESS: 459 Donner Laboratory, University of California, Berkeley, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort

77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine the influence of the gaseous air pollutants, NO/sub 2/ and SO/sub 2/, on lung carcinogenesis including effects on latent time, stages in tumor induction and risk of tumors.
APPROACH: The influence of NO/sub 2/ and SO/sub 2/ on relationship of dose to latent time and to yield in urethan induction of mouse lung cancer will be studied. The base for latency is being refined by collecting data on tumor size vs. time in 600 mice treated with urethan. First NO/sub 2/ trials will be at 15 ppM for 48 hr, with pre- or post-exposure to urethan. The morphology of lung tissue affected by these agents is being studied with the scanning electron microscope to investigate the mechanism of carcinogenesis.
RESULTS: (1) Quantified cocarcinogenic effects of NO/sub 2/ and SO/sub 2/ with urethan in mouse lungs. (2) Determination of stages in the process of carcinogenesis. (3) Extension of the data base for our previcusly published hypothesis about the relation between dose and latent period in carcinogenesis.
PROJECT MILESTONES: Begin exposures of mice to NO/sub 2/ with pre- and post-exposure to urethan (7/1/76). (2) Complete counting and measuring of lung tumors from urethan latest period experiment; begin analysis of results (8/1/76). (3) Begin exposures of mice to SO/sub 2/ with pre- and post-exposure to urethan (9/1/76). (4) Begin exposures of mice to labeled SO/sub 2/ to determine distribution in respiratory tract (10/1/76). (5) Determine by SEM examination earliest carcinogenic changes in lung tissue (12/1/76). (6) Begin preliminary experiments with benzo(a)pyrene as cocarcinogen with NO/sub 2/ and SO/sub 2/ (1/1/77).
KEYWORDS: LUNGS;NEOPLASMS;AIR POLLUTION;HEALTH HAZARDS;NITROGEN DIOXIDE;SULFUR DIOXIDE;MICE;URETHANE;CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;CARCINOGENS;INHALATION;PATHOGENESIS

<098034>
TITLE: Chemical Mutagenesis and Carcinogenisis
PROJECT NUMBER: 004034
PRINCIPAL INVESTIGATOR: Tinoco, I. Jr.
ADDRESS: Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720
AFFILIATION: California Univ., Berkeley (USA). Lawrence Berkeley Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$310,000
TECHNOLOGY: FOSSIL FUEL/General (80%);GENERAL SCIENCE (20%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (20%);COMBUSTION OR END USE (40%)
POLLUTANTS: ORGANICS/Polycyclic aromatics and polyamines (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This research is aimed at understanding the interactions of chemical mutagens and carcinogens with mammalian cells. These interactions include metabolism of the compounds, binding to cellular macromolecules, and repair of chemically induced lesions.
APPROACH: The method of analysis in this project will be primarily spectroscopic but will also include isotope exchange studies, electron microscopy, polyacrylamide gel analysis of DNA structure, and DNA sequencing. The experiments with mammalian cells will be carried out in cell culture and will involve determining the metabolic products of polycyclic aromatic hydrocarbons in mouse epithelial cells. These products will be structurally characterized and their biological effects on the cells will be analyzed. These products will also be tested in the Ames chemical mutagen assay.
RESULTS: This project should give a better understanding of the mechanism(s) involved with chemical mutagenesis and carcinogenesis. From these findings will come more definitive estimates of the biological hazards involved with energy production through fossil fuels.
PROJECT MILESTONES: Initiate project, 1/10/77.
KEYWORDS: MUTAGENESIS;POLYCYCLIC AROMATIC HYDROCARBONS;HEALTH HAZARDS;DNA;BIOCHEMICAL REACTION KINETICS;CARCINOGENS;ANIMAL CELLS

<098047>
TITLE: Coordinate R and D Information and National Design and Develop and Maintain R and D Energy Files
PROJECT NUMBER: 004047
PRINCIPAL INVESTIGATOR: Abbott, R.P.
ADDRESS: Computations Department, Lawrence Livermore Laboratory, P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Cooper, R.D.
TELEPHONE: F233-3631
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (25%);DEVELOPMENT (25%);PRODUCTION (25%);ANALYTICAL (25%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To apply the available inventories of energy and environmentally related data bases and models to specific requirements of ERDA/DBER. Task 1 Establish cost effective technique for future data exchange and network capability. Task 2 Evaluate optimum system design for management of R and D data.
APPROACH: To survey the current computer science technology to accommodate the above-mentioned task. This includes: (1) large storage technologies for storage of large data bases; (2) the use of networks for access and storage of the data; (3) the computer processing requirements for processing this data; and (4) survey of data base technology. Employing available data bases of the National Index, selected subsets will be created and made available to user requirements by magnetic tape, over computer networks, and in hard copy.

RESULTS: Current Plans: (1) to develop major milestones for the gathering of data necessary to support the survey; (2) to develop guidelines for organization, storage, location, and access of data; and 93) to develop a guideline to help program the ability to determine potential valuable data.
KEYWORDS: ENERGY;DATA ACQUISITION SYSTEMS;RESEARCH PROGRAMS;DESIGN;INFORMATION;DATA;TECHNOLOGY ASSESSMENT;MANAGEMENT;COST;COMPUTER CODES

<098050>
TITLE: Lung Cell Injury and Repair After Inhalation Exposure to Particulate Acid Sulfate
PROJECT NUMBER: 004050
PRINCIPAL INVESTIGATOR: Halliwell, W.H.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, Murray
TELEPHONE: F233-3681
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$100,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (20%);PARTICULATES (80%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: These studies are designed to determine the nature of lung cell injury and the processes by which lung tissue recovers from damage resulting from exposure to energy-related pollutnats such as H/sub 2/SO/sub 4/ or acid sulfate particles.
APPROACH: Lungs of animals exposed by inhalation to sulfuric acid mist or ammonium sulfate will be evaluated using advanced morphological and histochemical methodology. Correlative light and electron microscopic studies will be done taking advantage of three basic methods of morphologic evaluation: (1) light microscopy, (2) transmission electron microscopy, and (3) scanning electron microscopy. Selected histochemical tests will also be performed. Tissues examined at different times post-exposure will provide information on the relative sensitivity of specific lung cell types, the nature of cell injury and the sequence of events leading to cell repair.
RESULTS: Initial results from animals exposed to acid sulfates and sulfuric acid mist will provide comparative information on the nature and sequence of cellular injury and repair. These data may be used to predict the human health impact associated with release of sulfur-containing materials and the need to control such emissions.
PROJECT MILESTONES: Initiation of single exposure to acid sulfate aerosols 1 October 1976. (2) Initial evaluation of specific cell response to acid sulfates 1 January 1977. (3) Initiation of repeated exposure to acid sulfates 1 January 1977. (4) Comparison of early effects from single or repeated exposure 1 June 1977. (5) Completion of repeated exposure to acid sulfates 1 January 1978 (6) Evaluation of cell repair following acid sulfate exposure 1 July 1978.
KEYWORDS: LUNGS;INJURIES;BIOLOGICAL REPAIR;INHALATION;AIR POLLUTION;HEALTH HAZARDS;SULFATES;AEROSOLS;SULFURIC ACID;BIOLOGICAL RECOVERY;PATHOLOGICAL CHANGES;ANIMAL CELLS;AMMONIUM SULFATES;PATHOGENESIS;TOXICITY

<098053>
TITLE: Effect of Acid Sulfate Particles and H/sub 2/SO/sub 4/ Mists on the Anti-Bacterial, Anti-Viral and Particle Clearance Mechanisms of Lung
PROJECT NUMBER: 004053
PRINCIPAL INVESTIGATOR: Hahn, F.F.
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AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, Murray
TELEPHONE: F233-3681
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES/Acid sulfates;PARTICULATES/H/sub 2/SO/sub 4/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Epidemiological studies have indicated an increased incidence of mortality from respiratory disease during periods of elevated sulfur oxide levels. Since laboratory studies have not shown SO/sub 2/ alone to significantly affect pulmonary clearance, this project will examine the effect of oxidation products of SO/sub 2/ on pulmonary clearance mechanisms. Specifically, acid sulfates such as zinc sulfate or zinc ammonium sulfate and sulfuric acid mist will be used.
APPROACH: Mice will be chronically exposed by inhalation to graded levels of sulfates ranging from ambient air concentrations to high concentrations. The pulmonary clearance mechanisms will be examined which include the removal of particles from the deep lung, ability to kill inhaled bacteria such as Staphylococcus aureus and the ability to survive a respiratory viral infection such as influenza.
RESULTS: The results will indicate whether or not acid sulfates do reduce the susceptibility of animals to pulmonary infections and thus whether they may be an important factor to measure and control in polluted air. In addition, their role in reducing clearance of particles from the deep lung may be an additive factor in assessing hazatds from toxic particulates.
PROJECT MILESTONES: (1) Initiation of particle clearance study, chronic exposure acid sulfates H/sub 2/SO/sub 4/ 1 October 1976. (2) Initiation of mycoplasma studies, chronic exposure H/sub 2/SO/sub 4/ 1 February 1977. (3) Initiation of influenza studies, chronic exposures H/sub 2/SO/sub 4/ 1 June 1977. (4) Initiation of particle studies, chronic exposures and sulfates 1 October 1977. (5) Initiation of mycoplasma studes, chronic exposures acid sulfates 1 Febuary 1978. (6) Initiation of influenza studies, chronic exposure acid sulfates 1 June 1978.
KEYWORDS: SULFATES;SULFURIC ACID;HEALTH HAZARDS;LUNG CLEARANCE;BIOCHEMICAL REACTION KINETICS;AEROSOLS;AIR POLLUTION;FOSSIL FUELS;ANIMALS;RESPIRATORY SYSTEM DISEASES;SULFUR DIOXIDE;OXIDATION;BACTERIA;VIRUSES

<098054>
TITLE: Cardiopulmonary Injury and Repair After Inhaling Acid Sulfate Aerosols
PROJECT NUMBER: 004054
PRINCIPAL INVESTIGATOR: Mauderly, J.L.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Schulman, Murray
TELEPHONE: F233-3681
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$175,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: PARTICULATES/Acidic sulfates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project will investigate the physiological and morphological alterations of the cardiopulmonary system resulting from chronic inhalation of environmentally relevant levels of acid sulfate aerosols known to be present in fossil fuel combustion effluents.
APPROACH: Guinea pigs will be exposed for one hour to atmospheres containing 0.1 and 1.0 mg/m/sup 3/ of 0.5 micron sulfuric acid and ammonium sulfate aerosols while breathing patterns and pulmonary mechanics are monitored. Dogs will then be similarly exposed and monitored as a species comparison and to characterize relatively sensitive and insensitive populations. Information thus obtained will be used to design studies in which dogs will be chronically exposed and serial, comprehensive physiological evaluation will be performed during exposure and after cessation of exposure.
RESULTS: The chronic exposure data will aid in defining risks incurred by continuous inhalation of low levels of sulfates, will yield information on the ability to recover from functional and structural alterations, and will serve as a pilot study for further low-level, chronic exposure studies.
PROJECT MILESTONES: (1) Completion of species comparison 3 Jan 1977. (2) Completion of individual sensitivity evaluation 1 April 1977. (3) Decision on chronic exposure protocol 1 June 1977. (4) Initiation of chronic dog exposures 1 Sept 1977. (5) 9 mo sacrifice, chronic dog exposures 1 June 1978. (6) 1 year sacrifice, chronic dog exposures 1 Sept 1978.
KEYWORDS: FOSSIL FUELS;COMBUSTION;CHEMICAL EFFLUENTS;SULFATES;AEROSOLS;INHALATION;BIOLOGICAL EFFECTS;GUINEA PIGS;RESPIRATORY SYSTEM;ANIMAL CELLS;MORPHOLOGICAL CHANGES;PATHOLOGICAL CHANGES;LUNGS;PATHOGENESIS;RESPIRATION

<098057>
TITLE: Development of Improved Generation Methods and Sizing Instruments for Fine Particles in Aerosols for Characterizing Inhalation Hazards
PROJECT NUMBER: 004057
PRINCIPAL INVESTIGATOR: Kanapilly, G.M.
ADDRESS: P.O. Box 5890, Albuquerque, NM 87115
AFFILIATION: Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex. (USA). Inhalation Toxicology Research Inst.
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$50,000; Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/SO/sub x/ (20%);METALS/Cadmium;METALS/Vanadium;METALS/Nickel;METALS/Manganese (40%);PARTICULATES/(NH/sub 4/)/sub 2/SO/sub 4/ (40%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS
PROJECT DESCRIPTION: The objective is to develop technology for the generation and characterization of 0.01 to 0.5 mu m diameter fine particle aerosols of (NH/sub 4/)/sub 2/SO/sub 4/, H/sub 2/SO/sub 4/, organic compounds or metal oxides.
APPROACH: Vapor phase reactions will be used for the production of fine particle aerosols. For (NH/sub 4/)/sub 2/SO/sub 4/ and H/sub 2/SO/sub 4/ direct mixing of reactants and for organic compounds photochemical reactions will be used. Metal oxide aerosols will be produced by vaporization of readily vaporizable forms of the metal followed by thermal degradation. The reliability of diffusion battery, high resolution electron microscopic technique and electrical aerosols size analyzor for fine particle aerosol spectrometer will be developed.
RESULTS: Methods will be developed for the production and characterization of fine particle aerosols suitable for detailed laboratory investigations and animal exposure studies designed to evaluate inhalation hazards associated with fossil fuel fired electrical generating stations. Although an important fraction of particulate pollutants released from fossil fueled electrical generating stations is likely to be of condensation aerosols of less than 0.5 mu m size, very little reliable information is available for evaluating the inhalation hazards associated with these fine particles.
PROJECT MILESTONES: (1) Fine particle aerosols of (NH/sub 4/)/sub 2/SO/sub 4/, photochemical organic chemicals and H/sub 2/SO/sub 4/ will be produced and studied 1/6/1977. (2) Evaluation of different methods and instruments for the size determination of fine particles will be completed 1/10/1977. (3) Development of general methods for the generation and characterization of fine particle aerosols of metal oxides will be completed 1/1/1978. (4) Fine particle aerosols of Cd, V, Ni, Mn, As, Se, Cr, and Pb will be generated and size and chemical characteristics studied 1/10/1978.
KEYWORDS: INSTRUMENTATION;AEROSOL GENERATORS;DESIGN;PARTICLE SIZE;AEROSOLS;AMMONIUM SULFATES;SULFURIC ACID;METALS;OXIDES;ORGANIC SULFUR COMPOUNDS;HEALTH HAZARDS;INHALATION;PRODUCTION

<098061>
TITLE: Evaluation of the Mechanisms of Energy-Related Toxic Agents on the Mammalian Hematopoietic System Using Flow Microfluorometric Analysis
PROJECT NUMBER: 004061
PRINCIPAL INVESTIGATOR: Steinkamp, J.A.
ADDRESS: Biophysics and Instrumentation Group (MS888), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS (10%);PARTICULATES (75%);ORGANICS (15%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (85%);DEVELOPMENT/Laboratory scale (15%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To evaluate the mechanisms of physical and chemical toxic agents associated with fossil fuel energy production of the mammalian hematopoietic system.
APPROACH: Apply newly developed automated flow-systems technology to measure the effects of exposure (inhalation) to toxic agents on hematopoiesis by analysis of peripheral blood cell numbers and types.
RESULTS: Based on detailed toxicological investigations, the severity of dose-damage relationships can be established, thus providing a basis for establishing guidelines for estimating risks to occupationally exposed populations and society-at-large.
PROJECT MILESTONES: (1) 1-8-75 Initiate program including selection of animals and the application of flow-systems technology to peripheral blood cell characterization. (2) 1-1-77 Begin development of analytical techniques for bone marrow cells. (3) 1-9-77 Initiate preliminary tests on animals exposed to oil shale dusts. (4) 1-6-78 Begin detailed toxicological studies on the hematopoietic system.
KEYWORDS: FOSSIL FUELS;CHEMICAL EFFLUENTS;HEALTH HAZARDS;MAMMALS;HEMATOPOIETIC SYSTEM;INHALATION;BIOLOGICAL EFFECTS;AIR POLLUTION;ENVIRONMENT;PATHOLOGICAL CHANGES;ANIMALS;BLOOD;ANIMAL CELLS;TOXICITY

<098062>
TITLE: Role of the Immune System in Experimental Chemical Toxicity and Carcinogenesis
PROJECT NUMBER: 004062
PRINCIPAL INVESTIGATOR: Smith, D.M.
ADDRESS: Mammalian Biology Group (MS880), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion gasification (20%);FOSSIL FUEL/Oil Shale (80%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);TRANSPORTATION (10%);STORAGE (10%);PROCESSING, CONVERSION (40%)
POLLUTANTS: METALS/Cadmium;METALS/Cobalt (10%);PARTICULATES/Oil shale (40%);ORGANICS/Hydrocarbons (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To study the basic immunofunction in animals during recovery from chemical insults and preceding and during carcinogenesis so that the immune system may be assessed in an intelligent fashion as a prophylactic or therapeuic measure in dealing with such health hazards to the human population.
APPROACH: Considerable effort was spent in selecting our animal model system for studying the effects of potential carcinogenic agents on the immune system, but it enables us to perform nine tests on a single animal to detect perturbations in specific lymphocyte numbers, functions, and interactions. Studies will shortly proceed to expose animals to known chemical carcinogens to establish base lines using this model system for its future use in work with other potentially hazardous agents in the environment.
RESULTS: Investigation of the role of the immune system during experimentally induced carcinogenesis may lead to results that could be applied to various disease states of man.
PROJECT MILESTONES: (1) FY 1976 Develop animal model for testing immunocompetence. (2) FY 1977 Utilize model to test the immunologic effects of known carcinogens. (3) FY 1978 and continuing: Utilize model for testing toxicity of oil shale products.
KEYWORDS: MUTAGENS;BIOLOGICAL EFFECTS;LABORATORY ANIMALS;IMMUNE REACTIONS;TOXICITY;CARCINOGENESIS;NEOPLASMS;CARCINOGENS;IMMUNOLOGY;TISSUES

<098063>
TITLE: Evaluation of the Dose-Effect Relationships for the Immune Response to Biologically Active Agents Associated with Coal Gasification Technology
PROJECT NUMBER: 004063
PRINCIPAL INVESTIGATOR: Cram, L.S.
ADDRESS: Biophysics and Instrumentation Group (MS888), Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (10%);FOSSIL FUEL/Coal Conversion gasification (35%);FOSSIL FUEL/Oil Shale (35%);GENERAL SCIENCE (20%)
ENERGY CYCLE: EXTRACTION (20%);COMBUSTION IN SITU (20%);PROCESSING, CONVERSION (40%);COMBUSTION OR END USE (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (34%);PARTICULATES (33%);ORGANICS (33%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (65%);DEVELOPMENT/Laboratory scale (35%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC

AREAS/Global;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To use the unique and rapid cell analysis and sorting instrumentation at the Los Alamos Scientific Laboratory to quantitate certain cellular aspects of the human immune response to specific hazardous agents generated by coal gasification and oil shale production technologies.
APPROACH: Flow microfluorometry (FMF) is currently being used to provide a sensitive means for measuring lymphocyte stimulation in vitro before and after addition of specific and nonspecific mitogens. It is proposed to extend this work to determine the dose-effect relationship of lymphocytes to undergo immunostimulation following in vivo (animal model systems) and in vitro exposure to specific hazardous agents. Second, macrophage ingestion of specific nonnuclear particulate matter will be quantitated. The subsequent effect on the ability of such a macrophage to participate in its role of immunostimulation will be determined on a per cell basis using rapid cell-analysis techniques.
RESULTS: It is anticipated that these studies will provide information relating to defense mechanisms of the immune response (i.e., the role suppression plays in this most important response to hazardous agents).
PROJECT MILESTONES: (1) 1-1-76 Report on initial technique development. (2) 7-1-76 Animal sensitization under way; lymphocyte stimulation measurements initiated. (3) 1-1-77 Review developments pertaining to automated assay development anad its suitability for evaluating immune system damage.
KEYWORDS: COAL GASIFICATION;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;CELL CULTURES;IMMUNE REACTIONS;ANIMAL CELLS;IMMUNOLOGY;INHALATION;MEDICINE;MINING;MAN;ENVIRONMENT;POLLUTION

<098066>
TITLE: Effects of Hazardous Agents Associated with Coal and Oil Shale Extraction, Conversion or Utilization on Cell-Cycle Kinetics and On Chromatin/Chromosome Structure
PROJECT NUMBER: 4066
PRINCIPAL INVESTIGATOR: Tobey, R.A.
ADDRESS: Cellular and Molecular Biology Group, Health Division, Los Alamos Scientific Laboratory, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Stapleton, George E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Coal Conversion liquefaction (25%);FOSSIL FUEL/Oil Shale (25%)
ENERGY CYCLE: EXTRACTION (10%);COMBUSTION IN SITU (10%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (30%);METALS (50%);ORGANICS (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the effects that known energy production-related toxicants have on the growth and metabolism of cultured mammalian cells.
APPROACH: Emphasis is placed on agents which are known to have acute toxic effects at a certain dose but whose effects at subacute levels are not defined and for which increased understanding of cellular and molecular effects will facilitate a determination of risk posed by exposure to such subacute levels.
RESULTS: Cadmium has been selected as an agent of interest in this context.
PROJECT MILESTONES: (1) 3-1-77 Complete description of cadmium effects on viability, growth, and metabolism of informational molecules in cultured line cells; decide whether to extend studies to primary cultures; begin such studies on other toxic agents. (2) 6-1-77 Begin studies on interaction of homologous and heterologous agents and cellular protective mechanisms.
KEYWORDS: CHEMICAL EFFLUENTS;ANIMAL CELLS;CELL CULTURES;CELL CYCLE;CHROMATIN;PATHOLOGICAL CHANGES;ENVIRONMENT;POLLUTION;BIOLOGICAL EFFECTS;CADMIUM;BIOCHEMISTRY;METABOLISM;RNA

<098069>
TITLE: Development of an On-Line Aerosol Size-Mass Monitoring Instrument
PROJECT NUMBER: 004069
PRINCIPAL INVESTIGATOR: Sedlacek, W.A.
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AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wasson, Hodge
TELEPHONE: C(301)353-5355
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$90,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION IN SITU (25%);COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (25%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (37%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (50%);FULL SCALE DEMONSTRATION (13%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific U.S. regional at present
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: To develop a fast-response, in situ aerosol mass and sizing instrument. The instrument incorporates the use of a piezo-electric microbalance coupled with size collection stages. This technique produces aerosol mass distributions as a function of particle size. The size data may be resolved down to a few tenths of a micrometer for individual particles.
APPROACH: The prototype device has now been assembled in the laboratory where it is and has been undergoing preliminary stability and operational characterization tests. Modeling of the hydrodynamics of the cascade impactor stages is under way to improve the methodology for calculating cascade stage performance. There are several operational situations which present unanswered responses from the instrument. Future laboratory and fieldproof tests will be conducted to verify electronics hardening and to provide answers

to these previously puzzling responses.
RESULTS: It is anticipated that one or two early field tests with the present prototype instrument will precede completion of the laboratory investigations. This leapfrog experiment will be conducted as a part of a larger group of experiments flown on a low-altitude balloon over a large metropolitan area. It was felt that this opportunity for a genesic field experiment should be capitalized upon because of its uniqueness and appropriateness.
PROJECT MILESTONES: (1) 10-1-76 Completion of laboratory calibrations. (2) 2-1-77 Completion of environmental testing. (3) 6-1-77 Instrument environmental hardening. (4) 7-1-77 Prototype instrument field tests. (5) 9-11-77 Prototype instrument first flight. (6) 10-1-77 to 6-1-78 Proof test flights.
KEYWORDS: INSTRUMENTATION;AEROSOLS;MONITORING;SURFACE AIR;CHEMICAL EFFLUENTS;AIR POLLUTION MONITORS;DESIGN;PLUMES;METEOROLOGY

<098081>
TITLE: Preliminary Assessment of Effects of Gaseous Effluent Mixtures from Coal Conversion Technology on Terrestrial Plants
PROJECT NUMBER: 4081
PRINCIPAL INVESTIGATOR: Gehrs, C.W.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Lewis, Robert
TELEPHONE: F233-4208
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The overall objective of this research effort is to provide dose-response data which will permit rapid assessment of the potential dangers to vegetation resulting from release of gaseous coal conversion effluents to the atmosphere. This information will be provided by conducting fumigation experiments in the laboratory initially using a single species, kidney bean (Phaseolus vulgaris), which will be exposed to a pollutant mix collected from the effluent stream of ORNL's coal conversion pilot plant. Specific objectives of the research effort are four-fold: (1) to develop a controlled system for exposure of plants to the potentially hazardous gaseous effluents of coal liquefaction; the complexity of the effluent mixture makes achievement of this objective a crucial first step. This phase of the work is on schedule. (2) to obtain, through close cooperation with Analytical Chemistry and Chemical Technology Divisions, the best practicable chemical characterization of the effluent mix collected and used in our effects studies. This phase of the work is on schedule. Should results warrant more detailed investigations, research will focus on identifying potentially phytotoxic subfractions of the total effluent mix. (3) To identify the potential of bulk effluents from a coal liquefaction facility for causing acute injury to vegetation using Phaseolus vulgaris as a test organism, to assess
KEYWORDS: PLANTS;COAL GASIFICATION;CHEMICAL EFFLUENTS;AIR POLLUTION;PHASEOLUS;HAZARDS;COAL LIQUEFACTION;BIOLOGICAL EFFECTS;DOSE-RESPONSE RELATIONSHIPS;POLLUTION

<098082>
TITLE: Impacts of Trace Elements from Coal Conversion on Aquatic Ecosystems
PROJECT NUMBER: 4082
PRINCIPAL INVESTIGATOR: Gehrs, C.W.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, C.L.
TELEPHONE: F233-4208
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Trace elements (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Marine;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Far West;COASTS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Streams, lakes and reservoirs
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this research is to evaluate potential adverse impacts on aquatic biota and man of trace elements in aqueous coal conversion effluents. In order to insure the orderly and safe development of coal conversion technology on a large scale from the standpoint of aquatic systems, it is necessary to evaluate the toxicity and bioaccumulation potential of trace elements that may be released to aquatic environments.
KEYWORDS: AQUATIC ECOSYSTEMS;COAL LIQUEFACTION;BIOGEOCHEMISTRY;ELEMENTS;TRACE AMOUNTS;CHEMICAL EFFLUENTS;FOOD CHAINS;AQUATIC ORGANISMS;BIOLOGICAL ACCUMULATION;MONITORING;POLLUTION;WATER

<098083>
TITLE: Physical Transport of Organic Contaminants in Aqueous Coal Conversion Effluents
PROJECT NUMBER: 4083
PRINCIPAL INVESTIGATOR: Gehrs, C.W.
ADDRESS: Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Osterberg, C.L.

TELEPHONE: F233-4208
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000; Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Quantify rates of abiotic transformation of certain organic contaminant compounds present in coal conversion effluents which constitute hazards to aquatic organisms and humans. Determine basic relationships between molecular size and structure (within several chemical classes) and rates of transformation.
KEYWORDS: COAL LIQUEFACTION;CHEMICAL EFFLUENTS;TOXICITY;POLYCYCLIC AROMATIC HYDROCARBONS;AQUATIC ORGANISMS;BIOLOGICAL ACCUMULATION;DAPHNIA;FISHES;WASTE WATER;CARBON 14;TRACER TECHNIQUES;BIOLOGICAL EFFECTS;POLLUTION

<098086>
TITLE: Rapid Assay for Carcinogenic Potential of Energy Related By-Products
PROJECT NUMBER: 004086
PRINCIPAL INVESTIGATOR: Tennant, R.
ADDRESS: Biology Division, ORNL, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$114,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objective of this project is to evaluate the potential for producing malignant transformation by energy conversion by-products. The assay involves treatment with by-products of cultured mouse cells, which contain an integrated (endogenous) form of the virus in their cellular DNA, but which do not actively produce virus. Toxicity tests are conducted first to determine sub-toxic levels of the chemicals and assays for virus activation and transformation are conducted using concentrations of by products known to be non-toxic. Briefly, treated cells and controls (i.e., inactive and active activating agents) are assayed for activation of endogenous virus by immunofluorescent assays for viral antigens and for infectious virus by co-cultivation with appropriate indicator cells. The BALB/c 3T3 and AKR mouse cell lines are used initially as the test system because these cells are sensitive to activation procedures. Unfractionated by-products will be used in the first stage of the study to provide any possible interaction between two or more fractions. Treated and untreated cultures will be tested for transformation by observing for changes in morphology and growth in soft (0.3%) agar since it is known that positive results in these assays show a high correlation with tumorigenicity. Cells which are morphologically transformed will be cloned and tested for tumorigenicity in athymic (nude) mice.
KEYWORDS: CHEMICAL EFFLUENTS;MORPHOLOGY;HYDROCARBONS;LUNGS;COAL GASIFICATION;COAL LIQUEFACTION;BIOLOGICAL EFFECTS;CARCINOGENESIS;CELL CULTURES;ANIMAL CELLS;ENVIRONMENTAL EFFECTS

<098087>
TITLE: Tracheal Graft Model System for Evaluating Toxicity and Carcinogenicity of Polycyclic Hydrocarbons
PROJECT NUMBER: 4087
PRINCIPAL INVESTIGATOR: Griesemer, R.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The purpose of the project is: (1) to develop a new bioassay system for testing of respiratory tract carcinogens and cocarcinogens. (2) to study injury and repair of respiratory tract epithelium to carcinogenic and toxic fossil fuel combustion products.
APPROACH: Heterotopically transplanted tracheas are used as target tissues for test substances. The test substances are incorporated into a matrix or incased into a capsule which allows slow controlled release of the test substance into the lumen of the trachea. Selected matrix and incasing materials are studied in an in vitro system to study release rates. Materials showing desirable release characteristics are tested in vivo for tissue toxicity. If found to be nontoxic, they will be used for the incasement of test substances in vivo.
RESULTS: Result expected during the next two years is identification of substances that can serve to incase a number of chemical carcinogens and cocarcinogens and release them into the target tissue at variable but controlled rates. Subsequently the system will be used for carcinogenesis studies.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;BIOLOGICAL EFFECTS;CARCINOGENS;RESPIRATORY SYSTEM;EPITHELIUM;TOXICITY;CARCINOGENESIS;AIR POLLUTION;ENVIRONMENT;RESPIRATION;TRACHEA

<098088>
TITLE: The Role of Irritant Gases on the Susceptibility of Respiratory Tract Epithelium to Tumor Induction
PROJECT NUMBER: 004088
PRINCIPAL INVESTIGATOR: Cresia, D.A.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$85,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To determine whether the diethylnitrosamine (DEN) tumor system in hamsters can be used as a model system to test cocarcinogenicity of various reactive gases. To determine whether formaldehyde and nitrogendicxide enhance the respiratory tract tumor response to DEN.
APPROACH: Hamsters are injected repeatedly with low doses of DEN (0.5 mg/wk for 10 weeks). They are exposed to nitrogendioxide or formaldehyde either simultaneously with the DEN exposures or starting after cessation of DEN exposure. Lung, tracheal, and nasal tumors will be counted under the dissecting scope using a clearing and staining technique.
RESULTS: This experiment will show whether the DEN tumor system can be used to screen air contaminants for cocarcinogenic activity. If this is feasible, it would greatly facilitate such tests since we have developed methods that allow us to detect tumors in the respiratory tract of hamsters without performing expensive histopathology. The experiment is also expected to give an indication whether formaldehyde and nitrogendioxide are cocarcinogenic.
PROJECT MILESTONES: The first phase of the studies will explore the cocarcinogenic activity of nitrogendioxide and formaldehyde on a nitrosamine-lung tumor system. Animals will be exposed to repeated doses of a nitrosamine. They will subsequently be exposed to the above mentioned air pollutants.
KEYWORDS: IRRITANT GASES;FOSSIL FUELS;COMBUSTION;GASEOUS WASTES;AIR POLLUTION;RESPIRATORY SYSTEM;EPITHELIUM;CARCINOGENESIS;CARCINOGENS;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;ENVIRONMENT;LUNGS;RESPIRATION

<098089>
TITLE: Organ Culture Studies with Tracheal Mucosa Pre-Exposed In Vivo to PCH
PROJECT NUMBER: 004089
PRINCIPAL INVESTIGATOR: Marchok, A.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$80,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: It is important to define criteria by which various epithelial lesions can be classified in terms of their biological potential, i.e., normal and abnormal growth behavior, nutritional requirements, cell turnover, differentiation, etc. since the histopathological and cytopathological criteria used for diagnosis of pre-cancerous lesions are very unsatisfactory. The purpose of the studies is to determine the growth behavior of epithelial lesions induced in vivo by carcinogens. This will be accomplished by placing tracheal explants in vitro and observing the growth behavior of such epithelium under various in vitro conditions. The stability of preneoplastic lesions induced by different dose levels of polycyclic hydrocarbons will be investigated.
KEYWORDS: EPITHELIUM;TISSUE CULTURES;RESPIRATORY SYSTEM;CARCINOGENESIS;POLYCYCLIC AROMATIC HYDROCARBONS;BIOLOGICAL EFFECTS;ANIMAL GROWTH;ENVIRONMENT;CARCINOGENS;IN VIVO

<098090>
TITLE: The Use of Selected Teratogenic Test Systems to Identify Hazardous Agents Associated with Nonnuclear Energy Technologies, and to Determine Effective Levels of Such Agents
PROJECT NUMBER: 004090
PRINCIPAL INVESTIGATOR: Russell, L.B.
ADDRESS: Biology Division, ORNL, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/Coal (65%);NUCLEAR/General (10%);GENERAL SCIENCE (25%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
POLLUTANTS: ORGANICS (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: Damages to developing embryos from environmental agents are the subject of immediate human concern. In the past, extensive work on mouse embryos has utilized radiation as a teratogen and has identified critical periods as well as dose-effect relations. Little if any work of a similar systematic nature has been done with chemical teratogens. This project will develop systematic and sensitive methods for detecting the effects of environmental teratogens in vivo. These methods will subsequently be used to

test a number of chemicals, especially those related to coal-conversion and -utilization technologies.
APPROACH: Preliminary exploration has resulted in the choice of a mouse strain whose natural potentialities cause it to straddle the threshold for certain quantitative characters. It is hoped that in this developmentally labile situation, the effects of even small chemical disturbances will be discernible. Pregnant mouse females will be injected at one of up to four chosen stages of pregnancy with the putative teratogens. Embryo mortality will be measured, and survivors will be studied for a number of external and skeletal characters. In choice of compounds and analysis of results we shall coordinate our efforts with mutagenesis studies and with work on germ cell differentiation in the mouse.
RESULTS: The system chosen should be easily capable of quantitation, and even small effects should be detectable. We expect to identify compounds that are teratogenic and subsequently explore dose-effect relationships for such compounds. Qualitative differences in the actions of different compounds may be revealed by differences in relative stage sensitivity.
PROJECT MILESTONES: (1) November 1976 Completion of base-line experiments using x-rays (positive control) and decision on stages and systems to be chosen for most efficient tests. (2) June 1977 Completion of experiments using benzo(a)pyrene in various concentrations. (3) December 1977 Completion of experiments with three other chemicals related to energy technologies. (4) September 1978 Establishment of dose-effect relationships for 3 different energy-related agents.
KEYWORDS: EMBRYONIC DIFFERENTIATION;TOTIPOTENT DIVISION;MICE;EMBRYOS;CARCINOGENESIS;SURVIVAL TIME;ENVIRONMENT;AIR POLLUTION;BIOLOGICAL EFFECTS;CHEMICAL EFFLUENTS;MUTAGENESIS;ANIMAL CELLS

<098093>
TITLE: Characterization of Damage to DNA Caused by Chemical Agents: Emphasis on Synergistic Effects in Combination with Sunlight
PROJECT NUMBER: 004093
PRINCIPAL INVESTIGATOR: Rahn, R.O.
ADDRESS: Biology Division, ORNL, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$28,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: ORGANICS (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: To assess deleterious effects of energy related compounds whose mode of action on cells requires light in the near uv and visible.
APPROACH: Study damage and repair of DNA which is the target molecule in cells. Use various compounds known to interact with DNA and irradiate with 300-400 nm light. Measure formation and repair of chain breaks.
RESULTS: From in vitro studies the mechanism of action can be obtained. From this one can better predict and understand the results obtained with intact cells. It is expected that the ability of a compound to be taken up by a cell will greatly determine the influence on the cell of that compound. Conceivably, a need will arise to quantitate the uptake of any compound and to locate where in the cell that compound is likely to accumulate. Fluorescence may provide a useful tool to use.
PROJECT MILESTONES: (1) Oct. 1, 1976 Initiate tests on DNA in vitro. (2) July 1, 1976 Initiate tests on DNA in vivo.
KEYWORDS: ANIMAL CELLS;CELL CULTURES;CHEMICAL EFFLUENTS;BIOLOGICAL EFFECTS;AIR POLLUTION;DNA;STRAND BREAKS;PHOTOCHEMISTRY;POLYCYCLIC AROMATIC HYDROCARBONS

<098094>
TITLE: Regulatory Processes in Damaged Cells
PROJECT NUMBER: 004094
PRINCIPAL INVESTIGATOR: Kenney, F.T.
ADDRESS: Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.E.
TELEPHONE: F233-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (50%);FOSSIL FUEL/Coal (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: METALS (25%);ORGANICS (75%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this project are: (1) to utilize model cell regulatory systems wherein genetic transcription, translation, and turnover of key nucleic acids and proteins can be analyzed and manipulated to determine mechanisms of cellular damage to these processes by hazardous agents associated with coal and oil shale technologies; and (2) to determine if partial or total expression of oncogenic viruses is involved in malignant transformation by polycyclic hydrocarbons.
APPROACH: Hepatoma cells containing inducible enzyme system (tyrosine amino transference) are exposed to PAH compounds and trace metals to determine if agents affect transcription, translation, in RNA turnover, protein turnover. If ''yes'' effects are analyzed further biochemically to define molecular species affected. Fibroblasts containing latent integrated viral genome are exposed to PAH to determine if expression of one or more viral components is involved in transformation.
RESULTS: Projects should yield essential information on the nature of the cellular, regulatory mechanics affected by polycyclic hydrocarbons and other hazardous agents generated in fossil fuel conversion technologies, and to determine if partial expression of latent viral genomes is involved in cellular transformation by these agents.
PROJECT MILESTONES: (1) Jan. 1, 1977 Determine if high levels defined polycyclic hydrocarbons or nontoxic levels of undefined mixtures generated in coal conversion have significant effects of transcription, translation, RNA or protein turnover. Determine if cyclic nucleotide levels affected by these compounds.

(2) Jan. 1, 1977 Begin analyses of effects of trace metals on cellular regulatory mechanisms. (3) Aug. 1, 1976 Begin analyses of effects of polycyclic hydrocarbons on expression of RNA tumor virus genomes, especially partial expression.
KEYWORDS: ANIMAL CELLS;CELL CULTURES;POLYCYCLIC AROMATIC HYDROCARBONS;ONCOGENIC VIRUSES;BIOLOGICAL EFFECTS;SYNERGISM;CARCINOGENESIS;BIOCHEMICAL REACTION KINETICS;ENVIRONMENT;CARCINOGENS;DNA

<098110>
TITLE: Alveolar Clearance of Metal Oxides
PROJECT NUMBER: 004110
PRINCIPAL INVESTIGATOR: Sanders, C.L.
ADDRESS: Battelle-Northwest, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research Division
MONITOR: Carter, Charles E.
TELEPHONE: F973-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$80,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: METALS/Cadmium;METALS/Lead;METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project will examine the role of the alveolar macrophage, alveolar epithelial cells, and other pulmonary cells in influencing the distribution within the lung, and the clearance for the lung, of several inhaled metal oxides, initially those of lead, cadmium and mercury.
APPROACH: Electron microscopy will be employed to examine quantitatively the distribution and damage from metal oxides in the lung. Other studies will assess the degree of inhibition of clearance of a test aerosol given after metal oxide inhalation. The project is emphasizing the acute pathological effects of cadmium monoxide and its mechanism of action in the lung.
RESULTS: Data from these studies will be useful in the following ways: (1) establish exposure limits for acute heavy metal inhalation exposures; (2) define the health effects resultant from these exposures; and (3) examine mechanisms of toxic action and potential methods to minimize ('treat') these toxic effects once exposure has occurred.
KEYWORDS: LEAD OXIDES;CADMIUM OXIDES;MERCURY OXIDES;TISSUE DISTRIBUTION;LUNGS;INHALATION;RETENTION;ANIMAL CELLS;EPITHELIUM;MACROPHAGES;ELECTRON MICROSCOPY;AEROSOLS;ANIMALS;PATHOGENESIS;TOXICITY;PARTICLES

<098111>
TITLE: Environmental Effects of Oil Shale Development
PROJECT NUMBER: 001264
PRINCIPAL INVESTIGATOR: Wildung, R.E.
ADDRESS: Battelle Pacific Northwest Laboratories, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Dahlman, Roger C.
TELEPHONE: F233-5078
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$207,000; Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS:
METALS/Copper;METALS/Nickel;METALS/Boron;METALS/Molybdenum;METALS/Iron;METALS/Selenium;METALS/Arsenic (50%);ORGANICS/Heterocyclic nitrogen;ORGANICS/Sulfur;ORGANICS/Oxygen cpds;ORGANICS/Hydrocarbons (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (90%);FULL SCALE DEMONSTRATION (10%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Site specific Rocky Mountains
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this study is to investigate and model the source, transport, physical and chemical reactions, stability, and fate of wastes from oil shale processes including overburden leachates, retort water, mine dewatering salines, and prerefining waste.
APPROACH: Batch and column studies will be used to measure the equilibrium and kinetic parameters which control the fate and transport of the wastes and leachates through typical soil systems of the oil shale regions. A computer simulation program will be developed to predict pollutant transport through these soils. The model will be useful in evaluating various disposal alternatives for these wastes and in the reclamation of mined land.
RESULTS: Development of a suitable shale reaction and transport model will allow prediction of the ground water pollution potential by oil shale retort wastes and accumulation of waste products in soil systems. Determining properties of waste components can be utilized to set standards of performance for pollution control equipment. The predicted concentration of pollutants derived from this research can be coupled with toxicological data to predict the potential that oil shale process wastes have on permanent environmental damage.
PROJECT MILESTONES: (1) 1 Nov 1976 Completion of literature study. (2) 1 Jan 1977 Establish preliminary predictive model of trace element transport. (3) 1 Nov 1977 Complete development of methods for characterization of waters. (4) 1 Sept 1978 Major waste, soil-spent shale, and interaction parameters completed.
KEYWORDS: CHEMICAL EFFLUENTS;OIL SHALES;DIFFUSION;SOILS;LAND POLLUTION;WATER;TRANSPORT;ELEMENTS;TRACE AMOUNTS;ORGANIC COMPOUNDS

<098112>
TITLE: The Immediate Effects of Effluents From Coal Utilization on the Behavior and Physiology of Freshwater Biota
PROJECT NUMBER: 4112
PRINCIPAL INVESTIGATOR: Anderson, D.R.
ADDRESS: Pacific Northwest Laboratory, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Watters, Robert L.
TELEPHONE: F233-5329
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal Conversion liquefaction;FOSSIL FUEL/Coal Conversion gasification (100%)
ENERGY CYCLE: EXTRACTION (30%);PROCESSING, CONVERSION (30%);COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (20%)
POLLUTANTS: METALS (45%);ORGANICS (45%);HEAT, THERMAL (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (20%);ANALYTICAL (30%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;COASTS/Far West;COASTS/Northwest;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This research program is designed to provide data for establishing water quality criteria for the protection of freshwater resources and ecosystems, and to evaluate ways to minimize the effects of pollutants arising from coal utilization. The proposed program will concentrate on the immediate behavioral or physiological effects on aquatic organisms of thermal and chemical effluents reaching freshwater systems via releases to the atmosphere, surface waters and ground waters due to fossil fuel combustion and utilization.
APPROACH: A state of the art literature review will be made to assess the most efficient mode of action toward new areas of research using the most advanced techniques employing biological and physiological detection thresholds. Behavioral studies employing parameters such as heart rate, cough response, avoidance-attraction response, social hierarchy changes, and alterations in learned responses in fishes will be monitored using a polygraph and closed-circuit videotape instrumentation for recording observation and electrographic information. These sublethal measures, coupled with information concerning the 96 hour LC/sub 50/, will permit determination of detection thresholds for toxicants which may be well below the lethal levels of the toxicants.
RESULTS: A literature review will be completed to determine the chemistry of a variety of compounds and elements originating from coal combustion, liquefaction, gasification, the toxicity of these materials, current knowledge in regard to aquatic organism behavioral and physiological responses and up-to-date techniques to monitor these responses. The results of this literature survey and information from other ongoing programs from the King Report are being used as the basis for designing a comprehensive research program.
PROJECT MILESTONES: (1) 30 January 1976 Complete behavioral and physiological portion of the literature review. (2) 1 April 1976 Design and initiate construction of testing apparatus for behavioral and physiological monitoring of several species of fish. (3) 30 June 1976 Completion of final portion of literature review. Selection of toxicants to be tested and experimental design and test approach for next year's program of research.
KEYWORDS: AQUATIC ECOSYSTEMS;WATER POLLUTION;AQUATIC ORGANISMS;BIOLOGICAL EFFECTS;COAL GASIFICATION;COAL LIQUEFACTION;CHEMICAL EFFLUENTS;ENVIRONMENTAL EFFECTS;POPULATION DYNAMICS;CADMIUM;NICKEL;ZINC;COPPER;MANGANESE;FISHES;HEART;HYDROCARBONS;NITROGEN COMPOUNDS;TOXINS;WATER

<098113>
TITLE: Immediate Effects of Anti-Fouling Biocides from Coastal and Offshore Power Plants on Selected Ecosystems and Associated Organisms
PROJECT NUMBER: 4113
PRINCIPAL INVESTIGATOR: Thatcher, T.O.
ADDRESS: Battelle, Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H.
TELEPHONE: F233-5324
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$100,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (40%);NUCLEAR/General (40%);GENERAL SCIENCE (20%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: METALS (15%);ORGANICS (15%);HEAT, THERMAL (20%);SPECIFIED OTHER POLLUTANTS/Biocides (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal zone
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Little information is presently available concerning the effects of chlorinated (or other biocide treated) salt water upon non-target estuarine or marine organisms. This project has the objective of determining the effects of short-term exposures of Pacific Northwest meroplankton and infaunal species to power plant biocides and biocide-organics.
APPROACH: Laboratory studies will be conducted in proven continuous flow-through systems which will include both continuous and intermittent exposures of planktonic life stages of important fishes and invertebrates, and chosen infauna, to the selected stressor conditions. Chlorine has been identified as the initial biocide for study, and other chemicals such as bromine chloride and ozone will be employed later. Another important part of the study is the compilation of data on actual biocide usage schemes, and other important stressors encountered by organisms experiencing passage through power plant systems, or existing as permanent benthic forms in effluent areas. Biocide-organic compounds formed during chlorination of salt water will also be studied.
RESULTS: This proposed research project will determine effects of short-term exposures of important saltwater and marine organisms tc power plant biocides in studies which will simulate actual power plant situations. The result will be water quality criteria which answer real world needs for protecting important estuarine and marine organisms. The lack of such information in the face of an increasing potential for impact could lead to inadequate planning of power plant locations and operating practices with the attendant potential

for the degradation of extremely valuable and productive saltwater habitats.
PROJECT MILESTONES: (1) May 1977 Development of a suitable analytical methodology for chlorinated organics and initiate exposure experiments. (2) December 1976 Issue interim report on the effects of chlorine and organic constituents on meroplankton. (3) December 1978 Initiate studies with other selected biocides, e.g., ozone, chromates, etc., on plankters and infauna.
KEYWORDS: BIOCIDES;NUCLEAR POWER PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;COOLANTS;CHLORINE;BIOLOGICAL EFFECTS;AQUATIC ECOSYSTEMS;SEAWATER;ESTUARIES;COASTAL WATERS;AQUATIC ORGANISMS;POPULATION DYNAMICS;PLANKTON;TOXICITY;WATER POLLUTION;FISHES;INVERTEBRATES

<0098114>
TITLE: Power Plant Heat and Chemical Effluent Effects on Selected Marine and Estuarine Communities
PROJECT NUMBER: 4114
PRINCIPAL INVESTIGATOR: Young, J.S.
ADDRESS: Battelle Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hamilton, D.H. Jr.
TELEPHONE: F233-5324
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$100,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (25%);ELECTRICITY GENERATION (75%)
POLLUTANTS: METALS (35%);ORGANICS (5%);HEAT, THERMAL (25%);SPECIFIED OTHER POLLUTANTS/Biocides (35%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Coastal zone
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLCGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objectives are to identify the forms of chemicals in power plant effluents (e.g., chlorine, copper, chromium and nickel) that are biologically active, how they are modified by physical parameters such as heat, and to determine their single and combined effects on important marine and estuarine species and communities. Short-term laboratory experiments will lead into long-term, low-contaminant-level investigations. These will be compared to field verification studies at existing power plant effluents.
APPROACH: The above effects are being evaluated by comparing individual and community (communities developed on portable artificial substrates) responses to single and combined chemicals in terms of LC50's, ash-free dry weights, respiration, and species numerical and compositional variations as determined by indices of species evenness, richness, dominance, and affinity. All toxicant bioassays will run with and without heat modification.
RESULTS: The anticipated results are the establishment of realistic water quality criteria for thermal discharges, the optimization of biocide dosages when combined with other chemicals having known toxic effects, the relative toxicities of chemical releases and how they are modified by heat, and the long-term, low-level effects of combined releases on marine and estuarine communities.
PROJECT MILESTONES: (1) December 1977 Determination and assessment of the concentrations of single chemical contaminants needed to produce an effect on marine communities and representative individuals. (2) January 1978 Determination and assessment of the combined effects of chemical contaminants on marine communities and representative individuals. (3) December 1978 Determination and assessment of the effects of heat on single and combined toxicities of chemical contaminants on marine communities and representative individuals.
KEYWORDS: NUCLEAR POWER PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;CHLORINE;COPPER;CHROMIUM;NICKEL;TOXICITY;WATER POLLUTION;AQUATIC ORGANISMS;POPULATION DYNAMICS;COASTAL WATERS;ESTUARIES;AQUATIC ECOSYSTEMS;FISHES;INVERTEBRATES;SYNERGISM

<0098116>
TITLE: Effects of Refinery Wastes and Oil from Transfer Facilities on Pacific Northwest Marine Coastal Ecosystems
PROJECT NUMBER: 4116
PRINCIPAL INVESTIGATOR: Vanderhorst, J.R.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: McCammon, Helen M.
TELEPHONE: F233-5549
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$90,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (100%)
ENERGY CYCLE: TRANSPORTATION (50%);PROCESSING, CONVERSION (50%)
POLLUTANTS: METALS/Vanadium;METALS/Cadmium (2%);ORGANICS/Petroleum hydrocarbons (98%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Puget Sound coastal zone
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This is a program to define effects on marine intertidal communities from oil refineries and transfer facilities at specific sites in the Puget Sound region of the Pacific Northwest.
APPROACH: Effects are being measured in terms of organic content of sediment, general community structure, and change in the age structure, recruitment, growth and mortality of an important clam species. The sites chosen for study include the Cherry Point region, an operating and developing refinery site; the Port Angeles region, an area for which a deep water port and pipeline terminus is proposed; and, the Sequim Bay region, an area to serve as an uncontaminated control.
RESULTS: Anticipated effects would result from refinery wastes, chronic spillage of crude or refined oil, and the possible large spillage associated with tanker collision or grounding. Output is to be in terms of data summary and statistical measures of sampling sensitivity.
PROJECT MILESTONES: (1) March 1976 Review and interpret existing data to design research program (complete).

(2) August 1977 Describe within year sensitivity of measures for parameters. (3) October 1978 Assess between year variability in parameter estimates. (4) January 1980 Verify predictions of changes in parameters related to chemical measurement of source.
KEYWORDS: COASTAL REGIONS;AQUATIC ECOSYSTEMS;OILS;SEAS;COMMUNITIES;REFINING;PUGET SOUND;SEDIMENTS;MOLLUSCS;GROWTH;MORTALITY;OIL SPILLS;WASTES;ENVIRONMENTAL EFFECTS;POLLUTION;CHEMICAL EFFLUENTS;HYDROCARBONS;INVERTEBRATES

<098118>
TITLE: Lung Toxicity of Sulfur Pollutants
PROJECT NUMBER: 004118
PRINCIPAL INVESTIGATOR: Loscutoff, S.M.
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MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: F973-5468
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Energy Research and Development Administration FY77:$100,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/General (60%);FOSSIL FUEL/Coal (20%);FOSSIL FUEL/Oil and Gas (10%);FOSSIL FUEL/Oil Shale (10%)
ENERGY CYCLE: COMBUSTION IN SITU (20%);COMBUSTION OR END USE (40%);ELECTRICITY GENERATION (40%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/SO/sub 3/ (25%);PARTICULATES/H/sub 2/SO/sub 4/ mist (75%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: This project will provide information on the interactions between the physiologic event of bronchoconstriction caused by exposure to sulfur pollutants and related physiologic and biochemical changes which may place sensitive individuals at risk from heart attacks or exacerbation of bronchitis or emphysema.
APPROACH: We will define those vasoactive agents responsible for bronchoconstriction caused by inhalation of sulfur pollutants in guinea pigs. Possible vasoactive agents will be evaluated by pretreating the animals with specific pharmocologic blocking agents. If the response to sulfuric acid mist is absent or reduced following pharmocologic blockage, the agent being blocked will be assumed to be involved in the normal pulmonary response to sulfuric acid exposure.
RESULTS: The primary output of this study will be to define the biochemical agents responsible for changes in pulmonary function caused by exposure to sulfur pollutants. As a consequence of this initial finding, possible beneficial effects of inhibiting the action of these responsible agents will be evaluated to determine whether individuals highly sensitive to sulfur pollutants can be protected. If this research proves fruitful, a means of protecting the health of sensitive individuals in the human population may be available without the economic drain of scrubbers to remove all sulfur compounds from power plant effluent.
KEYWORDS: LUNGS;SULFUR;TOXICITY;HEALTH HAZARDS;AIR POLLUTION;BRONCHI;BIOLOGICAL EFFECTS;SULFURIC ACID;PATHOLOGY;AEROSOLS;ANIMALS;BIOCHEMISTRY;HEART;INHALATION;RESPIRATION

<098121>
TITLE: Applications of Holography
PROJECT NUMBER: 4121
PRINCIPAL INVESTIGATOR: Hildebrand, B.P.
ADDRESS: Battelle Pacific Northwest Laboratories, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$50,000; Energy Research and Development Administration FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (50%);GEOTHERMAL/General (50%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This research is aimed at instrumentation designed to aid the analysis and design of particulate and aerosol emission abatement equipment for use on all thermal power plants.
APPROACH: Laboratory simulation of aerosol and particulate emission to evaluate holographic techniques for various applications.
RESULTS: Designs of three-dimensional holographic cameras tailored to the specific applications of the researcher.
PROJECT MILESTONES: (1) 9-1-76 Identification of application experiments. (2) 9-1-76 Installation of mode selector. (3) 1-1-77 Installation of double-pulse Q-switch. (4) 6-1-77 Performance of application experiments. (5) 9-1-77 Design of specific cameras. (6) 1-1-78 Installation of repetitive pulse laser.
KEYWORDS: HOLOGRAPHY;USES;AEROSOLS;EMISSION;SIMULATION;CAMERAS;DESIGN;PARTICLES

<098135>
TITLE: Atmospheric Sciences: Potential of Energy Extraction Processes in the Northern Great Plains for Heavy Metals Contamination and Consequent Uptake and Turnover in a Range Ecosystem Model
PROJECT NUMBER: 4135
PRINCIPAL INVESTIGATOR: O'Toole, J.J.;Gordon, C.C.
ADDRESS: Ames Laboratory Reactor, Ames, IA 50011
AFFILIATION: Ames Lab., Iowa (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Hinds, W. Ted
TELEPHONE: F233-3763
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$140,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)

ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/HF (20%);METALS/Arsenic;METALS/Antimony;METALS/Selenium and transition;METALS/Heavy;METALS/Rare earths (60%);PARTICULATES (10%);ORGANICS/Aromatics (5%);RADIATION/Natural radionuclides (5%)
HARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Colstrip, Montana;HYDROGRAPHIC AREAS/Other hydrographic areas Stock impoundments
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objectives of this study are to evaluate the rate of generation and atmospheric release of elemental pollutants at the new Colstrip, Montana power station, to describe their chemical transformations, and to measure the dispersion and subsequent accumulation and impacts on components of the ecosystems they invade.
APPROACH: (1) Qualitative description and quantitative measurement of major and minor elements in mass balance study on Colstrip Unit 1. (2) Evaluation of wet and dry deposition rates of air pollutants and characterization of chemical transformations of key pollutants after stack releases. (3) Measure the accumulation of gaseous and particulate pollutants in terrestrial vegetation, and evaluate their effects on plant community structure, growth, and pathogenesis. (4) Determination of pollutant elements in principal animal species. (5) Measurement of efficiency and rate of transport of elemental pollutants down a model watershed to its impoundment. (6) Evaluation of impoundments for changes in water and sediment composition, biomass, algal succession, and bioconcentration of toxic trace elements. (7) Laboratory measurements of rates of uptake and bioconcentration of key pollutant elements by dominant algae and macrophytes. (8) Evaluation of the accumulation and turnover of toxic pollutant elements in controlled studies on ruminant animals.
RESULTS: Formulation of a model describing the nature and environmental behavior of pollutants generated from coal combustion in a modern coal-fired power plant and evaluation of the environmental impact of the stack effluents on terrestrial and aquatic ecosystems in the Northern Great Plains.
PROJECT MILESTONES: FY 77 Characterize environmental levels of sized air particulates/trace elements composition and gaseous effluents downwind from Colstrip Unit No. 1 and establish a mass balance between coal and combustion products; characterize physical and chemical transformations of effluents during atmospheric transport. Measure plant community characteristics and productivity in study plots in terrestrial and aquatic systems influenced by the plume of Colstrip No. 1. Continue trace element analysis on water, soil, precipitation and dominant species of flora and fauna from established study sites. Carry out toxicity studies of key toxic elements on aquatic flora. Initiate metabolic turnover studies of toxic elements in ruminant animals. Continue watershed and soil mapping for watershed models. FY 1978 More carefully define nature of coal-generated pollutants and their chemical and physical changes in the environment. Begin formulation of a model describing nature and environmental behavior of pollutants. Evaluate bioconcentration of trace metals in terrestrial and aquatic flora and fauna. Determine pollutant effects on plant pathology, productivity, frequency, cover, and diversity. Assess effects of fly ash sources of trace elements on algae using in situ model systems. Continue turnover studies in herbivores using radionuclide species of high priority toxic elements.
KEYWORDS: SOURCE TERM;METALS;AIR POLLUTION;POWER PLANTS;ENVIRONMENTAL EFFECTS;DEPOSITION;AEROSOLS;STACK DISPOSAL;TERRESTRIAL ECOSYSTEMS;PLANTS;PATHOGENESIS;WATER;SEDIMENTS;BIOMASS;ALGAE;ECOLOGICAL CONCENTRATION;COAL;COMBUSTION;POLLUTION;AIR;ARSENIC;CADMIUM;MERCURY;SELENIUM;FLUORINE;ANTIMONY;PLUMES;AQUATIC ECOSYSTEMS

<0980136>
TITLE: Terrestrial and Aquatic Ecosystem Effects of Coal-Fired Power Plants in the Northern Great Plains
PROJECT NUMBER: 4136
PRINCIPAL INVESTIGATOR: O'Toole, J.J.
ADDRESS: Ames Laboratory, Ames, IA 50011
AFFILIATION: Ames Lab., Iowa (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research, Environmental Program
MONITOR: Jacobson, Jay S.
TELEPHONE: C(301)353-3664
TYPE OF FUNDING: Contract No.-W-7405-ENG-82;Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$250,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS (50%);METALS (25%);PARTICULATES (25%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The purpose of this study is to determine the effects of coal-fired power plants performing under new source performance standards on the atmospheric, terrestrial and aquatic environments.
APPROACH: Through the use of chemical and biological measurements the distribution and effects of heavy metals and gaseous air pollutants on plants and animals will be determined. The composition of flyash, scrubber solution and stack effluents at different distances downwind also will be measured.
RESULTS: Results of this study will produce information relating to the following questions: what is the effect of the Colstrip, Montana, power plants on plants and animals in terrestrial and aquatic ecosystems of the Fort Union Basin; what are the gaseous and particulate pollutants emitting from these power plants and deposited on plants, soils and waters.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;LAND POLLUTION;WATER POLLUTION;TERRESTRIAL ECOSYSTEMS;CHEMICAL EFFLUENTS;GASEOUS WASTES;LIQUID WASTES;METALS;PLANTS;BIOLOGICAL EFFECTS;FLY ASH;STACK DISPOSAL;PARTICLES;AEROSOLS

<0980137>
TITLE: (A) Laser Pumped Luminescence and Microwave Resonance; (B) Abs. Mass Calibration of Air Particulate Filters
PROJECT NUMBER: 004137
PRINCIPAL INVESTIGATOR: Fassel, V.A.;Small, G.J.
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AFFILIATION: Ames Lab., Iowa (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Wood, Robert W.
TELEPHONE: F233-5355

TYPE OF FUNDING: Contract No.-W-7405-ENG-82;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: EXTRACTION (25%);COMBUSTION OR END USE (50%);ELECTRICITY GENERATION (25%)
POLLUTANTS: NOXIOUS GAS (40%);PARTICULATES (30%);ORGANICS (30%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The broad objectives of this study are to develop the basic science, the investigative methods and the hardware so that the demanding analytical requirements associated with the characterization of organic and inorganic pollutants in effluents from energy generating sources can be met in a viable practical manner. Particular emphasis is devoted to the development of multipollutant analytical concepts and on the determination of ultratrace pollutants. Special attention is being placed on those inorganic and organic pollutants which are or may be emitted from fossil-fueled energy sources and from coal liquefaction and gasification plants. Many of these pollutants are certainly health hazards, and some already identified are proven carcinogens.
APPROACH: Two approaches are utilized. The first involves laser pumped luminescence and microwave resonance (LPLMR) spectroscopy. The second approach is focused on the compositional characterization of air particulates and is based on drawing the polluted air through polycarbonate membrane filters of exceptional high purity having pore diameters of 0.8 mu m. These filters are then dissolved and the resulting solutions are analyzed by the ultrasensitive inductively-coupled plasma, atomic emission spectroscopic technique developed in the Ames Laboratory.
RESULTS: (1) The development of the LPLMR technique should allow the characterization and quantitation of carcinogenic polynuclear atomatic hydrocarbons at the ppb level by three independent spectroscopic ''fingerprints.'' (2) The development of a practical technique for the simultaneous determination of the trace element content, of air particulates, at powers of detection far superior to any other analytical technique.
PROJECT MILESTONES: (1) 1978 The laboratory demonstrations that reproducible and accurate mass calibrations can be achieved by a laboratory particulate deposition facility will be completed. The air sampling concept will be tested in the field. (2) 1979 Authentic air and water samples will be analyzed for the common carcinogens by the LPLMR technique and the performance will be evaluated critically. Recommendations on the desirability for the development of a commercial facility will be made.
KEYWORDS: INSTRUMENTATION;AEROSOLS;AIR FILTERS;COAL INDUSTRY;OIL SHALE INDUSTRY;HEALTH HAZARDS;AIR POLLUTION;WATER POLLUTION;LAND POLLUTION;COAL LIQUEFACTION;COAL GASIFICATION;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;CHEMICAL ANALYSIS;HEALTH HAZARDS;POLYCYCLIC AROMATIC HYDROCARBONS;TOXICITY

<098151>
TITLE: The Study of Autoxidation of Lipids of Biomembranes and of Lung Surfactants Initiated by Oxidative Pollutants and Its Inhibition by Antioxidants
PROJECT NUMBER: 004151
PRINCIPAL INVESTIGATOR: Mead, J.F.
ADDRESS: 900 Veterans Avenue, Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, L.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$51,000; Energy Research and Development Administration FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub 2/;NOXIOUS GAS/O/sub 3/ (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: The objectives of this research are to understand how oxidative pollutants such as NO/sub 2/ and O/sub 3/ can initiate oxidative damage in ordered arrangements of lipids such as the membrane bilayer, how the reaction proceeds, once initiated, and how it may be prevented or arrested with antioxidants and other substances. The knowledge gained from these studies will be applied to biomembranes and to whole animals in an attempt to find means of protection against this type of damage.
APPROACH: The initial studies are performed on model systems of lipid mono and bilayers and involve measurement of the damage to the unsaturated fatty acids by the radical chain oxidation and its modification by membrane components. Similar studies are under way with membrane systems from experimental animals in which similar modifications of membrane composition are attempted.
RESULTS: In FY 1976, the physical and chemical nature of the model system will be understood and the nature and mechanism of formation of the products of monolayer fatty acid autoxidation (epoxides) are clarified. The effect of saturated fatty acids is found to decrease the autoxidation rate if the acyl chain extends more than 6-8 carbon and cholesterol increases autoxidation although its esters afford some protection. The mechanism of action of the tocopherols is shown to be complete blocking of autoxidation by alpha-tocopherol until it is decreased and to the point where autoxidation is released, less effective blocking for longer periods of time by alpha-tocopherol and still longer less effective blocking by a tailored antioxidant, a hydroquinone, containing fatty acid. In 1977, a complete understanding of the model system will be achieved and experiments designed to control the composition of the rat-liver microsomal membrane will continue. The relationship between dietary antioxidant and polyunsaturated fatty acid and exposure to oxidative pollutants as NO/sub 2/ and O/sub 3/ will be assessed and, in 1978, protective measures will be considered.
PROJECT MILESTONES: (1) In FY 1976 the nature of the model membrane system and the information it affords for membrane autoxidation and antioxidants will be reported. (2) In FY 1977 the knowledge gained with the model system will be applied to the biomembrane system in vitro and in vivo. (3) In FY 1978 the manipulation of the biomembrane by dietary means will be attempted in order to suggest protective measures against the effect of oxidative effluents.
KEYWORDS: LIPIDS;MEMBRANES;LUNGS;SURFACTANTS;POLLUTION;ANTIOXIDANTS;INHIBITION;OXIDATION;ACYL RADICALS;RATS;LIVER;MICROSOMES;BIOLOGICAL EFFECTS;AGING;AIR;CHEMICAL EFFLUENTS

<098152>
TITLE: Reparative and Adaptive Mechanisms in Respiratory Systems of Rodents and Monkeys Exposed to Sulfur Compounds and Particulates
PROJECT NUMBER: 004152
PRINCIPAL INVESTIGATOR: Goldman, M.
ADDRESS: Davis, CA 95616
AFFILIATION: California Univ., Davis (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, C.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency Energy Research and Development Administration FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/Coal (90%);FOSSIL FUEL/Oil and Gas (10%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To determine the functional and morphological consequences of injury to the respiratory system of rodents and monkeys by inhalation of effluents from coal-burning power sources. Sulfuric acid and particulates will be used as models of injury. (2) To determine the site and sequence of biochemical, immunological, and cellular mechanisms responsible for the injury. (3) To determine cellular and subcellular mechanisms of adaptation and repair according to intensity and duration of injury, and to plot the extent to which recovery is possible as a function of exposure concentration and time. (4) To examine the relationships between the factors involved in the balance between injury and adaptation/repair, and to assess their relative roles in the development of chronic bronchitis, emphysema, interstitial fibrosis, and proliferative states capable of increasing the risk of carcinogenesis.
APPROACH: Rodents and monkeys will be exposed 23 1/2 hours/day to aerosols of H/sub 2/SO/sub 4/, particulates including fly ash, and combinations for 3-12 months. Some animals will be examined at the end of the exposure and others after a 3-12 month period in clean air. The test systems will include whole rodents and monkeys and in vitro organs, tissue slices, and cells from those animals. Mechanisms of injury, adaptation, and repair will be determined and evaluated using sensitive techniques of respiratory physiology, biochemistry, immunology, microbiology, cell biology, and descriptive and quantitative pathology. We will study respiratory system; (1) Ventilatory and airway response and exchange area function; (2) clearance of inhaled radiolabeled partices and of bacteria; (3) biochemical markers of injury, adaptation, and repair; (4) immune responsiveness of lymphoid tissues and functional capabilities of the immunccompetent cells; (5) pathology using light, transmission electron, and scanning electron microscopy; and (6) cell kinetics and functions using autoradiography and histochemistry.
RESULTS: The basic processes of injury, adaptation, and repair will be determined, correlated, and evaluated in terms of intensity and duration of injury, extent of recovery, roles in the development of chronic lung diseases, and increased risk of cancer. This information will be useful to assess the relative human health hazards of exposures to energy related effluents.
PROJECT MILESTONES: (1) June 30, 1977 Preliminary report of effects of 3 month exposures of rodents to fly ash and H/sub 2/SO/sub 4/ aerosols separately. (2) December 30, 1977 Preliminary report of 3 month recovery by rodents from effects of 3 month exposure to fly ash and H/sub 2/SO/sub 4/ aerosols separately. (3) January 30, 1978 Preliminary report of repairative and adaptive mechanisms in rodents. Peliminary report of effects of 3 month exposure of rodents to aerosols of fly ash and H/sub 2/SO/sub 4/ combined. (4) December 30, 1978 Preliminary report of effects of 3-6 month exposure of monkeys to combined fly ash and H/sub 2/SO/sub 4/ aerosols. (5) February 1979 Completion of exposure facility expansion and exposure facility lab.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;CHEMICAL EFFLUENTS;SULFURIC ACID;PARTICLES;INHALATION;MONKEYS;RODENTS;BIOLOGICAL EFFECTS;RESPIRATORY SYSTEM;BIOLOGICAL REPAIR;BIOLOGICAL ADAPTATION;SILICON OXIDES;FLY ASH;ANIMALS;CARCINOGENS;RESPIRATION

<098153>
TITLE: Early and Late Effects of Energy-Related Pollutants on Experimental Animals; Evaluation of Airborne Hazards
PROJECT NUMBER: 004153
PRINCIPAL INVESTIGATOR: Morrow, P.E.;Mavis, R.
ADDRESS: University of Rochester Medical School, Rochester, NY 14642
AFFILIATION: Rochester Univ., N.Y. (USA). School of Medicine and Dentistry
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Division of Biomedical and Environmental Research
MONITOR: Carter, Charles E.
TELEPHONE: C(301)353-5468
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Energy Research and Development Administration FY77:$704,000; Environmental Protection Agency
TECHNOLOGY: FOSSIL FUEL/Coal (25%);NUCLEAR/General (25%);MULTITECHNOLOGY (50%)
ENERGY CYCLE: EXTRACTION (40%);COMBUSTION OR END USE (40%);WASTE MANAGEMENT (20%)
POLLUTANTS: NOXIOUS GAS (10%);METALS (10%);PARTICULATES (60%);RADIATION (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:HEALTH EFFECTS
PROJECT DESCRIPTION: (1) To determine basic responses of the respiratory system to inhaled toxicants and elucidate mechanisms of particulate matter clearance, translocation, and retention. (2) Identify and characterize key enzymes in essential lung metabolism. (3) Define the significance of physical and chemical properties in determining the toxicity of aerosols.
APPROACH: (1) Study of rodents, dogs, and man after carefully controlled inhalation exposures. In animal work, study of pulmonic lymphatic permeation, lymphoid uptake, and retention. (2) Use of microscopy and electron microprobe to study role of alveolar macrophage in particle clearance. (3) Use of tracer methodology to develop kinetic models to describe fate of inhaled toxicants. (4) Develop methods to characterize aerosol particles and produce monodisperse particulate preparations.
RESULTS: (1) Basic information for the design of respiratory dosimetric models appropriate to inhaled toxicants of both chemical and radioactive types. (2) Information regarding effects of airborne toxicants (such as SO/sub 2/, NO/sub x/, asbestos, or ozone) on normal pulmonary function, including clearance functions. (3) Molecular basis for the quantitative assessment of important pulmonary function (e.g., production of surfactants). (4) Techniques for simultaneous measurement of aerosol particle size and abundance and for generating aerosols that are monodisperse with respect to aerodynamic diameter but differ in other respects.

PROJECT MILESTONES: (1) Time-of-flight measurement of atmospheric aerosol size distribution Dec. 1976. (2) Finish collaborative study on attachment of radon decay products to airborne particulates June 1977. (3) Begin develcpment of methods for producing monodisperse aerosols for use in study of lung clearance Dec. 1977. (4) Begin development of analytical methods for U-232 and U-233 June 1978. (5) Initiate studies with neutron-activated coal dust Oct 1978. (6) Determine unique features of atmospheric particles which serve to identify their origin Dec 1978. (7) Complete human studies on preliminary absorption of lead Jan 1979. (8) Ccmplete initial phase of pulmonic lymphatic permeation study in dogs Nov. 1979.
KEYWORDS: AIR POLLUTION;HEALTH HAZARDS;GASES;METALS;AEROSOLS;ORGANIC COMPOUNDS;IONIZING RADIATIONS;TOXICITY;BIOLOGICAL RADIATION EFFECTS;DIFFUSION;RESPIRATORY SYSTEM DISEASES;INHALATION;LUNG CLEARANCE;MEASURING METHODS;LIPIDS;METABOLISM;PATHOLOGICAL CHANGES;LUNGS;ANIMALS;ENERGY;BIOCHEMISTRY;RESPIRATION

Federal Energy Administration

<100025>
TITLE: Application of Ohio State Implementation Plan Methodology to the EPA Section 4 ESECA Review
PROJECT NUMBER: CO-05-60569-00
PRINCIPAL INVESTIGATOR: Bartosh, C.P.
ADDRESS: 8500 Shoal Creek Boulevard, P.O. Box 9948, Austin, TX 78766
AFFILIATION: Radian Corp., Austin, Tex. (USA)
MONITORING AGENCY: Federal Energy Administration, Washington, D.C. (USA)
DIVISICN: Office of Environmental Analysis, Energy Resource Development
MONITOR: Pell, Jerry
TELEPHONE: F566-9392
TYPE OF FUNDING: Contract No.-CO-05-60569-00/Task 3
77 FUNDING: Federal Energy Administration FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Under Section 4 of ESECA, EPA was tasked with reviewing all State Implementation Plans for potential overkill and with advising states of its results. The EPA summary released in July 1975 is inadequate because it fails to address those air quality control regions which had insufficient data or which were rated marginal or poor. In addition, on August 27, EPA promulgated SIP's for Ohio employing new methods for SIP development. Since these methods were not applied to the incomplete ESECA Reviews, FEA finds this exercise necessary in order to encourage coal utilization in the ESECA Program.
APPROACH: Radian shall become familiar with the ESECA Section 4 Reviews for each state and the Summary Report and shall evaluate the methodology and results. Those states which were rated ''poor'', ''N.A.'', or ''marginal'' in the Reviews, but appear to have revision potential on the basis of the Ohio methodology, shall be identified. To the extent that a quantification of the impact of SIP revision on allowable coal sulfur is possible, that value shall be listed along with the identification of State SIP revision potential. In addition, Radian will develop instructions for applying the Ohio methodology to existing State SIP's in order that FEA can give guidance to states in effecting SIP revisions.
PROJECT MILESTONES: Final report expected 30 Sept 1977.
KEYWORDS: AIR POLLUTION;AEROSOLS;PARTICLES;METEOROLOGY;EMISSION;ECONOMICS;SULFUR DIOXIDE;STANDARDS;IMPLEMENTATION;US EPA;POLLUTION REGULATIONS;COAL INDUSTRY;MANAGEMENT;ENVIRONMENTAL IMPACTS

<100026>
TITLE: Five Tasks Related to Air and Water Quality Impacts from Energy Resource Development
PROJECT NUMBER: CO-05-60574-00
PRINCIPAL INVESTIGATOR: Burd, R.M.
ADDRESS: Manor Oak Two, 1910 Cochran Road, Pittsburgh, PA 15220
AFFILIATION: NUS Corp., Pittsburgh, Pa. (USA). Cyrus William Rice Div.
MONITORING AGENCY: Federal Energy Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Analysis, Energy Resource Development
MONITCR: Pell, Jerry
TELEPHONE: F566-9392
TYPE OF FUNDING: Contract No.-CO-05-60574-00, Tasks 7,8,9,10,11
77 FUNDING: Federal Energy Administration FY77:$169,000
TECHNOLOGY: FOSSIL FUEL/General (80%);NUCLEAR/General (20%)
ENERGY CYCLE: EXTRACTION (20%);TRANSPORTATION (20%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (50%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide (20%);PARTICULATES/Dust (20%);HEAT, THERMAL/From power plants (40%);SPECIFIED OTHER POLLUTANTS/Hydrocarbons (20%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST:
BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: Five studies on the subjects of: Technologies available for control of emissions of fugitive dust from surface mining operations; Technical analysis of Court of Appeals decision in Appalachian Power Co. vs. Train re the Federal Water Pollution Control Act; Water resource requirements of air pollution control technologies; Technical analyses of proposed amendments to the Federal Water Pollution Control Act; and Technical analysis of available technologies for air and water pollution controls on petroleum facilities.

PROJECT MILESTONES: Final reports for all 5 tasks expected 30 Sept 1977.
KEYWORDS: AIR QUALITY;WATER QUALITY;EARTH ATMOSPHERE;ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL IMPACTS;SULFUR DIOXIDE;HYDROCARBONS;AIR POLLUTION CONTROL;POLLUTION CONTROL EQUIPMENT;LEGAL ASPECTS;FEDERAL WATER POLLUTION CONTROL ACT;WATER REQUIREMENTS;PETROLEUM INDUSTRY;TECHNOLOGY ASSESSMENT;AIR POLLUTION;WATER POLLUTION;CONTROL;REMOVAL;SCRUBBERS;PARTICLES;DUSTS;WASTE MANAGEMENT;WATER RESOURCES

<100027>
TITLE: Analysis of Energy Resource Development Impacts of Clean Air Act Amendments and Related EPA Activities
PROJECT NUMBER: CR-05-70028-00
PRINCIPAL INVESTIGATOR: Murphy, B.L.
ADDRESS: 696 Virginia Road, Concord, MA 01742
AFFILIATION: Environmental Research and Technology, Inc., Concord, Mass. (USA)
MONITORING AGENCY: Federal Energy Administration, Washington, D.C. (USA)
DIVISION: Office of Environmental Analysis, Energy Resource Development
MONITOR: Bell, Jerry
TELEPHONE: F566-9392
TYPE OF FUNDING: Contract No.-CR-05-70028-00
77 FUNDING: Federal Energy Administration FY77:$55,000
TECHNOLOGY: FOSSIL FUEL/General (90%);NUCLEAR/General (10%)
ENERGY CYCLE: COMBUSTION OR END USE (20%);ELECTRICITY GENERATION (80%)
POLLUTANTS: NOXIOUS GAS/Sulfur dioxide (70%);PARTICULATES/Dust (15%);SPECIFIED OTHER POLLUTANTS/Hydrocarbons (15%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);ANALYTICAL (80%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The contractor shall, in collaboration with, and under the guidance of, the GTR, perform technical analyses of the implications for energy resource development, in terms of balancing energy and economic considerations with environmental objectives, of the following EPA emerging policies and regulatory directives: (a) Significant Deterioration; (b) Compliance Date Extensions; and (c) Proposed Guideline on Air Quality Models.
APPROACH: Some of the other issues include regulatory and administrative delays, choice of atmospheric dispersion models, allocation/partitioning of the increments, natural violations, and other pollutants. Methods of enforcing prevention of significant deterioration is of particular concern. The concept itself is new and innovative enforcement techniques will be necessary. It is important that we examine these techniques to ensure that they do not exacerbate a concept already thought to be restrictive of economic growth. The contractor shall also address the following additional issues: procedural delays; methods of enforcement; other pollutants; and number of Class I areas.
PROJECT MILESTONES: (1) Interim report Oct. 15, 1977. (2) Draft final report Dec. 31, 1977. (3) Final report Feb. 28, 1978.
KEYWORDS: ENERGY SOURCE DEVELOPMENT;ENVIRONMENTAL IMPACTS;CLEAN AIR ACT;IMPLEMENTATION;PLANNING;MANAGEMENT;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;ENERGY MODELS;ECONOMIC IMPACT;ENFORCEMENT;SULFUR DIOXIDE;DUSTS;PARTICLES;AEROSOLS;HYDROCARBONS;AIR QUALITY;SCRUBBING;METEOROLOGY;NITROGEN OXIDES;EMISSION;CHEMICAL EFFLUENTS;FOSSIL FUELS

National Science Foundation

<110001>
TITLE: Characterization of Contaminants in Oil Shale Residuals and the Potential for Their Management to Meet Environmental Quality Standards
PROJECT NUMBER: ENV75-00175-A05
PRINCIPAL INVESTIGATOR: Schmidt, J.J.
ADDRESS: University Park, Denver, CO 80210
AFFILIATION: Denver Research Inst., Colo. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Advanced Environmental Research and Technology
77 FUNDING: National Science Foundation FY77:$20,000
TECHNOLOGY: FOSSIL FUEL/Oil Shale (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: ORGANICS/POM (50%);SPECIFIED OTHER POLLUTANTS/Carbonaceous ash (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater
PROJECT DESCRIPTION: This research is directed toward providing information needed for management of residual spent shale to minimize environmental impact. This is an award to supplement NSF Grant No. ENV 75-00175A04 for the purpose of utilizing its results to design a monitoring strategy for in situ oil shale retorting processes.
KEYWORDS: OIL SHALE INDUSTRY;WASTE MANAGEMENT;POLLUTION REGULATIONS;QUALITY ASSURANCE;ENVIRONMENTAL IMPACTS;CHEMICAL EFFLUENTS

<110002>
TITLE: Nature and Role of Polymetallic Clusters in Oxidation Catalysis
PROJECT NUMBER: ENG76-00699-A01
PRINCIPAL INVESTIGATOR: Carberry, J.J.;Kuczynski, G.C.
ADDRESS: Notre Dame, IN 46556
AFFILIATION: Notre Dame Univ., Ind. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Engineering
77 FUNDING: National Science Foundation FY77:$31,600
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS/CO (40%);METALS/Cu;METALS/Ir;METALS/Au;METALS/Pt;METALS/Ag (60%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater
PROJECT DESCRIPTION: It is planned to study the environmentally important oxidations of CO and olefins as

catalysed by Pt and Ag, each alloyed (clustered) with co-metallics such as Cu, Ir, Au, with the goal of securing effective low and high temperature activity-selectivity in the presence of poisons. Further, resistance to sintering will be systematically employed.
APPROACH: The state and nature of prepared clusters will be ascertained by selective chemisorption, titration, reaction, specificity, ESCA-Auger spectroscopy and both scanning electron and transmission electron microscopy.
KEYWORDS: ETHYLENE;OXIDATION;CATALYTIC EFFECTS;CARBON MONOXIDE;SILVER;COMBUSTION;PROPYLENE;PLATINUM;COPPER;IRIDIUM;GOLD;ALKENES;CATALYSIS;POLLUTION CONTROL EQUIPMENT

<110003>
TITLE: Diagenesis of Pelagic Siliceous Sediments
PROJECT NUMBER: OCE76-02128-A01
PRINCIPAL INVESTIGATOR: Kastner, M.
ADDRESS: P.O. Box 109, San Diego, CA 92037
AFFILIATION: California Univ., San Diego (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Ocean Sciences
77 FUNDING: National Science Foundation FY77:$33,600
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Inorganics (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
PROJECT DESCRIPTION: This project is a two-stage experimental study examining the chemical controls on the formation of different types of siliceous rocks. These rocks, commonly called cherts or porcelanities, are rather common in deep-sea sediments and in certain continental regions form important petroleum reservoir rocks.
APPROACH: In the first stage of this study, the chemistry and mineralogy of siliceous organisms will be determined and low temperature hydrothermal experiments will determine the effects of carbonate and clay minerals on the crystallization process. The second stage will examine the effect of various inorganic impurities on the chemical reactions in marine and fresh water environments and extend the laboratory studies to Deep Sea Drilling Project samples.
RESULTS: Results from this project will provide significant insight into both the origin and evolution of these sedimentary rock sequences.
KEYWORDS: ROCKS;PETROLEUM;GEOCHEMISTRY;OCEANOGRAPHY;SEDIMENTS;PETROLOGY;CRYSTALLIZATION;OFFSHORE DRILLING

<110004>
TITLE: Sources, Transformation, and Chemical Nature of Atmospheric Pollutants
PROJECT NUMBER: ENV75-02667-A05
PRINCIPAL INVESTIGATOR: Gordon, G.E.
ADDRESS: School of Arts and Sciences, College Park, MD 20742
AFFILIATION: Maryland Univ., College Park (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Advanced Environmental Research and Technology
77 FUNDING: National Science Foundation FY77:$393,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO;NOXIOUS GAS/O3;NOXIOUS GAS/NOx;NOXIOUS GAS/HC (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
PROJECT DESCRIPTION: This is a continuation of work under Grants GI-36338 and ENV75-02667 A04 on the trace elements and polycyclic aromatic hydrocarbons in size-graded particulates emitted by power plants (coal- and oil-fired), municipal refuse and sewage-sludge incinerators, automotive traffic, airports, and the rural background. The objective is to identify sources of toxic elements and to trace the origins of ambient particulates. A second objective is to elucidate certain aspects of homogeneous gas reactions in polluted air and to determine the conditions that control ozone formation in power-plant and industrial plumes.
APPROACH: This grant extends the study to the combustion of refuse-derived fuel and to industrial sources represented by steel-making, petroleum refining, cement manufacture, and nonferrous smelting. Trace elements are analyzed by neutron activation and atomic absorption. Polycyclic aromatic hydrocarbons are measured in the particulate and gas phases. Studies in the meteorological forecasting of stagnation periods will assist in evaluating the significance of the source emissions. Studies of rainfall pH will attempt to correlate the acidity of rain with the chemistry of power plant emissions. Aircraft sampling will be continued to elucidate the factors controlling the appearance of ozone bulges in power plant and industrial plumes by coordinated measurements of ozone, hydrocarbons, nitrogen oxides, carbon monoxide, humidity, condensation nuclei, and temperature.
KEYWORDS: POLYCYCLIC AROMATIC HYDROCARBONS;ENVIRONMENTAL TRANSPORT;FOSSIL-FUEL POWER PLANTS;COAL;PETROLEUM;MUNICIPAL WASTES;SEWAGE;SLUDGES;INCINERATORS;AUTOMOBILES;EXHAUST GASES;FLUE GAS;AIRCRAFT;AIRPORTS;RURAL AREAS;OZONE;CHEMICAL REACTION KINETICS;AERIAL MONITORING

<110005>
TITLE: Chemical Model Systems for Dioxygenases
PROJECT NUMBER: CHE74-03096-A02
PRINCIPAL INVESTIGATOR: Brown, D.G.
ADDRESS: Moscow, ID 83843
AFFILIATION: Idaho Univ., Moscow (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Chemistry
77 FUNDING: National Science Foundation FY77:$23,500
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
PROJECT DESCRIPTION: The goal of the project is to devise chemical systems which will be models for the aromatic dioxygenases. Synthetic work will be directed toward synthesizing complexes with a predetermined structure and anticipated reactivity. Special emphasis will be placed on gaining a complete understanding of the oxidative aromatic ring cleavage reaction which has been discovered.
APPROACH: Work will be aimed at expanding the types of systems which react with O2 to give ring opening and to make the reaction catalytic. Potential applications of this dioxygenase-like chemistry include: (a)

develcpment of synthetically useful mild ring opening reactions; (b) formulation of a chemical means of oxidatively degrading aromatic pollutants; (c) a new approach to bleaching; (d) understanding the pathways of oxidative aromatic degradation; and (e) homogeneous catalysis as related to U.S. energy problems.
KEYWORDS: AROMATICS;OXIDATION;DECOMPOSITION;BLEACHING;POLLUTION;CATALYSIS;CHEMICAL REACTION KINETICS;HYDROCARBONS;CONTROL

<110006>
TITLE: Effects of Cadmium, Polychlorinate and Biphenyl Chlorinated Naphthalene on Mollusks from the Gulf of Mexicc
PROJECT NUMBER: OCE75-04890-A01
PRINCIPAL INVESTIGATOR: Neff, J.M.
ADDRESS: School of Science, College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA)
MONITORING AGENCY: National Science Fcundation, Washington, D.C. (USA)
DIVISION: Division of Ocean Sciences
77 FUNDING: National Science Foundation FY77:$55,600
POLLUTANTS: METALS/Heavy (50%);SPECIFIED OTHER POLLUTANTS/Hydrocarbons (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
PROJECT DESCRIPTION: The Biological Effects Program (BEP) is conducting laboratory studies to evaluate the effects of metals, petroleum, chlorinated hydrocarbons and phthalates on marine organisms. The objectives of this program are to determine which species, life cycle stages and physiological processes are most effected by various types of pollutants, and at what levels. In addition, the investigators are looking specifically for biological indicators which could be used as an early warning system to detect pollutant-induced perturbations in the open ocean.
APPROACH: This project intends to precisely define certain sublethal physiological responses particularly sensitive to pollutant-mediated perturbation in marine animals. Highly purified ''model pollutants'' representative of three major marine pollutant types will be evaluated. These include industrial chlorinated hydrocarbcns, hydrocarbon-type pollutants, and heavy metals.
RESULTS: Two types of sublethal responses will investigate the growth energetics and energy budgets of marine larvae, which involve measurements of growth rate, feeding, assimilation, respiration and excretion by marine larvae during exposure to sublethal concentrations of model pollutants, and the corticosteroid stress response in fish. Fish will be exposed to sublethal concentrations of the model pollutants and be monitored over an extended period of time for plasma cortisol, cholesterol and glucose, interrenal and hepatic ascorbic acid concentrations and hepatic microsomal mixed function oxidase activity. In addition, newly hatched larvae of fish will be exposed continuously to the pollutants for a month and monitored for evidence of ascorbic acid depletion and scurvy. These responses may, in turn, provide valuable early warning indices which indicate when pollutants have reached damaging levels in the oceans.
KEYWORDS: CADMIUM;ORGANIC CHLORINE COMPOUNDS;MOLLUSCS;BIOLOGICAL EFFECTS;METABOLISM;METALS;PETROLEUM;PHTHALATES;GENETIC VARIABILITY;PHYSIOLOGY;BIOLOGICAL INDICATORS;WATER POLLUTION;SEAS;HYDROCARBONS;DOSE-RESPONSE RELATIONSHIPS

<110007>
TITLE: Geochemical Ocean Sections Study--GEOSECS--Isotopic Measurements
PROJECT NUMBER: OCE76-05057-A01
PRINCIPAL INVESTIGATOR: Kroopnick, P.M.
ADDRESS: 2444 Dole St., Room 101, Honolulu, HI 96822
AFFILIATION: Hawaii Univ., Honolulu (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISICN: Division of Ocean Sciences
77 FUNDING: National Science Foundation FY77:$47,400
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: RADIATION (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: HYDROGRAPHIC AREAS/Deep ocean
PROJECT DESCRIPTION: The Geochemical Ocean Sections Study, GEOSECS, is a coherent oceanographic research program whcse purpose is to make detailed measurements of oceanic constituents at all depths along sections in the Atlantic and Pacific Oceans from the Arctic to the Antarctic. The purpose of these measurements is to provide, for the first time, a set of physical and chemical parameters measured on the same water and applying the same analytical techniques for each compound on an oceanwide basis.
APPROACH: This proposal will support the operation and maintenance of the laboratoy analyses for stable carbon and oxygen isotopes in total CO2 PCO2 and dissolved oxygen for GEOSECS samples. The data will be used to model the variations of in situ CO2 production, O2 consumption and organic particulate flux mineralization in the deep-sea. This will give accurate estimates of the proportions of deep-sea CO2 which comes from the mineralization of organic matter versus dissolution of CaCO3.
RESULTS: The results of these measurements will provide data for quantitative studies of oceanic diffusion and mixing against which the distribution of future levels of fission and waste products and other pollutants in the sea can be evaluated.
KEYWORDS: OCEANOGRAPHY;MATHEMATICAL MODELS;SEAWATER;PHYSICAL PROPERTIES;CHEMICAL COMPOSITION;DIFFUSION;MIXING;CARBON;OXYGEN;MINERAL CYCLING

<110008>
TITLE: Optimization of Environmental and Energy Related Systems
PROJECT NUMBER: ENG76-05191
PRINCIPAL INVESTIGATOR: Kortanek, K.O.
ADDRESS: 4400 5th Avenue, Pittsburgh, PA 15213
AFFILIATION: Carnegie-Mellon Univ., Pittsburgh, Pa. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. of Engineering
77 FUNDING: National Science Foundation FY77:$23,900
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
PROJECT DESCRIPTION: The research is principally concerned with the continued development of models and solution techniques for use in solving problems of environmental protection and energy conservation.
APPROACH: New control engineering models have been developed for optimizing air pollution abatement policies originally stemming from problems encountered in the Pittsburgh area. The basic control problem is to regulate the emission rate distribution of the polluting sources in order to achieve desirable air quality throughcut a geographic region. The optimization may be governed by any of a number of policy goals, such

as seeking a feasible emission distribution which minimizes the total economic-energy impact due to its implementation. This research concentrates on the related recovery problem of seeking solutions to integral equations having random disturbance terms by using a two-sided approximation of functions approach. Based on our Lagrangian interpolation study, the problem is focused for a (real) time-dependent analysis of system identification and adaptive-feedback control.
RESULTS: Numerical studies were made on the model in an attempt to find solutions. this led to new computational schemes and computer codes for solving extremum problems involving polynomial or orthogonal systems of functions, termed moment problems.
KEYWORDS: ENERGY MODELS;ENERGY CONSERVATION;SIMULATION;ENVIRONMENTAL ENGINEERING;AIR POLLUTION;OPTIMIZATION;AIR QUALITY;POLLUTION CONTROL;AIR POLLUTION ABATEMENT;AEROSOLS;PARTICLES;IMPLEMENTATION;ECONOMIC IMPACT;ENERGY CONSUMPTION;COMPUTER CODES;ENVIRONMENTAL IMPACTS;MATHEMATICAL MODELS;RECOVERY;POLLUTION CONTROL EQUIPMENT

<110009>
TITLE: Concentration Modulation for Remote Detection of Stack Pollutants
PROJECT NUMBER: ENG77-05308
PRINCIPAL INVESTIGATOR: Barnes, F.S.;Hu, C.J.
ADDRESS: 1200 University Avenue, Boulder, CO 80302
AFFILIATION: Colorado Univ., Boulder (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Engineering
77 FUNDING: National Science Foundation FY77:$12,200
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Smoke stack emissions (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
PROJECT DESCRIPTION: This investigation is concerned with the development of methods for enchancing detection schemes for remote monitoring of various pollutants emitted from smoke stacks and other sources.
APPROACH: The major technique to be investigated involves periodic modulation of the concentration of specific constituents in the sampled region by intense ultraviolet illumination combined with detection of infrared or other wavelength emissions from the modulation products. Signal to background emission noise enhancement is provided by differential detection and signal integration techniques. Electronic systems necessary to perform the signal processing will be constructed and measurements will be made on the gases NO2, SO2, and NH3.
KEYWORDS: STACK DISPOSAL;GASEOUS WASTES;AEROSOL MONITORING;REMOTE SENSING;INFRARED SPECTRA;NITROGEN DIOXIDE;SULFUR DIOXIDE;AMMONIA;AIR POLLUTION;ELECTRONIC EQUIPMENT

<110010>
TITLE: Research Initiation and Support (RIAS)
PROJECT NUMBER: SER77-06579
PRINCIPAL INVESTIGATOR: Kruger, C.H.
ADDRESS: School of Engineering, Palo Alto, CA 94305
AFFILIATION: Stanford Univ., Calif. (USA). School of Engineering
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. of Science Education Resources Improvement
77 FUNDING: National Science Foundation FY77:$39,400
PROJECT DESCRIPTION: The specific objectives of the project are: (1) to establish a combustion sciences laboratory to serve as a training and research facility, (2) to develop a supporting teaching and directed study program, (3) to provide new opportunities for initiation of combustion research by young scientist, and (4) to establish co-operative programs with industrial and government research laboratories for the purpose of education, technology transfer and project evaluation.
APPROACH: A research and training program in combustion science will be initiated. Particular emphasis will be placed on fundamental combustion problems related to energy utilization and pollutant emissions.
RESULTS: The combustion program will become an integral part of Stanford's educational and research activities in energy-related fields and will significantly strengthen the training and research program in the increasingly important area of energy science.
KEYWORDS: COMBUSTION KINETICS;EDUCATION;POLLUTION;THERMAL EFFLUENTS;CHEMICAL EFFLUENTS;GASEOUS WASTES;LIQUID WASTES;TECHNOLOGY TRANSFER;EVALUATION;ENERGY SOURCES;COAL;NATURAL GAS;PETROLEUM;COMBUSTION PRODUCTS;ENVIRONMENTAL IMPACTS

<110011>
TITLE: Distribution of Spilled Oil in Relation to Beach Morphology
PROJECT NUMBER: ENV76-06898 A01
PRINCIPAL INVESTIGATOR: Hayes, M.O.
ADDRESS: Administration Bldg., Room 115, Columbia, SC 29208
AFFILIATION: South Carolina Univ., Columbia (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. of Advanced Environmental Research and Technology
77 FUNDING: National Science Foundation FY77:$9,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Oil spill (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global;COASTS/Other coasts All
PROJECT DESCRIPTION: This additional research is designed to measure the rate by revisiting the beaches six months after the original trip and re-measuring the beach profiles using the permanent survey points as reference markers.
RESULTS: Under the present NSF grant, the beaches have already been classified, profiles drawn, oil distribution defined, and permanent survey markers installed. Much oil is being removed by beach erosion which removes sediment and the included oil. The oil is then lost to the water and the resulting clean sediment is washed up onto another beach. This process of erosion and deposition is continuous and results

in a clean-up of those beaches subject to erosion. At other beaches, the oil in place is being covered by fresh sediment being washed in. Although this erosion-deposition process is understood, the rate at which it occurs is not.
KEYWORDS: OIL SPILLS;SHORES;MORPHOLOGICAL CHANGES;ENVIRONMENTAL TRANSPORT;PETROLEUM;ENVIRONMENTAL EFFECTS;SEDIMENTS;EROSION;WEATHERING;SHAPE;COASTAL REGIONS

<110012>
TITLE: Research Initiation and Support
PROJECT NUMBER: SER77-06904
PRINCIPAL INVESTIGATOR: Boyer, D.L.
ADDRESS: P.O. Box 3435, University Station, Laramie, WY 82070
AFFILIATION: Wyoming Univ., Laramie (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. of Science Education Resources Improvement
77 FUNDING: National Science Foundation FY77:$67,500
TECHNOLOGY: FOSSIL FUEL/Coal (50%);GENERAL SCIENCE (50%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
PROJECT DESCRIPTION: The goals of the program are to establish an institutional framework whereby young scientists and students of diverse academic backgrounds can (1) attack, as a team, some of the critical problems relating to energy development and environmental impact now facing the nation; and in the process to (2) develop a dynamic interdisciplinary academic program in the area of energy and the environment.
APPROACH: The initial task force will consider the broad area of coal derived energy transport alternatives. Faculty from the following academic departments will participate on the Coal Task Force: Atmospheric Science, Civil Engineering, Economics, Geography, Mechanical Engineering, Sociology and Zoology/Physiology.
KEYWORDS: WYOMING;ENERGY SOURCE DEVELOPMENT;ECONOMIC IMPACT;ENVIRONMENTAL IMPACTS;SOCIAL IMPACT;USA;EVALUATION;EDUCATION;COAL INDUSTRY;ECONOMICS;ENGINEERING;SOCIOLOGY;ECOSYSTEMS;GEOGRAPHY;EARTH ATMOSPHERE;ENERGY;ENVIRONMENT

<110013>
TITLE: Reactor and Crossed-Jet Studies of the Dynamics of Free-Radical Reactions
PROJECT NUMBER: CHE76-09574 A03
PRINCIPAL INVESTIGATOR: Bowman, J.M.
ADDRESS: 3300 S. Federal Street, Chicago, IL 60616
AFFILIATION: Illinois Inst. of Tech., Chicago (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. of Chemistry
77 FUNDING: National Science Foundation FY77:$50,700
TECHNOLOGY: GENERAL SCIENCE (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
PROJECT DESCRIPTION: The objective of the planned research is to obtain new and useful quantitative information of the elementary gas reactions of polyatomic organic free radicals which are important reactive intermediates in high temperature combustion, and which are also involved in the transformation undergone by gaseous substances emitted into the atmosphere by man's activities.
APPROACH: Complementary quantitative studies are planned which will probe both the sources and sinks of polyatomic free radicals. The reactions of O atoms and OH radicals with gaseous organic molecules will be studied in heated crossed jets, and the free radicals produced will be detected and identified using a special photoionization mass spectrometer designed and built for these studies. These experiments will directly determine the open reactive routes of these reactions. Rate constants for the individual routes of each reaction will be measured at several temperatures in separate experiments using a heatable fast-flow reactor to quantitatively establish the relative importances of the separate routes of each reaction and how they vary with temperature.
RESULTS: Subsequent reactions undergone by these reactive polyatomic free radicals will be also quantitatively studied using a new photochemical reactor as well as with a new relaxation technique developed especially to obtain this kind of information.
KEYWORDS: RADICALS;COMBUSTION KINETICS;CHEMICAL REACTION KINETICS;ORGANIC COMPOUNDS;GASEOUS WASTES;COMBUSTION PRODUCTS;JETS;PHOTOCHEMICAL OXIDANTS;EARTH ATMOSPHERE

<110014>
TITLE: Hydrogen Sulfide and Reduced Forms of Sulfur in Air
PROJECT NUMBER: ENV76-09585-A02
PRINCIPAL INVESTIGATOR: Braman, R.S.
ADDRESS: 4202 E. Fowler Avenue, Tampa, FL 33620
AFFILIATION: Florida State Univ., Tampa (USA). School of Natural Sciences
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Advanced Environmental Research and Technology
77 FUNDING: National Science Foundation FY77:$42,500
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Sulfur compounds (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
PROJECT DESCRIPTION: The proposed research is aimed at developing convenient field methods of sufficient sensitivity to permit getting quantitative values at ambient levels well above detection limits. This is necessary in order to arrive at reliable quantitative estimates of the natural biogenic contributions of hydrogen sulfide and other volatile sulfur compounds for comparison with man-made sources of atmospheric sulfur, such as combustion sources of sulfur dioxide. The ultimate goal is to provide methodology to help assess the relative contributions of natural and man-made precursors of toxic airborne sulfate particulates. This is an extension of Grant ENV-76-9585A01.
APPROACH: Analytical techniques to be evaluated include absorption of gaseous species in metal-coated beads with subsequent high-temperature expulsion into suitable detection systems, and selective retention and expulsion of certain sulfur species in gas-chromatographic columns. For solid particulate materials, experiments will be done by heating in inert gases, by acid treatments, by solvent extraction, and by heat treatment in the presence of hydrogen gas. Water and sediment samples will be handled by comparable methods.
KEYWORDS: HYDROGEN SULFIDES;SULFUR;ENVIRONMENTAL TRANSPORT;AEROSOL MONITORING;TERRESTRIAL ECOSYSTEMS;TOXICITY;CHEMICAL ANALYSIS;AIR POLLUTION MONITORS

<110015>
TITLE: Statistics and Origin of Haze in the Central United States
PROJECT NUMBER: ENV77-12125
PRINCIPAL INVESTIGATOR: Robinson, G.D.
ADDRESS: 275 Windsor Street, Hartford, CT 06120
AFFILIATION: Center for the Environment and Man, Inc., Hartford, Conn. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Advanced Environmental Research and Technology
77 FUNDING: National Science Foundation FY77:$49,600
TECHNOLOGY: SOLAR/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Haze (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Midwest
PROJECT DESCRIPTION: This research is investigating the frequency, intensity, nature and origin of atmospheric haze in an area in the midwest, and the reduction of available solar energy at the earth's surface by this haze.
APPROACH: Joint statistics of visual range, stability of the lower atmosphere, and cloud type and amount are being studied. This allows the estimation of the attenuation coefficient and scale height of the haze, and computation of the depletion of solar radiation. Validating evidence is being sought in the records of recent air quality programs in the St. Louis area. In addition to the statistical studies, a sample air quality model, previously developed by the investigators, is being used to investigate the origin of the haze and the proportion of sulfate to other particles. Validation of the model is sought in Environmental Protection Agency air quality records.
KEYWORDS: AIR QUALITY;USA;AEROSOLS;ENVIRONMENTAL IMPACTS;PARTICLES;CLIMATES;EARTH ATMOSPHERE;STABILITY;MATHEMATICAL MODELS;SULFATES

<110016>
TITLE: Case Studies of the Impact of Natural Resource Technologies on the Values of Two Contrasting Socio-Cultural Communities
PROJECT NUMBER: OSS76-13158
PRINCIPAL INVESTIGATOR: Caldwell, L.K.
ADDRESS: Memorial Hall, Bloomington, IN 47401
AFFILIATION: Indiana Univ., Bloomington (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Office of Science and Society
77 FUNDING: National Science Foundation FY77:$35,500
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Mining residue (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Northwest
APPROACH: The studies will focus upon the ethical and human value implications of the scientific findings and technolcgies pertinent to the cases in question among the social groups directly and immediately affected.
RESULTS: This project will generate two in-depth comparative studies of the impact of science-based technologies upon the values, life-styles, and environmental conditions of contrasting social/cultural communities: (a) the Reserve Mining operations on Lake Superior, and (b) the Garrison Diversion Project in North Dakota.
KEYWORDS: HUMAN POPULATIONS;COMMUNITIES;SOCIOLOGY;ECONOMIC DEVELOPMENT;COMPARATIVE EVALUATIONS;SOCIO-ECONOMIC FACTORS;ENVIRONMENTAL IMPACTS;LAKE SUPERIOR;NORTH DAKOTA;CONSTRUCTION;FRESH WATER;MANAGEMENT;ENERGY SOURCE DEVELOPMENT;MINING;USA;TERRESTRIAL ECOSYSTEMS

<110017>
TITLE: System Control of Anabiotic and Catabiotic Phenomena in the Below-Ground Ecosystem
PROJECT NUMBER: DEB75-13468 A02
PRINCIPAL INVESTIGATOR: Coleman, D.C.;Hunt, H.W.
ADDRESS: Fcrt Cclins, CO 80521
AFFILIATION: Colorado State Univ., Fort Collins (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. cf Environmental Biology
77 FUNDING: National Science Foundation FY77:$166,200
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial
PROJECT DESCRIPTION: This research will describe and quantify the interconnections between the dominant energy and nutrient flow pathways in the below-ground portion of a grassland ecosystem. It is conceptually based on a complex, two-phase paradigm of system anabolism or primary production, and system catabolism or heterotrophy centered chiefly on biophagic grazing on roots and saprophagic activity and its attendant grazing phenomena.
APPROACH: Using microcosms and simulation modeling approaches to better conceptualize and examine key processes, four key areas will be examined: (1) Root growth, exudation, and respiration; (2) Root grazing; (3) Microbial productivity, turnover, and mineralization; and (4) Saprophagic grazing, and subsequent release of available minerals. With a series of controlled experiments microcosms (in the first two years) will be treated with varied moisture and temperature regimes and with atmospheric pollutants (e.g., SO2, NO2, O3). Subsequently, in the third year (1977--1978) field studies with similar variables are anticipated using portions of the Ecosystem Stress Area (ESA) on the Pawnee Site (shortgrass prairie).
KEYWORDS: TERRESTRIAL ECOSYSTEMS;BIOLOGICAL MODELS;GRASS;SOILS;NUTRIENTS;SIMULATION;ROOTS;PLANTS;MINERAL CYCLING;SULFUR DIOXIDE;NITROGEN DIOXIDE;OZONE;ENVIRONMENTAL TRANSPORT

<110018>
TITLE: Information Support Services for Chemical Threats to Man and the Environment Program
PROJECT NUMBER: ENV76-14776 A02
PRINCIPAL INVESTIGATOR: Ross, R.H.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. of Advanced Environmental Research and Technology
77 FUNDING: National Science Foundation FY77:$90,000
PROJECT DESCRIPTION: The information Center Complex of Oak Ridge National Laboratory is providing a variety

of information support services to the NSF-RANN program on Chemical Threats to Man and the Environment intended for the broad community of users of the information generated by program research.
APPROACH: The services include: (1) the preparation of overview documents summarizing current literature on halogenated organic compounds, focusing on the organohalides of strategic environmental and human health concern; (2) the publication and distribution of a bimonthly abstract journal and newsletter covering all research results published by the Chemical Threats program grantees; (3) the annual publication of the Chemical Threats Directory of program participants; (4) the management of a technical information system file and (5) the operation of an environmental response and referral center which provides literature searches, bibliographies, summaries of information and replies to specific questions requested by the community of researchers, governmental agencies, industrial organizations and interested individuals concerned with the environmental and human health aspects of trace contaminants.
KEYWORDS: MAN;HEALTH HAZARDS;METABOLISM;BIOLOGICAL EFFECTS;ENVIRONMENT;INFORMATION SYSTEMS;ORGANIC HALOGEN COMPOUNDS;DATA COMPILATION;CHEMICAL EFFLUENTS;DATA PROCESSING;INFORMATION RETRIEVAL;BIBLIOGRAPHIES;INFORMATION CENTERS;POLLUTION;TOXICITY

<110019>
TITLE: Research Initiation and Support--Organization of a Resource Recovery Experimentation Station
PROJECT NUMBER: SER76-18251
PRINCIPAL INVESTIGATOR: Rhyner, C.R.
ADDRESS: School of Environmental Sciences, Green Bay, WI 54301
AFFILIATION: Wisconsin Univ., Greenbay (USA). Coll. of Environmental Sciences
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Science Education Resources Improvement
77 FUNDING: National Science Foundation FY77:$50,700
TECHNOLOGY: GENERAL SCIENCE (100%)
PROJECT DESCRIPTION: The project is designed to improve the master's degree training program in waste management at the University of Wisconsin at Green Bay. Grant funds will be used not only to improve the academic curriculum, but also to equip a resource recovery experimentation station.
RESULTS: The availability of station facilities will enable graduate students to investigate alternative methods of processing and disposing of liquid and solid wastes from the standpoint of available and future technologies, total energy requirements, economics, resource recovery, and benefits or detriments to the environment.
KEYWORDS: WASTE MANAGEMENT;EDUCATION;EQUIPMENT;RESOURCE CONSERVATION;RESOURCES;RECOVERY;MATERIALS RECOVERY;LIQUID WASTES;ENERGY DEMAND;ECONOMICS;ENVIRONMENTAL IMPACTS;ENERGY CONSERVATION;ENERGY FACILITIES;TECHNOLOGY ASSESSMENT

<110020>
TITLE: Inadvertent Weather Modification by Effluents from Coal-Fired Electric Power Plants
PROJECT NUMBER: ENV75-19701
PRINCIPAL INVESTIGATOR: Hobbs, P.;Radke, L.F.
ADDRESS: C301 Health Sciences Building, Seattle, WA 98105
AFFILIATION: Washington Univ., Seattle (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Advanced Environmental Research and Technology
77 FUNDING: National Science Foundation FY77:$90,700
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (40%);SPECIFIED OTHER POLLUTANTS/Water vapor (10%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
PROJECT DESCRIPTION: The objective of the study is to determine the effects on visibility, clouds and precipitation of the effluents (particles, gases, heat and water vapor) from modern coal-power plants.
APPROACH: Measurements will be made from a research aircraft which is equipped with state-of-the-art instrumentation for measuring particles, gases and the structure and microphysics of clouds. Particular attention will be paid to the effluents from the plants and their effects on drop size distributions, ice particles and the production of precipitation in clouds located downwind from the power plants.
RESULTS: The data obtained will be analyzed to determine the difference in cloud processes and precipitation of ambient vs. prevailing conditions as a result of the plume contaminants. Results from this project should aid in the evaluation of the environmental effects of power plants and help in the siting of new power plants.
KEYWORDS: WEATHER;MODIFICATIONS;ENVIRONMENTAL IMPACTS;FOSSIL-FUEL POWER PLANTS;AIR POLLUTION;AEROSOLS;COAL;ATMOSPHERIC PRECIPITATIONS;PLUMES;SITE SELECTION

<110021>
TITLE: Supplement to Mercury in the Environment at Almaden, Spain
PROJECT NUMBER: INT75-21284
PRINCIPAL INVESTIGATOR: Huckabee, J.W.
ADDRESS: P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of International Programs
77 FUNDING: National Science Foundation FY77:$5,200
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS/Mercury (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater
PROJECT DESCRIPTION: This supplement will allow the completion of work begun three years ago, involving scientists from the Oak Ridge National Laboratory in cooperation with their colleagues of the Mines of Almaden in Spain. This is an ecological study of mercury in both the terrestrial and aquatic ecosystems in the vicinity of Almaden with the objective of defining the range of mercury concentrations in critical ecosystem compartments, identifying indicator species (if they exist), and charting the distribution of environmental mercury away from the mining area.
KEYWORDS: SPAIN;MERCURY;ECOLOGICAL CONCENTRATION;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;WATER QUALITY;AIR QUALITY;ENVIRONMENT

<110022>
TITLE: Precise Experimental Determination of the Carbon Dioxide Buffer Factor of Sea Water
PROJECT NUMBER: OCE74-21496-A02
PRINCIPAL INVESTIGATOR: Keeling, C.D.
ADDRESS: P.O. Box 1529, San Diego, CA 92038
AFFILIATION: California Univ., San Diego (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Ocean Sciences
77 FUNDING: National Science Foundation FY77:$16,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/CO2 (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Marine
APPROACH: A series of precise measurements of K1, K2, and the buffer factor will be made by relating by direct measurement, variations in CO2 partial pressure, alkalinity, and total inorganic carbon in the range 0 to 30 degrees, at varying salinities. In the proposed study, pH measurements will be included as an adjunct to overdetermine the chemical system and ferret out and eliminate any systematic errors.
RESULTS: The accuracy of knowledge of the CO2 buffer factor should be increased by at least a factor of ten, possibly by a factor of 50. The accuracy of prediction of carbonate solubilities should be improved and substantially a better measure of pH at low temperatures where conventional electrode experiments are not reliable will be provided.
KEYWORDS: CARBON DIOXIDE;SEAWATER;ENVIRONMENTAL EFFECTS;OCEANOGRAPHY;CHEMICAL COMPOSITION;MATHEMATICAL MODELS;COMBUSTION PRODUCTS;ENVIRONMENTAL TRANSPORT

<110023>
TITLE: Social and Psychological Effects of Rapid Community Development (Doctoral Dissertation)
PROJECT NUMBER: SOC76-21871
PRINCIPAL INVESTIGATOR: Freudenburg, W.R.;Erikson, K.T.
ADDRESS: 206 Elm, New Haven, CT 06520
AFFILIATION: Yale Univ., New Haven, Conn. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Social Sciences
77 FUNDING: National Science Foundation FY77:$1,800
PROJECT DESCRIPTION: This study examines social and social psychological responses to the stress of rapid physical and economic growth acccompanying coal development in four western U.S. towns.
APPROACH: By simultaneously examining four towns which were initially similar but are now at different stages of the develcpment seguence, the study is able to make quasilongitudinal comparisons. A year of ethnographic observation is followed by interviews with approximately 900 respondents distributed among the four communities. Particular emphasis is placed on participants' assessment of their personal and social well-being.
KEYWORDS: BEHAVIOR;ENERGY SOURCE DEVELOPMENT;COAL INDUSTRY;USA;ECONOMIC IMPACT;COMPARATIVE EVALUATIONS;HUMAN POPULATIONS;COMMUNITIES;URBAN AREAS;SOCIAL IMPACT;ENVIRONMENTAL IMPACTS;ECONOMIC DEVELOPMENT;PUBLIC OPINION;MANPOWER

<110024>
TITLE: Special Foreign Currency Award (2,530,000 Polish Zlotys) to Study Flame and Detonation Propagation in Coal, Dust, Methane, Air-Mixtures
PROJECT NUMBER: INT-75-22131
PRINCIPAL INVESTIGATOR: Wojcicki, S.
ADDRESS: Pl. Jednosci Robotniczej 1, Warsaw, Poland, XX
AFFILIATION: Politechnika Warszawska (Poland)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. of International Programs
77 FUNDING: National Science Foundation FY77:$42,300
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: PARTICULATES/Coal dust (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
PROJECT DESCRIPTION: This cooperative research program between the Technical University of Warsaw and the University of Michigan is concerned with some fundamental aspects of coal mine explosions and is a natural outgrowth of other combustion and explosion work.
APPROACH: The study would concentrate on various mixtures of coal dust (ranging from a brown coal to a blast furnace coke) and gases (such as methane-oxygen-nitrogen). Analytical as well as experimental approaches would be employed, wherein the latter would be restricted to the university laboratory type investigations. The Warsaw group would investigate the transition from a flame to a detonation, the dust ignition phenomena, and the burning time of the coal particles; the Michigan group would investigate the propagation of a coal dust detonation, the ignition of coal particles behind a shock wave, and the energy release required for detonation.
KEYWORDS: COAL FINES;METHANE;AIR;FLAME PROPAGATION;DETONATIONS;IGNITION;SHOCK WAVES;COORDINATED RESEARCH PROGRAMS;POLAND;USA

<110025>
TITLE: Fundamental Aspects of Flame and Detonation Propagation in Coal Dust, Methane, Air Mixtures
PROJECT NUMBER: ENG-76-22958
PRINCIPAL INVESTIGATOR: Nicholls, J.A.
ADDRESS: School of Engineering, Ann Arbor, MI 48106
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Div. of Engineering
77 FUNDING: National Science Foundation FY77:$60,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);ANALYTICAL (50%)
PROJECT DESCRIPTION: The research covers primarily three phases: (1) Shock Wave Ignition and Burning Time of Coal Particles. (2) Propagation of Detonation in Coal Dust--Methane--Air Mixtures. (3) Blast Wave Initiation of Detonation.
APPROACH: Under No. 1 above, an important aim will be to identify the contribution of the reaction of the

volatiles of the coal as compared to heterogeneous surface reaction. Theoretical support of the experimental work will consist of the calculation of the rate of heat transfer to the particles and the acceleration of the particles by the flow behind the shock. Under No. 2, above, to extent possible uniform particles of coal will be injected into a shock tube. The prime variables to be investigated will include type of coal, particle size, particle loading fraction, oxidizer concentration and methane concentration. Experimental measurements will be made. A mathematical model will be used to interpret the experimental data. Under No. 3 above, the research deals with the phenomena of a blast wave which is basically a shock wave followed by an expansion zone. The blast wave is to be calibrated using planar blast wave theory so that for any given operating condition the effective initiator energy will be known. The main information sought here will be the determination of whether detonation is realized or not.
KEYWORDS: COAL FINES;METHANE;FLAME PROPAGATION;DETONATIONS;AIR;CHEMICAL REACTION KINETICS;IGNITION;SHOCK WAVES;BENCH-SCALE EXPERIMENTS;MATHEMATICAL MODELS;COORDINATED RESEARCH PROGRAMS;USA;POLAND

<110026>
TITLE: Study of the Abundance of Carbon Dioxide in the Atmosphere and Its Exchange with the Ocean
PROJECT NUMBER: ATM76-23053
PRINCIPAL INVESTIGATOR: Keeling, C.O.
ADDRESS: P.O. Box 1529, San Diego, CA 92038
AFFILIATION: California Univ., San Diego (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Atmospheric Sciences
77 FUNDING: National Science Foundation FY77:$58,300
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/CO2 (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
PROJECT DESCRIPTION: A study of the content and variability of carbon dioxide in the earth's atmosphere and the exchange of carbon dioxide between the atmosphere and the oceans is proposed as a continuation of a program initiated during the International Geophysical Year and continued through 1974.
APPROACH: The prospect that fossil fuel combustion will lead to large increases in the concentration of atmospheric carbon dioxide over the coming decades has led to plans by several nations to investigate CO2 variation under the guidance of the World Meteorological Organization. The WMO has proposed a world wide network of stations to measure CO2 with the Scripps laboratory designated as the WMO central CO2 calibrating facility. To aid the WMO effort, support will go to maintain WMO primary reference gases, to provide secondary reference gases to national networks, and to participate in intercalibrations between national central laboratories and field stations.
RESULTS: Support will be given to aid the WMO effort by continuing observations of CO2 in equatorial regions and in the southern hemisphere and to carry out detailed model studies of the time-dependent carbon cycle.
KEYWORDS: CARBON DIOXIDE;ECOLOGICAL CONCENTRATION;ENVIRONMENTAL TRANSPORT;SEAWATER;MATHEMATICAL MODELS

<110027>
TITLE: Antarctic Tritium
PROJECT NUMBER: DPP76-23433
PRINCIPAL INVESTIGATOR: Ostlund, H.G.;Mason, A.S.
ADDRESS: 4600 Rickenbacker Causeway, Miami, FL 33149
AFFILIATION: Miami Univ., Fla. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Polar Programs
77 FUNDING: National Science Foundation FY77:$37,100
POLLUTANTS: NOXIOUS GAS/Hydrocarbons (50%);METALS/Tritium (50%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
PROJECT DESCRIPTION: The concentrations of tritium gas, tritiated water vapor, and tritiated hydrocarbons will be measured at the Clean Air Facility at South Pole Station in Antarctica during 1978 and 1979. In addition, airborne samples will be taken during the austral summers of 1977/78 and 1978/79 from one of the C-130 resupply aircraft.
APPROACH: In austral summer 1977/78, two people will install sampling equipment at South Pole Station, and one person will operate the sampling equipment on the C-130. In austral summer 1978/79, two persons will conduct measurements at South Pole Station and one will operate the equipment on the C-130.
RESULTS: This project is expected to yield (1) representative data for a global scale inventory of atmospheric tritium and its variation with time caused by releases from nuclear industry, (2) a measure of the amount of subsidence of stratospheric air as a part of the global circulation pattern of the atmosphere, and (3) information on the exchange of water between the air and drifting snow.
KEYWORDS: ANTARCTIC REGIONS;TRITIUM;RADIOECOLOGICAL CONCENTRATION;GASEOUS WASTES;WASTE WATER;HYDROCARBONS;AEROSOL MONITORING;RADIOACTIVE EFFLUENTS;NUCLEAR ENERGY;STRATOSPHERE;EARTH ATMOSPHERE;SNOW;PRECIPITATION SCAVENGING;RADIONUCLIDE MIGRATION;AIR QUALITY

<110028>
TITLE: Effects of Air Pollution on Epiphytic Cryptogams
PROJECT NUMBER: DEB76-24084
PRINCIPAL INVESTIGATOR: Hoffman, G.R.
ADDRESS: Vermillion, SD 57069
AFFILIATION: South Dakota Univ., Vermillion (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Environmental Biology
77 FUNDING: National Science Foundation FY77:$15,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/SO2 (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
APPROACH: Naturally occurring cryptogams can be useful as natural monitoring systems for levels of air pollution. This study will make use of cryptogams in the northern plains states to monitor sulfur dioxide

pollution from coal-fired power generators. Quantitative studies will show the demise of sensitive species from the vicinities of the generators and maps will be developed to correlate cryptogam species distributions with levels of sulfur dioxide pollution.
KEYWORDS: AIR POLLUTION;ENVIRONMENTAL IMPACTS;SULFUR DIOXIDE;MONITORING;FOSSIL-FUEL POWER PLANTS;BIOLOGICAL INDICATORS;PLANTS;BIOLOGICAL EFFECTS;GENETIC VARIABILITY;SULFUR DIOXIDE

<110029>
TITLE: Geochemical Ocean Sections Study--Geosecs--Sediment Dissolution, Model for Fossil Fuel CO2
PROJECT NUMBER: OCE76-81316
PRINCIPAL INVESTIGATOR: Hoffert, M.I.
ADDRESS: 421 1st Avenue, New York, NY 10012
AFFILIATION: New York Univ., N.Y. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Ocean Sciences
77 FUNDING: National Science Foundation FY77:$39,000
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO2 (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: HYDROGRAPHIC AREAS/Deep ocean
PROJECT DESCRIPTION: The Geochemical Ocean Sections Study, GEOSECS, is a coherent oceanographic research program whose purpose is to make detailed measurements of oceanic constituents at all depths from the Arctic to the Antarctic. The purpose of these measurements is to provide for the first time, a set of physical and chemical parameters measured on the same water and applying the same analytical techniques for each compound on an oceanwide basis. The results of these measurements will provide data quantitative studies of oceanic mixing and organic productivity and simultaneously serve as a baseline for the levels of fission and waste products being added to the sea.
APPROACH: The proposed study will further develop a model of these transport routes that will serve to predict the distribution of CO2 between the ocean and atmosphere over the next 50 or so years.
KEYWORDS: OCEANOGRAPHY;GEOCHEMISTRY;ARCTIC REGIONS;FOSSIL FUELS;ENVIRONMENTAL IMPACTS;CARBON DIOXIDE;ENVIRONMENTAL TRANSPORT;MATHEMATICAL MODELS;MINERAL CYCLING;ENERGY;FOOD;ECOLOGY;MANAGEMENT;COAL;PETROLEUM;SEAS;POLLUTION;MARINE DISPOSAL;BIOADSORBENTS;FISSION PRODUCTS;RADIOACTIVE WASTE DISPOSAL;BASELINE ECOLOGY;METEOROLOGY

<110030>
TITLE: Measurement of Sulfur Dioxide Oxidation on Particulate Surfaces
PROJECT NUMBER: ENV76-81817
PRINCIPAL INVESTIGATOR: Mohnen, V.A.
ADDRESS: 41 State Street, Albany, NY 12203
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Advanced Environmental Research and Technology
77 FUNDING: National Science Foundation FY77:$92,400
POLLUTANTS: NOXIOUS GAS/SO2 (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
PROJECT DESCRIPTION: The objective of this program is to develop and evaluate procedures for investigating the mechanisms and importance of sulfur dioxide oxidation on the surface of solid particulate matter of natural and anthropogenic origin.
APPROACH: Sulfate formation on well characterized particle and reference surfaces will be studied using molecular beams of sulfur dioxide, oxygen and water. Auger electron spectroscopy and mass spectroscopy will be used to measure the rate of product formation. It is anticipated that reaction rates and orders can be determined for a variety of surfaces during the course of this work. Surfaces to be examined include: carbon, oxides of vanadium, oxides of iron, and particulate matter collected from ambient air, power plant stacks, and laboratory flames.
KEYWORDS: SULFUR DIOXIDE;CHEMICAL REACTION KINETICS;PARTICLES;AEROSOLS;OXIDATION;ELECTRON SPECTROSCOPY;MASS SPECTROSCOPY;CARBON;VANADIUM OXIDES;IRON OXIDES;AIR POLLUTION;FLUE GAS;FOSSIL-FUEL POWER PLANTS;FLAMES;ENVIRONMENTAL IMPACTS

<110031>
TITLE: Geochemical Ocean Sections Study--GEOSECS--Sediment Dissolution (Model for Fossil Fuel CO2)
PROJECT NUMBER: OCE76-82035
PRINCIPAL INVESTIGATOR: Takahashi, T.;Broecker, W.S.
ADDRESS: Palisades, NY 10964
AFFILIATION: Columbia Univ., Palisades, N.Y. (USA). Lamont-Doherty Geological Observatory
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Ocean Sciences
77 FUNDING: National Science Foundation FY77:$73,400
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS/CO2 (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: HYDROGRAPHIC AREAS/Deep ocean
PROJECT DESCRIPTION: The Geochemical Ocean Sections Study, GEOSECS, is a coherent oceanographic research program whose purpose is to make detailed measurements of oceanic constituents at all depths from the Arctic to the Antarctic. The purpose of these measurements is to provide for the first time a set of physical and chemical parameters measured on the same water and applying the same analytical techniques for each compound on an oceanwide basis. The results of these measurements will provide data for quantitative studies of oceanic mixing and organic productivity and simultaneously serve as a baseline for the levels of fission and waste products being added to the sea.
APPROACH: This research is based on CO2 data collected during the Atlantic and Pacific phases of GEOSECS studies and other related field experiments. Models for CO2 ocean uptake and calcite dissolution will be constructed from this data base. Initially a two-dimensional advection-diffusion model will be used to characterize thermocline mixing. Later extension of the model to the third dimension should result in important input to other areas, such as the role of the ocean in influencing climate.
KEYWORDS: CARBON DIOXIDE;ENVIRONMENTAL TRANSPORT;MINERAL CYCLING;MATHEMATICAL MODELS;ARCTIC REGIONS;OCEANOGRAPHY;GEOCHEMISTRY;SEDIMENTS;DIFFUSION;TWO-DIMENSIONAL CALCULATIONS;SEAS;FOSSIL FUELS;ENVIRONMENTAL IMPACTS;METEOROLOGY;CLIMATES;BIOADSORBENTS

<1110032>
TITLE: Radiative Energy Transfer in Gases
PROJECT NUMBER: ENG76-82547
PRINCIPAL INVESTIGATOR: Cess, R.D.
ADDRESS: Stony Brook, NY 11790
AFFILIATION: State Univ. of New York, Stony Brook (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Engineering
77 FUNDING: National Science Foundation FY77:$32,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric
APPROACH: This research program concerns radiative energy transfer in gases, and involves the incorporation of radiative parameterizations into simple climate models, in order to estimate the sensitivity of the earth-atmosphere system to either man-made or natural climate perturbations; the inclusion of wind-blown dust into infrared radiative transfer formulations for the earth's atmosphere; an investigation into possible negative feedback mechanisms which might modify the projected global climate change resulting from the enhancement in atmospheric carbon dioxide through the burning of fossil fuels; and the development of an atmospheric radiation model for Saturn, with the goal towards producing a thermal structure model which is consistent with ground-based infrared emission observations.
KEYWORDS: CLIMATES;MATHEMATICAL MODELS;EARTH ATMOSPHERE;CARBON DIOXIDE;ENVIRONMENTAL IMPACTS;FOSSIL FUELS;COMBUSTION PRODUCTS;ALBEDO;REFLECTION;INFRARED SPECTRA;SATURN PLANET;EARTH PLANET;METEOROLOGY;GASES

<1110033>
TITLE: Organic Geochemical Interactions in the Okefenokee and Everglades Peat-Forming Environments
PROJECT NUMBER: EAR76-84069
PRINCIPAL INVESTIGATOR: Casagrande, D.J.
ADDRESS: Park Forest, IL 60466
AFFILIATION: Illinois State Univ., Park Forest (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Earth Sciences
77 FUNDING: National Science Foundation FY77:$33,800
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: HYDROGRAPHIC AREAS/Deep ocean
PROJECT DESCRIPTION: This project concerns the determination of the geochemical changes occurring in organic matter during the processes of transformation from plant to litter to peat and ultimately to lignite in the early stages of coalification.
APPROACH: Field measurements of geochemical parameters and samples of water and of organic materials will be then taken from both fresh water (Okefenokee) and marine (Everglades) peat-forming environments. Special attention will be given to the chemistry of sulfur and of various metals in order to determine how, when, and under what conditions they are incorporated into the precursors of coal.
KEYWORDS: PLANTS;MINERAL CYCLING;PEAT;LIGNITE;GEOCHEMISTRY;SULFUR;WATER;COAL;SWAMPS;FLORIDA

<1110034>
TITLE: Phthalate and Chlorinated Hydrocarbon Effects on Marine Biota
PROJECT NUMBER: OCE76-84073
PRINCIPAL INVESTIGATOR: Giam, C.
ADDRESS: School of Science, College Station, TX 77843
AFFILIATION: Texas A and M Univ., College Station (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Ocean Sciences
77 FUNDING: National Science Foundation FY77:$94,600
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Phthalates (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Global
PROJECT DESCRIPTION: This award is to study the biological effects of phthalate ester plasticizers on marine organisms. The major objective is to evaluate the use of structure-physiological activities in predicting the toxicity of chemicals to marine organisms. The phthalate ester plasticizers have been chosen as model compounds for the study because dialkyl phthalates are produced in large amounts, are widely used and are present in all samples from the Gulf of Mexico. Although phthalates are more abundant than PCB's or DDT, they are less toxic to higher organisms. But these compounds or their degradation products are potentially toxic to lower organisms, larvae and eggs.
APPROACH: Marine organisms will be exposed to phthalates (lower homologues of dialkyl phthalates) and chlorinated hydrocarbons. An analysis will be made of the different uptake and concentration factors of the two classes of compounds. Models for the chemical structure vs the physiological responses of marine organisms will be developed to help predict toxic effects of classes of organic chemicals on marine organisms.
KEYWORDS: PHTHALATES;ORGANIC CHLORINE COMPOUNDS;HYDROCARBONS;AQUATIC ECOSYSTEMS;TOXICITY;BIOLOGICAL EFFECTS;AQUATIC ORGANISMS;CHLORINE COMPOUNDS;PLASTICIZERS;BIOLOGICAL INDICATORS;WATER POLLUTION;ALKYLATING AGENTS;PHYSIOLOGY;BIOLOGICAL MODELS

<1110041>
TITLE: Energy Conservation in Housing
PROJECT NUMBER: AER-76-23403
PRINCIPAL INVESTIGATOR: Harrje, D.T.
ADDRESS: Center for Environmental Studies, Princeton, NJ 08540
AFFILIATION: Princeton Univ., N.J. (USA). Center for Environmental Studies
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
FUNDING: National Science Foundation FY77:$50,000
TECHNOLOGY: CONSERVATION/End use (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This grant is a renewal to NSF grant number AER 76-23403 entitled ''Energy Conservation

in Housing."
APPROACH: This renewal will allow the data analysis team of the Princeton/Twin Rivers project to expand and finish their analysis of the data collected to date.
RESULTS: This analysis will focus on finishing the analysis of the effect of the energy crisis on winter gas consumption, modeling the summer energy consumption, the effects of retrofits and price on summer gas consumption and two parameter modeling of monthly gas consumption.
KEYWORDS: ENERGY CONSERVATION;USA;HOUSES;RESIDENTIAL SECTOR;COMBUSTION;ENERGY EFFICIENCY;SYSTEMS ANALYSIS;ENERGY CONSUMPTION;DATA COMPILATION;DATA ACQUISITION;SIMULATION;NATURAL GAS;CONSUMPTION RATES;SEASONAL VARIATIONS;ENERGY MODELS;RETROFITTING;COST;ECONOMIC IMPACT;DATA;EVALUATION

<110042>
TITLE: Modeling of International Long Range Development and Supplies
PROJECT NUMBER: AER-76-23264
PRINCIPAL INVESTIGATOR: Rapoport, L.A.
ADDRESS: Blacksburg, VA 24061
AFFILIATION: Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$113,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: COASTS/Northwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop an analytical tool for long-range energy supply projections and energy policy assessments.
APPROACH: Linear programming input-output model.
RESULTS: This grant is a renewal of NSF grant number AER-7600202. The research to date has developed a prototype model in a linear programming format and the results of the application of the model have demonstrated the potential of the system as an analytical tool for long-range energy supply projections and energy policy assessments. This continuation will allow for further testing and validation and for extensions to the model formulation and data base which will enhance the validity and applicability of the model.
KEYWORDS: ENERGY MODELS;ECONOMICS;ENERGY SOURCES;SIMULATION;ENERGY SUPPLIES;FORECASTING;ENERGY POLICY;EVALUATION;LINEAR PROGRAMMING

<110043>
TITLE: Validation and Enhancement of Lorendas Modelling System
PROJECT NUMBER: AER-77-1904
PRINCIPAL INVESTIGATOR: Rapoport, L.A.
ADDRESS: Blacksburg, VA 24061
AFFILIATION: Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$139,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To develop an analytical tool for long-range energy supply projections and energy policy assessments.
APPROACH: Linear programming input-output model.
RESULTS: This supplement completes the funding for a renewal of NSF grant AER 74-18596 which was approved and partially funded during the transition quarter. The research to date has developed a prototype model in a linear programming format and the results of the application of the model have demonstrated the potential of the system as an analytical tool for long-range energy supply projections and energy policy assessments. The renewal will allow for further testing an validation and for extensions to the model formulation and data base which will enhance the validity and applicability of the model.
KEYWORDS: LINEAR PROGRAMMING MODEL;POLICY ANALYSIS;INPUT-OUTPUT SUPPLY PROJECTIONS;ENERGY MODELS;ECONOMICS;LINEAR PROGRAMMING;SIMULATION;ENERGY SUPPLIES;FORECASTING;ENERGY POLICY;EVALUATION;ENERGY SOURCES

<110044>
TITLE: Energy Vulnerability of Alternative Systems of Agricultural Production
PROJECT NUMBER: AER-76-23416
PRINCIPAL INVESTIGATOR: Commoner, B.
ADDRESS: Center for the Biology of Natural Systems, Box 1126, St. Louis, MO 63130
AFFILIATION: Washington Univ., St. Louis, Mo. (USA). Center for the Biology of Natural Systems
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$107,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (75%);WASTE MANAGEMENT (25%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This research is a continuation of analysis of alternative agricultural production techniques that have the potential for increasing the efficiency with which limited resources are used--NSF Grant AER-74-18438.
APPROACH: The first component continues a comparative study of corn belt farms that do and do not use chemical fertilizers and pesticides with particular emphasis on field measurements of corn and wheat yields under the two systems, as well as measurements of their comparative effects on soil properties and on grain protein. The second component extends and generalizes work previously undertaken on the impact of energy problems and declining water tables on the economics of crop production under sprinkler irrigation in the Great Plains. This work will encompass more locations in the Plains and will compare various methods for allocating limited energy and ground water reserves. The third component is an investigation of the use of sewage sludge as a fertilizer for Corn Belt farms. This work will analyze the economic viability and resource-intensiveness of sludge use, and will seek to identify the factors working for and against farmers' willingness to use sludge and other off-farm organic wastes. It will also examine the comparative effects of sludge and conventional fertilization on the nutrient levels of several

Midwestern soils under typical sludge utilization practices.
RESULTS: Determinants of energy vulnerability of corn belt agriculture to shortages of water and limited energy. Analysis of results of use of sludge as fertilizer.
KEYWORDS: AGRICULTURE;ECONOMICS;WATER RESOURCES;REGIONAL ANALYSIS;CROPS;IRRIGATION;FERTILIZERS;SEWAGE SLUDGE;PESTICIDES;BIOLOGICAL EFFECTS

<110045>
TITLE: Energy Vulnerability of Alternative Systems of Agricultural Production
PROJECT NUMBER: AER-77-01905
PRINCIPAL INVESTIGATOR: Commoner, B.
ADDRESS: Center for the Biology of Natural Systems, St. Louis, MO 63130
AFFILIATION: Washington Univ., St. Louis, Mo. (USA). Center for the Biology of Natural Systems
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$191,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (75%);WASTE MANAGEMENT (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: This supplement completes the funding for a continuation grant to NSF grant AER 74-18438 which was approved and partially funded during the transition quarter. The continuation grant will continue analysis of alternative agricultural production techniques that have the potential for increasing the efficiency with which limited resources are used.
APPROACH: The research is focused on three tasks: (1) comparison of organic and conventional farming practices; (2) the impact of energy problems and declining water tables on sprinkler irrigation in the Great Plains; and (3) the use of sewer sludge as a fertilizer for corn belt farms.
RESULTS: Determinants of energy vulnerability of corn belt agriculture to shortages of energy, fertilizer and groundwater resources.
KEYWORDS: AGRICULTURE;ECONOMICS;WATER RESOURCES;REGIONAL ANALYSIS;IRRIGATION;CROPS;SEWAGE SLUDGE;FERTILIZERS;PESTICIDES;WASTE WATER

<110046>
TITLE: Resource Conserving Agricultural Production Methods
PROJECT NUMBER: AER-77-17031
PRINCIPAL INVESTIGATOR: Commoner, B.
ADDRESS: Center for the Biology of Natural Systems, St. Louis, MO 63130
AFFILIATION: Washington Univ., St. Louis, Mo. (USA). Center for the Biology of Natural Systems
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$60,000
TECHNOLOGY: CONSERVATION/Improved conversion efficiency (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (75%);WASTE MANAGEMENT (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The overall objective of this study is to evaluate the energy vulnerability of corn belt agriculture and to analyze alternative production techniques which are intended to make agricultural production less vulnerable to potential shortages of energy, fertilizer and ground water resoures. The final two years of this project will complete the work underway on organic farming, the use of sewage sludge and ground water irrigation.
APPROACH: The organic farming component objective is to compare the performance of farms which do not use chemical fertilizers or pesticides with conventional farms. The second component objective is to examine costs and benefits of using sewage sludge as fertilizer on working farms. The third component objective is to analyze the economics of irrigated farming in the Great Plains taking account of energy supply problems and ground water depletions.
RESULTS: Determinations of energy vulnerability of corn belt agriculture to shortages of energy, fertilizer and ground water resources.
KEYWORDS: AGRICULTURE;ECONOMICS;CROPS;NUTRIENTS;BIOLOGICAL WASTES;SEWAGE SLUDGE;FERTILIZERS;COST BENEFIT ANALYSIS;SOILS;COMPARATIVE EVALUATIONS;PESTICIDES;BIOLOGICAL EFFECTS;WATER RESOURCES;REGIONAL ANALYSIS

<110047>
TITLE: Field Studies of Biologically Produced Atmospheric Sulfur Compounds
PROJECT NUMBER: AEN-76-80322
PRINCIPAL INVESTIGATOR: Bandy, A.R.
ADDRESS: 32nd and Chesnut Streets, Philadelphia, PA 19010
AFFILIATION: Drexel Univ., Philadelphia, Pa. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$68,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project addresses the question whether the biogenic emissions believed to be dominant on the global scale are also significant for the production of airborne sulfate particulates in regions impacted by anthropogenic sources of sulfur dioxide like coal- or oil-burning plants.
APPROACH: The research will be done by gas-chromatographic analysis of estuarine and oceanic waters and the overlaying air in an urban environment (Norfolk, Virginia) and in a pristine area (Wallops Island, Virginia). Samples will be analyzed for hydrogen sulfide, sulfur dioxide, methyl mercaptan, dimethyl sulfide, carbon disulfide, and carbonyl sulfide. Meteorological observations will be made as aids to the identification of sources. Surface emission rates for marsh, shallow bay, and ocean will be estimated by

calculations of the gas flux across a water-air interface using the method of Liss and Slater (Nature, 247, 181 (1974)).
RESULTS: Measuremens of worldwide emissions of volatile sulfur compounds from biogenic sources.
KEYWORDS: AIR POLLUTION;FOSSIL-FUEL POWER PLANTS;SULFUR COMPOUNDS;COASTAL REGIONS;WATER POLLUTION;SULFUR DIOXIDE;ENVIRONMENTAL TRANSPORT;METECROLOGY;CHEMICAL EFFLUENTS

<110048>
TITLE: Hydrogen Sulfide and Reduced Forms of Sulfur in Air
PROJECT NUMBER: AEN-77-14875
PRINCIPAL INVESTIGATOR: Braman, R.S.
ADDRESS: Tampa, FL 33620
AFFILIATION: University of South Florida, Tampa (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$68,300
TECHNOLCGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: The proposed research is aimed at developing convenient field methods of sufficient sensitivity to permit getting quantitative values at ambient levels well above detection limits.
APPROACH: For field surveys to estimate the fluxes of hydrogen sulfide and other volatile sulfur compounds from land and water surfaces, there are needed analytical methods capable of measuring these substances at expected ambient levels in the sub-part-per-billion range. These measurements are needed for estimating the fluxes to the atmosphere of volatile sulfur compounds emanating from biogenic sources in natural envircnments like marshes, estuaries, and land areas where biological reduction of sulfate may occur. Analytical techniques to be evaluated include absorption of gaseous species in metal-coated beads with subsequent high-temperature expulsion into suitable detection systems, and selective retention and expulsion of certain sulfur species in gas-chromatographic columns. For solid particulate materials, experiments will be done by heating in inert gases, by acid treatments, by solvent extraction, and by heat treatment in the presence of hydrogen gas. Water and sediment samples will be handled by comparable methods.
RESULTS: This is necessary in order to arrive at reliable quantitative estimates of the natural biogenic contributions of hydrogen sulfide and other volatile sulfur compounds for comparison with man-made sources of atmcspheric sulfur, such as combustion sources of sulfur dioxide. The ultimate goal is to provide methodology to help assess the relative contributions of natural and man-made precursors of toxic airborne sulfate particulates. This is an extension of Grant ENV 7609585A01.
KEYWORDS: AIR POLLUTION;MONITORING;CHEMICAL EFFLUENTS;SULFUR COMPOUNDS;LEAD;SULFATES;REDUCTION;MARSHES;ESTUARIES;COASTAL REGIONS;HYDROGEN SULFIDES;ENVIRONMENTAL TRANSPCRT

<110049>
TITLE: Assessment of the Potential for Applying Urban Wastes to Agricultural Lands
PROJECT NUMBER: AER-77-08280
PRINCIPAL INVESTIGATOR: Blobaum, R.
ADDRESS: Roger Blobaum and Associates, Creston, IA 50801
AFFILIATION: Blobaum (Roger) and Associates, Creston, Iowa (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$92,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The main objective of this research is to determine the cost-effective limits of recycling municipal waste from a single metropolitan area on nearby agricultural land.
APPROACH: The metropolitan region of Omaha and Council Bluffs will be the study site because the combined problems of high nutrient waste disposal and costly high energy agriculture exist within a closely integrated urban/agricultural complex.
RESULTS: The research will determine how much and what kinds of waste is available, estimate its chemical fertilizer equivalent, determine whether any of the available waste is potentially hazardous to crops or soils, determine whether sufficient close-in agricultural land is available for land application, determine whether the soil involved is suitable for land application, assess the systems available for transporting wastes to agricultural land, survey potential sites for assembling and treating municipal wastes, and calculate the per-ton costs of delivering wastes to possible application sites of increasing distances from waste sources. This study will examine the possibilities of converting waste problems into a rescurce opportunity. As such it will contribute to the emerging national concern to think how best to restore the bulk of our depleted resources through recycling and re-use.
KEYWORDS: MUNICIPAL WASTES;RECYCLING;AGRICULTURE;LAND RECLAMATION;SOILS;NUTRIENTS;PLANTS;FERTILIZERS;ECONOMY

<110050>
TITLE: Utilization of Waste Heat from Power Plants in Aquaculture
PROJECT NUMBER: AEN-77-01074
PRINCIPAL INVESTIGATOR: Guerra, C.R.
ADDRESS: Research and Development Department, 80 Park Place, Newark, NJ 07101
AFFILIATION: Public Service Electric and Gas Co., Newark, N.J. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$198,000
TECHNOLCGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;HYDROGRAPHIC AREAS/Other hydrographic areas River
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this award is to initiate a proof-of-concept scale evaluation of

utilizing thermal discharges from cooling of condensers at power generating stations to culture edible aquatic animals.
APPROACH: An aquaculture facility utilizing Delaware River water, heated in the condensers of the Public Service Electric and Gas Company's Mercer Generating Station at Trenton, New Jersey, is being used for the sequential culture of freshwater shrimp from May through October and rainbow trout from November through April. Wastes from the processing of other foods are being investigated for their potential in reducing aquaculture-feed costs.
RESULTS: This research should confirm the technical feasibility of the concept, evaluation of which was started under NSF Grant No. AEN-74-4079, at a sufficiently large scale to determine its commercial feasibility concentrating upon process reliability, reproducibility and product acceptability. Subcontracts for portions of the research plan have been awarded to Trenton State College (Dr. A. Eble) and Rutgers University (Dr. A. Farmanfarmaian). Nutritional factors being studied include amino acid and calcium diet supplementation, food conversion efficiencies and physical factors influencing intestinal absorption of food and potential pollutants such as coal, chlorine and heavy metals. The Trenton State College effort is concentrated on improvement in management procedures including field application of nutritional data, intensification of culture techniques and brood stock management. Also under subcontract Long Island Oyster Farms, Inc. is assisting in evaluation of commercial feasibility and the New Jersey Department of Agriculture's Division of Rural Resources is studying adaptation of agricultural facilities to production of fingerling trout.
KEYWORDS: THERMAL POWER PLANTS;THERMAL EFFLUENTS;AQUATIC ECOSYSTEMS;BIOLOGICAL EFFECTS;AQUACULTURE;SHRIMP;TROUT;WASTE HEAT;WASTE PRODUCT UTILIZATION

<110051>
TITLE: Evaluation of Alternative Energy Leasing Strategies and Schedules for Federal Lands
PROJECT NUMBER: AER-76-19778
PRINCIPAL INVESTIGATOR: Kalter, R.J.
ADDRESS: 445 Warren Hall, Ithaca, NY 14853
AFFILIATION: Cornell Univ., Ithaca, N.Y. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$104,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: This grant is a continuation of NSF Grant SIA 74-21846. The objective of the original grant was to develop a comprehensive analytical framework for evaluating alternative energy leasing strategies and schedules for federally owned energy resources and to apply the evaluation model to several specific energy resources.
RESULTS: Such an evaluation was completed for the outer continental shelf gas and oil resources. This continuation will allow extension and refinement of the model, the completion of the evaluation of coal and uranium strategies now underway, and application of the model to geothermal and onshore petroleum resources.
KEYWORDS: EVALUATION;LAND USE;ENERGY SOURCES;ENERGY MODELS;ECONOMICS;NATURAL GAS;PETROLEUM;CONTINENTAL SHELF;COAL DEPOSITS;URANIUM DEPOSITS;GEOTHERMAL RESOURCES;NATIONAL SCIENCE FOUNDATION;LAND LEASING;PLANNING;PUBLIC LANDS;LEASING;OFFSHORE SITES;NATURAL GAS DEPOSITS;PETROLEUM DEPOSITS;SIMULATION

National Science Foundation/RANN

<111003>
TITLE: Beach Morphology in Relation to the Distribution of Oil from a Spin in the Straits of Magellan
PROJECT NUMBER: ENV-76-06898
PRINCIPAL INVESTIGATOR: Hayes, M.O.
ADDRESS: Dept. of Geology, Univ. of S.C., Columbia, SC 29208
AFFILIATION: South Carolina Univ., Columbia (USA). Dept. of Geology
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: RANN/Advanced Environmental Research and Technology
MONITOR: Thiel, Charles
TYPE OF FUNDING: Grant No.-ENV-76-06898
77 FUNDING: National Science Foundation FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific Chile;COASTS/Other coasts Straits of Magellan, Chile
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;ECT;OS
PROJECT DESCRIPTION: To define in detail the geomorphology, coastal sedimentation pattern and dynamic physical processes shaping the coastal zone of the Metule oil spill and of the New England coastal area between Maine and New York City; a classification of sensitivity of coastal zones to oil spill damage.
APPROACH: Detailed data collected on: (1) geological history; (2) coastal zone morphology; (3) regional sediment patterns; (4) wave and nearshore conditions; (5) tidal regime; (6) climate; (7) oil accumulation.
RESULTS: Delineation of coastal zone of New England into areas of varying degrees of potential oil spill damage; also less detailed classification of the southern Alaska area. On understanding of oil-sediment interaction would lead to recommendation for oil spill treatment.
KEYWORDS: COASTAL MORPHOLOGY;OIL SPILLS;COASTAL WATERS;ATLANTIC OCEAN;SHORES;MAINE;NEW HAMPSHIRE;MASSACHUSETTS;RHODE ISLAND;CONNECTICUT;NEW YORK;REGIONAL ANALYSIS;OILS;DIFFUSION;ENVIRONMENTAL EFFECTS;WATER POLLUTION;LAND POLLUTION;SEDIMENTS;CLIMATES;TIDE;ENVIRONMENT;CHEMICAL EFFLUENTS;PETROLEUM PRODUCTS;HYDROCARBONS

<111004>
TITLE: Microbiological Effects of Petroleum Accumulation on Beaches
PROJECT NUMBER: ENV-76-08310
PRINCIPAL INVESTIGATOR: Colwell, R.R.
ADDRESS: Department of Microbiology, University of Maryland, College Park, MD 20742
AFFILIATION: Maryland Univ., College Park (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Division of Advanced Environmental Research and Technology
MONITOR: Thiel, Charles
TELEPHONE: P632-4345
TYPE OF FUNDING: Contract No.-ENV-76-08310
77 FUNDING: National Science Foundation FY77:$92,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (50%);SPECIFIED OTHER TECHNOLOGIES/Environmental effects (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: ORGANICS/Oil (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Alaska;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Northwest;COASTS/Alaska;COASTS/Other coasts Antarctic;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Beaches
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The objective of this program is to determine the role of microorganisms (bacteria, yeasts, and fungi) in the biodegradation of petroleum accumulating on beaches and in beach sand from spills, drilling accidents, or poor handling procedures at production sites. The rate, amount, and qualitative pattern of biodegradation in the Straits of Magellan by indigenous microorganisms will be studied.
APPROACH: The objectives of the project are being accomplished by collecting samples of beach sand and seawater at the site of the oil spill from the Supertanker METULA in the Straits of Magellan. The naturally occurring bacteria, yeasts, and fungi are being analyzed to determine the rate, extent, and pattern of microbial biodegradation of the oil. Field work is done to determine environmental parameters influencing microbial biodegradation.
RESULTS: It is expected that the microbial degradation, occurring on the beaches of the Straits of Magellan, will be characterized, with respect to rate, extent, pattern, and seasonal fluctuation of the microbial biodegradation. The results of this study will be extrapolated to the geomorphological similar sites in New England and Alaska to predict probable effects of oil spills in those regions on the beach areas.
PROJECT MILESTONES: (1) First microbiological study ever made of the beach sand and seawater of the Straits of Magellan. (2) First integrated study of the biodegradation of petroleum incorporating geomorphology, chemistry, and microbiology in a near-antarctic site. (3) First measurement of the rate of microbial biodegradation and extent of biodegradation of crude oil in a near-antarctic site. (4) At the completion of the project, the rate and extent of crude oil biodegradation carried out by the indigenous microflora of beaches will be provided.
KEYWORDS: PETROLEUM INDUSTRY;ENVIRONMENTAL EFFECTS;WATER POLLUTION ABATEMENT;SEAWATER;FRESH WATER;BIODEGRADATION;WASTE MANAGEMENT;OIL SPILLS;CLEANING;PETROLEUM;BACTERIA;YEASTS;FUNGI;HYDROCARBONS

<111008>
TITLE: Petroleum Industry in the Delaware Estuary
PROJECT NUMBER: AEN 74-14810
PRINCIPAL INVESTIGATOR: Whipple, W. Jr.
ADDRESS: Water Resources Research Inst. Rutgers University, New Brunswick, NJ 08903
AFFILIATION: Rutgers--the State Univ., New Brunswick, N.J. (USA). Water Resources Research Inst.
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: Advanced Environmental Research and Technology
MONITOR: Thiel, Charles
TELEPHONE: C(202)632-4345
TYPE OF FUNDING: Grant No.-AEN 74-14810
77 FUNDING: National Science Foundation FY77:$350,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: ORGANICS/Hydrocarbons in water (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;GEOGRAPHIC AREAS/Northeast;COASTS/Northeast;HYDROGRAPHIC AREAS/Other hydrographic areas Estuary
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;HEALTH EFFECTS;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Identify, characterize, and measure the sources of petroleum pollution in the Delaware estuary, including urban runoff and treatment plant effluents as well as spills and refinery wastes; trace the fate of this contamination in the estuary, and its effect upon fish shellfish and environmental quality; consider the beneficial effects of alternative remedial programs.
APPROACH: Initially attention was given to three fronts, (a) the investigation of sources, particularly urban runoff, (b) the mechanics of estuarial flow, and (c) the effects of given petroleum concentrations upon biota. While (c) is being developed, more work on other sources, and on fates, will complete the study of causation. Remedial programs will then be considered.
RESULTS: A more balanced view as to where petroleum pollution actually comes from, and the relative priority and economy of various types of controls.
PROJECT MILESTONES: (1) Evaluation of quantities of petroleum in urban runoff. (2) Effects of ultraviolet light in increasing toxicity of Fuel Oil No. 2 in water. (3) High toxicity of petroleum to oysters when ingested on clay particals.
KEYWORDS: FATE;AQUATIC ECOSYSTEMS;ESTUARIES;DELAWARE;WATER POLLUTION;CHEMICAL EFFLUENTS;PETROLEUM PRODUCTS;OIL SPILLS;ENVIRONMENTAL EFFECTS;WATER QUALITY;FISHES;MOLLUSCS;CRUSTACEANS;BIOLOGICAL EFFECTS;MUNICIPAL WASTES;HEALTH HAZARDS

<111016>
TITLE: An Assessment of the Effects of Energy Development in the Ft. Union Basin, Montana and Neighboring States
PROJECT NUMBER: AER-75-14178
PRINCIPAL INVESTIGATOR: Silverman, A.J.
ADDRESS: University of Montana, Department of Geology, Missoula, MT 59801
AFFILIATION: Montana Univ., Missoula (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
DIVISION: RANN/Advanced Environmental Research and Technology
MONITOR: Thiel, Charles C.
TELEPHONE: 632-4345
TYPE OF FUNDING: Grant No.-AER-75-14178
77 FUNDING: National Science Foundation FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Great Plains;HYDROGRAPHIC AREAS/Other hydrographic areas Yellowstone basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Baseline data on terrestrial and aquatic ecosystems in the Yellowstone drainage, Northern Great Plains coal fields. Also supply-demand study for N.G.P. coal.
APPROACH: Field data collecting, theoretical modeling, remote sensing.
RESULTS: Final economic study complete.
PROJECT MILESTONES: Not continued by N.S.F.; phase-out of energy-environment program.
KEYWORDS: AQUATIC ECOSYSTEMS;TERRESTRIAL ECOSYSTEMS;COAL MINES;ENVIRONMENTAL EFFECTS;REGIONAL ANALYSIS;MONTANA;ECONOMICS;BASELINE ECOLOGY;ECOLOGY;REMOTE SENSING;STREAMS

<111020>
TITLE: Measurement of Sulfur Dioxide Oxidation on Particulate Surfaces
PROJECT NUMBER: 76-81817
PRINCIPAL INVESTIGATOR: Mohnen, V.A.
ADDRESS: Atmospheric Sciences Research Center, E.S. 319, 1400 Washington Ave., Albany, NY 12203
AFFILIATION: State Univ. of New York, Albany (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$231,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT;OS
PROJECT DESCRIPTION: The objective of this program is to develop and evaluate procedures for investigating the mechanisms and importance of sulfur dioxide oxidation on the surface of solid particulate matter of natural and anthropogenic origin.
APPROACH: Sulfate formation on well characterized particle and reference surfaces will be studied using molecular beams of sulfur dioxide, oxygen and water. Auger Electron Spectroscopy and Mass Spectrometry will be used to measure the rate of product formation.
RESULTS: It is anticipated that reaction rates and orders can be determined for a variety of surfaces during the course of this work. Surfaces to be examined include: carbon, oxides of vanadium, oxides of iron, and particulate matter collected from ambient air, power plant stacks, and laboratory flames.
KEYWORDS: SULFUR DIOXIDE;CHEMICAL REACTION KINETICS;PARTICLES;SULFATES;OXIDATION;CARBON;VANADIUM OXIDES;IRON OXIDES;FLUE GAS;LABORATORY EQUIPMENT;COMBUSTION PRODUCTS;FLAMES;EARTH ATMOSPHERE;AIR POLLUTION

<111021>
TITLE: Interdisciplinary Study of Environmental Pollution by Lead and Other Metals
PROJECT NUMBER: 77-15085
PRINCIPAL INVESTIGATOR: Rolfe, G.L.
ADDRESS: Institute of Environmental Studies, Urbana, IL 61801
AFFILIATION: Illinois Univ., Urbana (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$18,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (50%);WASTE MANAGEMENT (50%)
POLLUTANTS: METALS (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT;OS
PROJECT DESCRIPTION: This is a supplemental award to achieve the research objectives supported under NSP Grant No. ENV74-24276 A03. This has been a comprehensive research project centered on the environmental impacts of lead emissions resulting from the combustion of leaded gasoline.
APPROACH: The project includes studies on the effects of soil and atmospheric lead on crop yields of corn and soybeans. In addition, plant burdens of lead as a function of various soil lead levels are being studied. The distribution of lead in an urban area, including building interiors, is being determined to identify regions of elevated exposure.
RESULTS: Lead samples have been characterized in terms of physical and chemical form as a first step toward identifying the environmental transport pathways and transformations of lead. A risk/benefit economic analysis is using data from this project and elsewhere to weigh the benefits of continued use of leaded gasoline against the risk to health and crop productivity. The supplemental effort is concerned with testing and evaluating a computer-based model which is designed to predict how lead induced stresses in agriculturally-important plants may affect crop yield.
KEYWORDS: LEAD;ENVIRONMENTAL IMPACTS;GASOLINE;ADDITIVES;SOILS;EARTH ATMOSPHERE;AIR QUALITY;COST BENEFIT ANALYSIS;HEALTH HAZARDS;AGRICULTURE;BIOLOGICAL EFFECTS;PLANTS;MAIZE;SOYBEANS;ECOLOGICAL CONCENTRATION;AIR

<111022>
TITLE: Remote Measurement of Pollutants
PROJECT NUMBER: 77-10198
PRINCIPAL INVESTIGATOR: Murray, E.R.
ADDRESS: Menlo Park, CA 94025
AFFILIATION: Stanford Research Inst., Menlo Park, Calif. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$167,000
POLLUTANTS: NOXIOUS GAS (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
PROJECT DESCRIPTION: The present grant is a continuation of work done under Grants GI-38986 and AEN75-14997 A02. The objective is the development of laser methods for remote measurement of atmospheric levels of gases such as sulfur dioxide (SO/sub 2/), nitrogen dioxide (NO/sub 2/), ozone (O/sub 3/), ethylene (C/sub 2/H/sub 4/), and ammonia. These techniques are needed for monitoring ambient levels of gases in polluted air and for obtaining average concentrations integrated over kilometer (or longer) pathlengths to provide data for testing pollutant dispersion models.
APPROACH: The work employs the differential absorption laser-radar (DIAL) technique whereby light transmitted from a laser source is back-scattered from atmospheric particles or from topographic targets (like a hillside). The light beam is tuned to a wavelength strongly absorbed by a molecule of interest. From the time delay between the sending and the receipt of the returned back-scattered signal pulses, one can determine gas concentrations at various distances along the path. The concept has been tested for measurement of SO/sub 2/ and O/sub 3/ in the ultraviolet and of NO/sub 2/ in the visible spectrum.
RESULTS: Under the present grant the investigators will demonstrate the performance of the system under different pollutant-gas levels and variable meteorological conditions. The technique will be extended to the infrared to explore the advantages of this spectral region for detecting a wider variety of gases and for potentially greater detection sensitivity. Special attention will be given to ammonia and ozone in the infrared.
KEYWORDS: AIR POLLUTION;REMOTE SENSING;SULFUR DIOXIDE;NITROGEN DIOXIDE;OZONE;ETHYLENE;AMMONIA;MONITORING;ENVIRONMENTAL TRANSPORT;PERFORMANCE TESTING;INFRARED SPECTRA;HYDROCARBONS

<111023>
TITLE: The Supply and Demand Potential of Eastern Coals
PROJECT NUMBER: AER 76-24680
PRINCIPAL INVESTIGATOR: Newcomb, R.T.
ADDRESS: West Virginia University, Morgantown, WV 26506
AFFILIATION: West Virginia Univ., Morgantown (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$49,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Middle Atlantic
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The objective of this new research grant is to establish an economic framework for the assessment of geological and mineral processing engineering factors in the production and use of bituminous coals. The emphasis is on the supply technologies, especially mining and mineral preparation and on conventional demands for fuel derived from power generation and metallurgical processes, rather than on demands for the advanced conversion processes.
APPROACH: The advance over current economic modelling will be the ability to consider the impact of variations in the geologic properties of coal seams and the technical aspects of mining and coal preparation on the delivered prices. This research draws upon data and models developed under NSF grant AER 73-07799 entitled, "The Potential of Coal Based Fuel and Energy Complexes." An existing quadratic programming model will be modified to give a simple workable model of the eastern energy submarkets which can assess the supply costs of coal under submarket demand constraints and supply conditions. The research has been co-funded by the Electric Power Research Institute.
RESULTS: Programming model of eastern energy submarkets for assessing the supply costs of coal.
KEYWORDS: SUPPLY AND DEMAND MODEL;QUADRATIC PROGRAMMING;BITUMINOUS COAL;AVAILABILITY;ECONOMICS;MARKET;ECONOMIC IMPACT;TECHNOLOGY ASSESSMENT;ENERGY MODELS;MATHEMATICAL MODELS;PLANNING;POWER GENERATION;METAL INDUSTRY;PREDICTION EQUATIONS;ECONOMETRICS;COAL INDUSTRY

<111024>
TITLE: The Pennsylvanian Coal-Bearing Strata of the Narragansett Basin
PROJECT NUMBER: AER 77-00977
PRINCIPAL INVESTIGATOR: Skehan, J.W.
ADDRESS: Weston Observatory, Weston, MA 02193
AFFILIATION: Boston Coll., Weston, Mass. (USA). Weston Observatory
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$109,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: VISUAL AESTHETICS (50%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Narragansett Basin
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS;ECT;OS
PROJECT DESCRIPTION: Objective: to determine whether reserves of coal of sufficient quantity and quality exist in the Narragansett Basin, so as to justify development of the resource. The first year has emphasized geologic exploration of the Basin and has relied on data from drill cores. Funds provided by NSF have been applied toward management, utilization studies and geological research connected with the project, while costs of drilling are covered by contributions from other organizations.
APPROACH: Among the scientific studies to be performed in the continuation period are: (1) detailed petrographic analysis of cores, including a study of illite crystallinity as a basis for prediction of metamorphic grade of coal; (2) lithologic analysis of cores for determination of sedimentary environmental of coal deposits and prediction of stratigraphic sequence and distribution of coal beds; (3) additional

floral studies for stratigraphic correlation; (4) additional photogeologic study for mapping geologic structure; (5) analysis of geophysical well logs; and (6) additional gravity survey coverage of the Basin.
RESULTS: Follow-on in the nongeologic area will emphasize solutions for legal, economic, environmental, and societal problems associated with coal-mining development in the Basin and upon funding ways of utilizing the coal that are economically and environmentally acceptable to the region.
KEYWORDS: COAL RESERVES;ENERGY SOURCE DEVELOPMENT;PENNSYLVANIA;ECONOMICS;ECONOMETRICS;COAL INDUSTRY;PETROLOGY;GRAVITY SURVEYS;GEOLOGICAL SURVEYS;GEOPHYSICAL SURVEYS;WELL LOGGING;DRILLING;LEGAL ASPECTS;SOCIAL IMPACT;ECONOMIC IMPACT;ENVIRONMENTAL IMPACTS;ECOSYSTEMS;FINANCING;COAL MINING;LAND USE

<111025>
TITLE: Energy Conservation by Subsurface Construction
PROJECT NUMBER: AER-77-18692
PRINCIPAL INVESTIGATOR: Bligh, T.P.
ADDRESS: Department of Mechanical Engineering, Univ. of Minnesota, Minneapolis, MN 55455
AFFILIATION: Minnesota Univ., Minneapolis (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$90,000
TECHNOLOGY: CONSERVATION/General (100%)
CHARACTER OF STUDY: DEVELOPMENT/Laboratory scale (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT;OS
PROJECT DESCRIPTION: Under a previous grant SIA 75-03481 the National Science Foundation supported the instrumentation of a subsurface building being constructed on the University of Minnesota campus. This grant supports the measurement of data from this instrumentation, the analysis of the thermal properties of the building envelope and the surrounding soil and the development of computer models to predict the thermal behavior of subsurface construction.
APPROACH: The use of subsurface construction offers significant opportunities for reducing the energy required to heat and cool buildings. The present data base on thermal design data and energy use in such construction is limited. The lack of such data tends to deter engineers, architects and planners from fully utilizing subsurface construction.
RESULTS: This research program will generate the urgently needed data and analytical models for estimating the thermal performance of subsurface buildings.
KEYWORDS: ENERGY CONSERVATION;UNDERGROUND;SUBSURFACE STRUCTURES;HEATING;COOLING;CONSTRUCTION;DATA ACQUISITION;THERMODYNAMICS;COMPUTER CODES;FORECASTING;SOILS;ENVIRONMENTAL ENGINEERING;ENERGY CONSUMPTION;MEASURING INSTRUMENTS;ECONOMICS;BUILDINGS

<111026>
TITLE: Environmental Systems Study on the Development of Fossil Fuel Resources in the Southwest
PROJECT NUMBER: AER 77-03870
PRINCIPAL INVESTIGATOR: Sawyer, J.W.
ADDRESS: 1755 Massachusetts Ave., N.W., Washington, DC 20036
AFFILIATION: Resources for the Future, Inc., Washington, D.C. (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$104,500
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT
PROJECT DESCRIPTION: The objective of this research is the development of a technologically based framework to aid policy makers in the Southwest by providing comparative analysis of the environmental and economic costs of alternate energy development strategies.
APPROACH: The research program will develop a mathematical model of the potential energy and fuel industry in the region which will (a) examine the responses of industries to variations in prices of factor inputs and to environmental policy instruments; (b) examine the costs of providing energy for different type fuels by considering the costs of production, transmission and residuals disposal; and (c) act as an energy conversion-fuel production submodel for a large regional study of the impact of energy development in the Southwest.
RESULTS: Analyses of several alternative energy development strategies in terms of environmental and economic costs.
KEYWORDS: GOVERNMENT POLICIES;ENERGY POLICY;COMPARATIVE EVALUATIONS;ECONOMIC IMPACT;ENVIRONMENTAL IMPACTS;ENERGY MODELS;MATHEMATICAL MODELS;CHARGES;DECISION MAKING;INDUSTRY;ENERGY SOURCE DEVELOPMENT;ENERGY CONVERSION;ECONOMIC ELASTICITY;COMPUTER CODES;ECONOMICS

<111027>
TITLE: Systems-Integration Requirements for the Synergistic Co-Siting of Industrial Activities
PROJECT NUMBER: AER 76-80993
PRINCIPAL INVESTIGATOR: Spurlock, J.M.
ADDRESS: Engineering Experiment Station, Atlanta, GA 30332
AFFILIATION: Georgia Inst. of Tech., Atlanta (USA)
MONITORING AGENCY: National Science Foundation, Washington, D.C. (USA)
77 FUNDING: National Science Foundation FY77:$200,000
TECHNOLOGY: CONSERVATION/General (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT;ECT;OS
PROJECT DESCRIPTION: The objectives of this new research grant are to: (1) develop the methodology for the comprehensive systems integrated design of cost effective, synergistically coupled industrial complexes and (2) communicate to prospective users guidelines and recommendations for the practical application of the co-siting methodology that will result from this study.
APPROACH: Synergistic co-siting involves the carefully planned grouping of industrial and/or agricultural activities in complexes that provide mutually beneficial utilization of energy, raw materials, land, plant wastes and transportation facilities.
RESULTS: This research will utilize systems analysis to identify candidate industries for co-siting, design

them into realistic complexes and evaluate the economic, resource and environmental costs and benefits of these complexes as compared to conventional industrial siting approaches. The prospective users of this research are government and industry planners and policy makers.
KEYWORDS: INDUSTRIAL SITING;SITE SELECTION;SYNERGISM;ECONOMICS;TERRESTRIAL ECOSYSTEMS;ENVIRONMENTAL IMPACTS;ENERGY CONVERSION;ENERGY PARKS;ENERGY FACILITIES;LAND USE;PLANNING;INDUSTRY

Tennessee Valley Authority

<130001>
TITLE: Atmospheric Transformation of Emissions from Coal-Fired Power Plants; (a) Full-Scale Field Studies
PROJECT NUMBER: 79 BDL
PRINCIPAL INVESTIGATOR: Meagher, J.F.
ADDRESS: Air Quality Research Section, Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: Hall, Clinton W.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$174,000; Tennessee Valley Authority FY77:$149,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (40%);METALS (10%);PARTICULATES (40%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To identify the mechanisms responsible for chemical transformations in coal-fired power plant plumes. Emphasis will be placed on the SO/sub 2/-sulfate and NO-NO/sub 2/-nitrate conversions.
APPROACH: Crosswind profiles and average concentrations of the various plume constituents are obtained by traversing the plume with an instrumented aircraft. Measurements are made at different altitudes for each of several locations downwind of a power plant. Additional gaseous and particulate samples are collected and returned to the laboratory for detailed analysis. Data will be collected under various meteorological conditions.
RESULTS: The data obtained will be used to calculate conversion rates for primary effluents. These rates will be correlated with changes in temperature, relative humidity, solar intensity, and plume constituent concentrations. A mechanism will be postulated to explain the observations.
PROJECT MILESTONES: (1) TVA internal report on SO/sub 2/ oxidation rates 10/76. (2) TVA internal report on meteorological effects on SO/sub 2/ oxidation 10/77. (3) Milestone report on plume chemistry 11/78. (4) Final report 6/81. (5) Complete testing of chamber 1/77. (6) TVA internal report on SO/sub 2/ oxidation 10/77. (7) Milestone report on SO/sub 2/ oxidation. (8) TVA internal report on stack gas study 6/79. (9) Final report 3/81.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;COAL;AIR POLLUTION;DIFFUSION;TRANSLOCATION;PLUMES;SULFUR DIOXIDE;SULFATES;NITROGEN OXIDES;NITRATES;CHEMICAL REACTION KINETICS;OXIDATION;METEOROLOGY;DATA;PLUMES;AEROSOL MONITORING;CHEMICAL REACTION KINETICS

<130002>
TITLE: Regional Atmospheric Transport of Coal-Fired Power Plant Emissions
PROJECT NUMBER: 79 BDL
PRINCIPAL INVESTIGATOR: Sharma, V.
ADDRESS: Air Quality Research Section, Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: Hall, Clinton W.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$75,000; Tennessee Valley Authority FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (40%);METALS (10%);PARTICULATES (40%);ORGANICS (10%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To develop a quantitative regional model to describe the transport and transformations of the SO/sub 2/-sulfate complex in the Tennessee Valley region. This model will be useful in determining the relative importance of TVA emissions as compared with other upwind sources of emissions.
APPROACH: Measurements of the SO/sub 2/-sulfate complex and other pollutants are made using an instrumented aircraft at various locations and altitudes in the region of interest. Data collected at various meteorological stations are used to study air-parcel trajectories. Intensive field studies will be conducted under various meteorological regimes.
RESULTS: The data obtained will be helpful in understanding transport, diffusion, and chemical transformation of species of interest. Correlations with the meteorological data will explain relative importance of temperature inversions, wind velocity, climatic regime, and precipitation. A quantitative regional model will be the final product.
PROJECT MILESTONES: (1) TVA internal report on regional model 6/77. (2) Milestone report on regional model 6/78. (3) TVA internal report on model refinement and existing networks 12/78. (4) Final report 11/80.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;DIFFUSION;REGIONAL ANALYSIS;TRANSLOCATION;SULFUR DIOXIDE;SULFATES;AERIAL MONITORING;MATHEMATICAL MODELS;COAL;METEOROLOGY;ENVIRONMENTAL TRANSPORT;CHEMICAL REACTION KINETICS

<130003>
TITLE: Filtered and Filtered/Unfiltered Exposure Chamber Studies of Effects of Coal-Fired Power Plant Emissions on Crop and Forest Species of Economic Importance in Southeastern United States
PROJECT NUMBER: 79 BDO (Task 1)
PRINCIPAL INVESTIGATOR: Jones, H.C.
ADDRESS: Air Quality Research Section, Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: Hall, Clinton W.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (Coal-fired power plant emissions) (100%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To identify and quantify the impact of coal-fired power plant effluents on crop species of economic significance to the southeastern United States.
APPROACH: Determine impact on yield and crop appearance through the use of field (polluted) air exclusion system and charcoal-filtered air greenhouses.
RESULTS: Relationship between crop appearance and yield will be determined; relationship between exposure dose and yield will be determined; effect of other environmental parameters on modifying plant response to SO/sub 2/ will be determined.
PROJECT MILESTONES: 1st year: 30 air filtration systems to be established; results to be obtained for soybeans and cotton. 2nd year: 30 additional air filtration systems to be established, continue soybean and cotton tests, and add conifers, small grains. Remaining years: test other varieties of soybeans/cotton, other locations, vary soil fertility, soil ph.
KEYWORDS: CROP YIELD;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;COAL;CROPS;FORESTS;ECONOMICS;AIR POLLUTION;SOCIO-ECONOMIC FACTORS;SULFUR DIOXIDE;SOYBEANS;COTTON;CONIFERS;CEREALS;SOILS;FERTILITY;SEEDS;PLANT GROWTH;BIOLOGICAL EFFECTS;SYNERGISM;GASEOUS WASTES;CHEMICAL EFFLUENTS

<130004>
TITLE: Determine Dose-Response Kinetics for Effects of Atmospheric Emissions from Coal-Fired Power Plants on Soybeans and Other Crop and Forest Species of Economic Importance in Southeastern United States
PROJECT NUMBER: 79 BDO (Task 2)
PRINCIPAL INVESTIGATOR: Jones, H.C.
ADDRESS: Air Quality Research Section, Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: Hall, Clinton W.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$45,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/O/sub 3/;NOXIOUS GAS/NO/sub x/;NOXIOUS GAS/HF (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the individual and combined effects on vegetation of SO/sub 2/, NO/sub 2/, and O/sub 3/ exposures at concentrations, dosage rates, and environmental conditions typically occurring during surface exposures in the vicinity of large coal-fired power plants.
APPROACH: Using a fumigation chamber within a growth chamber and a pollutant injection system capable of duplicating actual field fumigations, crop plants will be exposed to power plant effluents and other atmospheric pollutants to determine their effects on yield and plant sensitivity.
RESULTS: The relationship between pollutant dose, foliar injury, and yield for stage of growth of crop plants most sensitive to yield reduction will be determined. The relationships between effects of multiple pollutant exposures (SO/sub 2/ + NO/sub 2/, and SO/sub 2/ + O/sub 3/) and yield will be established for soybeans and other crops important in the southeastern United States.
PROJECT MILESTONES: (1) 1st Year: Construct exposure chamber and perform SO/sub 2/ fumigation for several different dosage curves on soybeans. (2) 2nd Year: Perform fumigations with NO/sub x/ and O/sub 3/ on soybeans using same system as above. (3) 3rd Year (and subsequent years): Perform multiple pollutant exposures.
KEYWORDS: COAL INDUSTRY;ENVIRONMENTAL EFFECTS;FOSSIL-FUEL POWER PLANTS;SOYBEANS;CROPS;FORESTS;ECONOMICS;DOSE-RESPONSE RELATIONSHIPS;AIR POLLUTION;BIOLOGICAL EFFECTS;TERRESTRIAL ECOSYSTEMS;CHEMICAL REACTION KINETICS;SULFUR DIOXIDE;NITROGEN DIOXIDE;OZONE;SOILS

<130005>
TITLE: Characterize and Quantify the Transfer, Fate, and Effects of SO/sub x/, NO/sub x/, and Acid Precipitation in the Terrestrial Ecosystem Representative of the Tennessee Valley Region
PROJECT NUMBER: 79 BDO (Task 3)
PRINCIPAL INVESTIGATOR: Kelly, J.M.
ADDRESS: Air Quality Research Section, Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: Hall, Clinton W.
TYPE OF FUNDING: Agency in-house effort;EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$184,000; Tennessee Valley Authority FY77:$21,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)

CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Characterize and quantify the transfer, fate, and effects of SO/sub x/, NO/sub x/, and acid precipitation on terrestrial ecosystems representative of the Tennessee Valley region.
APPROACH: A series of forested watersheds is being established, instrumented, and calibrated in order to evaluate atmospheric inputs of SO/sub x/, and NO/sub x/. An acid rain simulator will be utilized to evaluate plant and soil response to precipitation pH.
RESULTS: A compartmental mass balance will be developed for selected elements in several biotic and abiotic compartments. This information will be used to evaluate atmospheric input in relation to system alteration and response.
PROJECT MILESTONES: (1) Completion of watershed characterization and baseline studies (FY 1977). (2) Completion of watershed response evaluation period and related studies (FY 1980).
KEYWORDS: TERRESTRIAL ECOSYSTEMS;TENNESSEE;SULFUR DIOXIDE;NITROGEN OXIDES;ACID RAIN;AIR POLLUTION;CHEMICAL REACTION KINETICS;BIOLOGICAL EFFECTS;DOSE-RESPONSE RELATIONSHIPS;LAND POLLUTION;WATER POLLUTION;ECOLOGICAL CONCENTRATION;PLANTS;ENVIRONMENTAL TRANSPORT

<130006>
TITLE: Evaluate the Beneficial Effects of SO/sub 2/ and Other Pollutants Emitted from Steam Plants on Crops and Forest Species, Particularly Soybeans and Pines
PROJECT NUMBER: 79 BDO (Task 4)
PRINCIPAL INVESTIGATOR: Noggle, J.C.
ADDRESS: Air Quality Research Section, Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: Hall, Clinton W.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$44,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To assess the contribution of sulfur and other plant nutrients to the terrestrial ecosystem from the atmosphere.
APPROACH: Sulfur and other plant nutrients in rainfall and dry particulates are collected and analyzed. Sulfur also enters the terrestrial ecosystem as SO/sub 2/ and a technique for measuring accumulation in this manner under field conditions is needed. Four methods of measuring SO/sub 2/ uptaken by vegetation will be evaluated and the best method selected for use at various locations relative to coal-fired power plants to measure SO/sub 2/ uptake by soil. Assessment of past deposition of sulfur to soils needs to be evaluated. Samples of native soil will be collected on different radials from coal-fired power plants and the sulfur content compared with samples collected from areas remote from the power plants.
RESULTS: The results of this investigation will be used to estimate the amount of sulfur contributed by coal-fired power plants to meet the sulfur requirements of vegetation. The consequences of a possible sulfur deficiency occurring if this source of sulfur is eliminated can be evaluated.
KEYWORDS: SULFUR DIOXIDE;USES;CROPS;FORESTS;SOYBEANS;PINES;FOSSIL-FUEL POWER PLANTS;GASEOUS WASTES;AIR POLLUTION;AEROSOLS;PARTICLES;NUTRIENTS;BIOLOGICAL EFFECTS;SOILS;ECONOMICS;ENVIRONMENTAL TRANSPORT

<130007>
TITLE: Fate and Effects of Atmospheric Emissions from Cooling Systems on Terrestrial Habitats
PROJECT NUMBER: 79 BDP
PRINCIPAL INVESTIGATOR: Kelly, J.M.
ADDRESS: Air Quality Research Section, Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: Hall, Clinton W.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$67,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: METALS (90%);SPECIFIED OTHER POLLUTANTS/Water (humidity) (10%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Evaluate impact of moisture, salts, toxic trace metals, released from natural draft and mechanical draft cooling towers on the terrestrial environment.
APPROACH: Study plots located in areas of maximum and minimum deposition will be utilized to evaluate the effect of increased moisture levels, salt deposition, and toxic heavy metals on plant growth and vigor of selected species; accumulation of heavy metals on and in vegetation, as well as nutrient loss and accumulation in the soil.
RESULTS: Estimates of plant uptake and/or foliar contamination will be obtained. Changes in soil nutrient status will be monitored as will ice damage and increased incidence of plant pathogens and insects. Deposition information can be used to verify deposition models for areas within 6 miles of the source.
PROJECT MILESTONES: (1) Establishment of study plots and completion of initial survey of local flora FY 1977. (2) Completion of evaluation under operating conditions FY 1980.
KEYWORDS: HEAVY METALS;MICROCLIMATE;TERRESTRIAL ECOSYSTEMS;COOLING SYSTEMS;AIR POLLUTION;ENVIRONMENTAL EFFECTS;MECHANICAL DRAFT COOLING TOWERS;NATURAL DRAFT COOLING TOWERS;HUMIDITY;METALS;DEPOSITION;SALTS;NUTRIENTS;SOILS;LAND POLLUTION;BIOLOGICAL EFFECTS;PLANTS;CHEMICAL EFFLUENTS;HABITAT

<130008>
TITLE: Remote Sensing of SO/sub 2/ Effects on Vegetation
PROJECT NUMBER: 79 BDJ
PRINCIPAL INVESTIGATOR: Sapp, C.D.
ADDRESS: Air Quality Research Section, Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals, and Industry
MONITOR: D'Alessio, Greg
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$87,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/;NOXIOUS GAS/NO/sub 2/;NOXIOUS GAS/O/sub 3/ (100%)
CHARACTER OF STUDY: RESEARCH (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
PROJECT DESCRIPTION: The development and refinement of remote sensing techniques for monitoring and evaluating the effects of SO/sub 2/ emissions from fossil-fueled, electric-generating plants on terrestrial vegetation.
APPROACH: Initial studies involve comparisons of ground-truth data (on effects) of foliar SO/sub 2/ effects to vegetation, primarily soybeans and pines; and color, color-infrared, and multi-spectral imagery obtained by conventional aircraft. If these methods prove satisfactory, then the feasibility of satellite imagery for effects monitoring will be evaluated.
RESULTS: Remote sensing methods for routine surveillance of biological effects of large areas which would permit permanent, quantitative documentation of the extent and severity of effects for economic assessment and determination of trends.
PROJECT MILESTONES: (1) TVA internal report on instrumentation 12/76. (2) TVA internal report on reflectance characteristics 10/77. (3) Milestone report discussing instrumentation and reflectance characteristics 7/78. (4) TVA internal report on high-altitude studies 8/78. (5) TVA internal report on remote sensing 8/79. (6) Final report 2/81.
KEYWORDS: COAL INDUSTRY;ENVIRONMENTAL EFFECTS;SULFUR DIOXIDE;FOSSIL-FUEL POWER PLANTS;PLANTS;BIOLOGICAL EFFECTS;SOYBEANS;PINES;ECONOMICS;MEASURING METHODS;REMOTE SENSING;AIR POLLUTION;TOXICITY;INFRARED SPECTRA;CORPS

<130009>
TITLE: Strip Mine Drainage Water Quality with Emphasis on Toxic Substances
PROJECT NUMBER: 79BDS
PRINCIPAL INVESTIGATOR: Cox, D. B.
ADDRESS: 246 401 Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Research and Development
MONITOR: Sanders, Walter;Mount, Donald;Hill, Ronald
TELEPHONE: C(404)546-3171;C(218)727-6548;C(513)684-4417
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$175,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: METALS (100%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);ANALYTICAL (20%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Other hydrographic areas Streams and rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The goal of this project is to demonstrate methodologies for predicting the impact on downstream biotic communities, based upon the characteristics of the site to be mined.
APPROACH: (1) Identify the occurrence and significance of trace metals in a strip mined area. (2) Calibrate existing regionalized hydrologic models using data from surface mined watersheds. (3) Develop or extend nonpoint source water quality models so that the natural-area environmental loadings of important water quality constituents can be predicted. (4) Relate the transport of significant trace metals and other important water quality constituents to the hydrology of small strip mined watersheds. (5) Develop relationships between the chemical composition of strip mine overburden and the downstream transport of important constituents over and above the natural-area environmental levels. (6) Relate the transport of important constituents to the structure and function of biological communities.
RESULTS: The end product of this research will be a methodology for planners or regulatory bodies for assessing the effects of incremental strip mining on water quality and the viability of the aquatic community. This methodology will be user oriented with the minimum amount of field data collection necessary to produce acceptable predictions.
PROJECT MILESTONES: (1) TVA internal report summarizing the findings of field investigations 12/76. (2) Milestone report summarizing the findings of field investigations 10/77. (3) TVA internal report which summarizes the studies of formation rates and transport mechanisms 8/78. (4) TVA internal report discussing treatment and reclamation evaluations 8/79. (5) Final report 8/81.
KEYWORDS: AQUATIC ORGANISMS;MINES;SURFACE MINING;WATER QUALITY;HYDROLOGY;METALS;TRACE AMOUNTS;WATERSHEDS;COMMUNITIES;FORECASTING;MATHEMATICAL MODELS;POLLUTION;ENVIRONMENTAL EFFECTS;COAL;MINE DRAINING;TOXIC MATERIALS

<130010>
TITLE: Evaluation and Improvement of Models Used for Radiological Impact Assessment of Gaseous Releases from Nuclear Power Plants
PROJECT NUMBER: 79 BDM
PRINCIPAL INVESTIGATOR: Doty, R.L.
ADDRESS: TVA-River Oaks Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Research and Development (Energy, Minerals, and Industry)
MONITOR: Bretthaur, Eric
TELEPHONE: F595-2969

TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$44,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (10%);ELECTRICITY GENERATION (85%);WASTE MANAGEMENT (5%)
POLLUTANTS: RADIATION/Fission and activation products (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To evaluate and refine the analytical models used for radiological impact assessment of nuclear power operations. Emphasis will be placed on models used to predict radiation doses from two components of direct radiation: (a) from radioactive materials confined within the plant, and (b) from radioactive materials in the gaseous effluent plume.
APPROACH: External radiation exposure levels in the vicinity of an operating, riverside nuclear power reactor(s) will be measured, and the results will be used in the development of accurate computer codes for calculating doses. Pressurized ionization chambers will be used for the measurements. Parametric analyses will be performed in conjunction with literature searches in an effort to improve the dispersion portion of the analytical model used for assessment of plume impact.
RESULTS: (1) Report(s) on direct radiation measurements at a BWR (PWR). (2) Report(s) on refined dosimetry and dispersion models and computer codes. These models and codes will be used to assess more accurately radiological impact of uranium fuel cycle operations. Improved assessment should facilitate the efficient and economical design of nuclear power plants and other uranium fuel cycle facilities.
PROJECT MILESTONES: (1) Direct radiation measurements at a BWR January 1979. (2) Final report on measurements and development of refined analytical models and computer codes August 1980.
KEYWORDS: NUCLEAR POWER PLANTS;RADIOACTIVE EFFLUENTS;MATHEMATICAL MODELS;ENVIRONMENTAL EFFECTS;NUCLEAR ENERGY;GASEOUS WASTES;RADIONUCLIDE MIGRATION;FISSION PRODUCTS;DOSIMETRY;RADIOECOLOGICAL CONCENTRATION;DIFFUSION;HEALTH HAZARDS;PLUMES

<130011>
TITLE: Development and Evaluation of an Integrated Approach to the Optimization of Nuclear Power Plant Radiolcgical Surveillance Programs
PROJECT NUMBER: 79EDI
PRINCIPAL INVESTIGATOR: Kanipe, L.G.
ADDRESS: Tennessee Valley Authority, River Oaks Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Research and Development (Energy, Minerals, and Industry)
MONITOR: Jarvis, Arthur
TELEPHONE: F595-2969
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$127,000
TECHNOLOGY: NUCLEAR/Fission Converters;NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: EXTRACTION (5%);PROCESSING, CONVERSION (5%);ELECTRICITY GENERATION (85%);WASTE MANAGEMENT (5%)
POLLUTANTS: RADIATION/Fission and activation products (100%)
CHARACTER OF STUDY: RESEARCH/Applied (65%);FULL SCALE DEMONSTRATION (35%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Rivers
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: (1) To develop and maintain a model quality assurance program for radiological surveillance. The emphasis in this task will be on development of a multiple-laboratory program. (2) To develop improved radiological monitoring techniques. (3) To develop an optimized radiological monitoring program.
APPROACH: (1) To produce an analytical quality control document which can be used by radiological laboratories for quality control monitoring of procedures, counting equipment, and data handling. (2) To develop a program of interlaboratory studies, standards, and analytical and counting procedures to use as standard methods in multiple laboratories. (3) To produce guidelines for gamma countig and data reduction techniques. (4) To develop a cost-effective radiological surveillance program through the use of statistical methodology, parametric studies, and improved sampling procedures.
RESULTS: (1) Analytical quality control manual for radioanalytical laboratories. (2) Demonstration of effective approach to multiple-laboratory quality assurance, to assure comparability of data produced throughout the U.S. for assessing radiological impact. (3) Reports on gamma data reduction techniques subsequent to or part of analysis using NaI(Tl) or Ge(Li) detection systems. (4) Improved environmental radiolcgical surveillance program, to facilitate the efficient and economical design of nuclear power systems.
PROJECT MILESTONES: (1) Least Squares Analysis of Gamma Spectra by ALPHA-M November 1976. (2) Applications of Ge(Li) Detectors in Environmental Analyses December 1977. (3) Cost-Effectiveness of Environmental Monitoring Schemes October 1978. (4) Final ''Pass-Thru'' Report February 1981.
KEYWORDS: QUALITY ASSURANCE;NUCLEAR POWER PLANTS;RADIOACTIVE EFFLUENTS;RADIOACTIVITY;MONITORING;ENVIRONMENTAL EFFECTS;FISSION PRODUCTS;AIR POLLUTION;RADIATION MONITORING;QUALITY ASSURANCE;RELIABILITY;DATA;WATER POLLUTION;LAND POLLUTION;COMPUTER CODES;ECONOMICS;GAMMA RADIATION;RADIOISOTOPES;STANDARDS

<130012>
TITLE: Effects of High Intensity Electric Fields
PROJECT NUMBER: 988-15-993.004
PRINCIPAL INVESTIGATOR: Barnett, J.H.
ADDRESS: TVA 1310 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Power Research Staff
MONITOR: Walker, T.R.
TELEPHONE: F854-3348
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$5,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
POLLUTANTS: RADIATION/Electric fields (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (50%);DEVELOPMENT/Laboratory scale (50%)

REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;HEALTH EFFECTS
PROJECT DESCRIPTION: Determine effects of high intensity fields. There is much public concern, as well as concern within the power industry itself, about the effects on people exposed to electric fields from EHV and UHV power lines and equipment. The solution of problems associated with exposure to these fields involves the identification of biological effects and biomedical problems and the advancement of technology to eliminate these effects.
APPROACH: This project will consist of an ongoing review of research being conducted nationally, investigations of specific problems and solutions related to electric fields on the TVA power system, and investigation of ways to apply the results of the national effort to the TVA power system. No funds are included for an intensive monitoring and/or development program.
RESULTS: Instrumentation was developed to monitor electromagnetic and electrostatic fields under transmission lines, substation buses, transformers, generators, and other energized equipment. Actual field mapping under certain TVA's 500 kV transmission lines and switchyards have been conducted to evaluate present exposure conditions. Laboratory and actual field tests are being conducted on an American optical demand pacemaker to determine if electromagnetic or electrostatic fields have any adverse effects on these life essential devices.
PROJECT MILESTONES: Presently no particular milestones have been established.
KEYWORDS: ELECTRIC FIELDS;HEALTH HAZARDS;ELECTRIC POWER;POWER TRANSMISSION LINES;BIOLOGICAL EFFECTS;EQUIPMENT;TENNESSEE VALLEY AUTHORITY;ELECTROSTATICS;HEART;ELECTROMAGNETIC FIELDS;EMISSION;CARDIAC PACEMAKERS;POWER GENERATION;POWER SUBSTATIONS

<130013>
TITLE: Economic Study of Dry NO/sub x/ Removal Processes
PRINCIPAL INVESTIGATOR: Hollinden, G.A.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Electric Power Research Inst., Palo Alto, Calif. (USA)
DIVISION: Fossil Fuels Program
TELEPHONE: C(415)493-4800
TYPE OF FUNDING: Contract No.
77 FUNDING: Electric Power Research Inst. FY77:$122,400
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/ (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective of the study is to provide a preliminary economic assessment of two potentially attractive NO/sub x/ control methods.
APPROACH: A preliminary study to develop investment and operating costs for dry NO/sub x/ removal processes.
RESULTS: This study is directed to evaluating potentially attractive dry NO/sub x/ control methods.
KEYWORDS: NITROGEN OXIDES;AIR POLLUTION;CONTROL;ECONOMICS;CLEANING;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS

<130014>
TITLE: NO/sub x/ Technology
PROJECT NUMBER: 988-15-990.1006
PRINCIPAL INVESTIGATOR: Hollinden, G.A.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Power Research Staff
MONITOR: Hollinden, Gerald A.
TELEPHONE: C(615)755-3381
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/NO/sub x/ (100%)
CHARACTER OF STUDY: RESEARCH/Applied (25%);ANALYTICAL (75%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objectives of the programs are to ensure that adequate data from TVA's power plants are available, that TVA is informed on the state of the art of NO/sub x/ removal or control, that NO/sub x/ removal or control projects are well defined, and that implementation of project plans is adequate.
APPROACH: Reviewing and commenting on advanced concepts associated with NO/sub x/ removal or control. Assisting in developing and reviewing project plans for EPRI programs related to NO/sub x/ removal or control. Testing at TVA's power plants, where data are not available, to determine NO/sub x/ emissions. The scope of this program consists of obtaining NO/sub x/ emission data; reviewing and visiting advanced NO/sub x/ removal or control systems; and reviewing, developing, and commenting on proposals.
RESULTS: Work is in progress reviewing and commenting on advanced NO/sub x/ removal or control systems.
KEYWORDS: NITROGEN OXIDES;TECHNOLOGY ASSESSMENT;FOSSIL FUELS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;REMOVAL;FOSSIL-FUEL POWER PLANTS;CONTROL;POLLUTION CONTROL EQUIPMENT

<130016>
TITLE: Particulate Technology
PROJECT NUMBER: 988-15-990.1018
PRINCIPAL INVESTIGATOR: Hollinden, G.A.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$30,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES/Fly ash (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)

REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT
APPROACH: The objectives of the project are to summarize and evaluate data pertaining to particulate emissions from fossil-fired power plants, to review advanced concepts in the area of particulate emission control, and to develop and coordinate research to improve collection efficiencies, and to reduce the environmental impact of particulate emissions. The scope of the program includes summarizing and evaluating data, reviewing concepts, and developing a test program for improving the techniques of particulate control.
KEYWORDS: AIR POLLUTION;FOSSIL-FUEL POWER PLANTS;AEROSOLS;PARTICLES;ENVIRONMENTAL EFFECTS;CONTROL

<130017>
TITLE: Lime/Limestone and Advanced Concepts; TVA's 1-MW Pilot Plant (Colbert)
PROJECT NUMBER: 79 BAZ
PRINCIPAL INVESTIGATOR: Hollinden, G.A.;Robards, R.F.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Control Systems Laboratory
MONITOR: Williams, John E.
TELEPHONE: F629-2915
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$450,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (75%);PARTICULATES/Fly ash (25%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The major objective of the project is to develop reliable closed loop mist eliminator systems for lime/limestone systems now in operation or planned in the near future; also, to the extent possible, develop less costly advanced high velocity scrubbers.
APPROACH: Determine the factors adversely affecting the mechanical and process reliability of mist eliminators in lime/limestone wet scrubbing systems.
RESULTS: Previous projects were initiated to provide technical design input for the full-scale scrubber installation at Widows Creek. Recent tests on new mist eliminator operating modes have been promising. This study will expand in more detail the viability of these recent tests.
PROJECT MILESTONES: Final report on vertical mist eliminator study. Final report on high velocity scrubber and mist eliminator combination study.
KEYWORDS: MIST ELIMINATOR;COAL;ENVIRONMENTAL EFFECTS;ELECTRIC POWER;POWER GENERATION;SCRUBBERS;RELIABILITY;LIMESTONE;SORPTIVE PROPERTIES;WATER VAPOR;AIR POLLUTION ABATEMENT;DESIGN;POLLUTION CONTROL EQUIPMENT

<130018>
TITLE: Development of Improved Lime/Limestone Scrubbing Technology
PROJECT NUMBER: TV-42660A
PRINCIPAL INVESTIGATOR: Hollinden, G.A.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Electric Power Research Inst., Palo Alto, Calif. (USA)
DIVISION: Fossil Fuels Program
MONITOR: Yeager, Kurt
TELEPHONE: C(415)493-4800
TYPE OF FUNDING: Contract No.-TV-42660A
77 FUNDING: Electric Power Research Inst. FY77:$114,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub 2/ (60%);PARTICULATES/Fly ash (20%);SPECIFIED OTHER POLLUTANTS/Scrubber sludge (20%)
CHARACTER OF STUDY: RESEARCH/Laboratory (15%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (85%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/South
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: The objectives of this program will include making heat balances for several reheat schemes and evaluating materials of construction along with system operability; to evaluate a horizontal scrubber system at the 1-MW level; to evaluate the erosion and corrosion of various materials used in the construction of scrubber systems; to determine the range of variability of the solids in sludges produced from scrubbers operated by various utilities and to correlate the variability with plant operating conditions.
APPROACH: Design, construction, and operation of each reheat system, horizontal scrubber, erosion/corrosion test loop. Contacting full-scale lime and limestone scrubber installations requesting sludges for chemical and instrumental analysis.
RESULTS: This project is directed to expanding an existing development and process evaluating program at the TVA Colbert lime/limestone scrubbing pilot plant to include four additional high priority tasks required in achieving a commercial design base for lime/limestone scubbing on high-sulfur coal.
PROJECT MILESTONES: Final report on each task.
KEYWORDS: REHEAT;SCRUBBING;CORROSION;SLURRIES;SCRUBBERS;DESIGN;CONSTRUCTION;OPERATION;LIMESTONE;PILOT PLANTS;COAL;ENVIRONMENTAL EFFECTS;WASTE MANAGEMENT;FLUE GAS;EROSION

<130019>
TITLE: ASTM Air Quality Evaluation Methods (EEI-RP102)
PROJECT NUMBER: 988-15-990-1007
PRINCIPAL INVESTIGATOR: Robards, R.F.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Office of Power
MONITOR: Hollinden, Gerald A.
TELEPHONE: C(615)755-3381

TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$1,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
POLLUTANTS: NOXIOUS GAS/All major (75%);PARTICULATES/All (25%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: This project is designed to determine how reliable the standard methods are for measuring the major pollutants in ambient air and in emissions from principal sources. Reliability comprises accuracy, reproducibility, and repeatability.
APPROACH: TVA is cosponsor of the project and the Power Research Staff keeps abreast of their accomplishments.
RESULTS: Work is in progress reviewing and commenting on the results of the project.
PROJECT MILESTONES: Development of reliable measuring techniques.
KEYWORDS: AIR QUALITY;MEASURING METHODS;TECHNOLOGY ASSESSMENT;SURFACE AIR;AIR POLLUTION;RELIABILITY;MEASURING INSTRUMENTS

<130020>
TITLE: Sludge Disposal from Sulfur Dioxide and Particulate Removal Processes
PROJECT NUMBER: 988-15-990-1013
PRINCIPAL INVESTIGATOR: Crowe, J.L.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$10,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Solid waste disposal (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Evaluate data available on sludge disposal methods and on the properties of both treated and untreated sludges so as to maintain our knowledge of the state of the art in disposal technology.
APPROACH: Summarize and evaluate existing data pertaining to sludge disposal, investigate the potential methods for improving the disposal characteristics of sludge, and recommend future testing.
RESULTS: Summarize and evaluate all available data concerning disposal methods so as to determine problem areas and collect, summarize, and evaluate data from sludge disposal test facilities so as to determine their application.
PROJECT MILESTONES: Report summarizing the state of the art in disposal technology--May, 1974 to--Feb., 1975.
KEYWORDS: POLLUTION CONTROL EQUIPMENT;SLUDGES;WASTE DISPOSAL;SOLID WASTES;SULFUR DIOXIDE;ENVIRONMENTAL EFFECTS;REMOVAL;AEROSOLS;TECHNOLOGY ASSESSMENT;AIR POLLUTION ABATEMENT;SCRUBBERS;SLUDGES;WATER

<130022>
TITLE: Processing Sludges from Lime/Limestone Wet Scrubbing Processes for Disposal or Recycle and Studying Disposal of Fluidized-Bed Combustion Waste Products
PROJECT NUMBER: 79 BBA
PRINCIPAL INVESTIGATOR: Crowe, J.L.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Industrial Environmental Research Laboratory
MONITOR: Jones, Julian W.
TELEPHONE: F629-2915
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$200,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Solid waste disposal (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/General (60%);DEVELOPMENT/Laboratory scale;DEVELOPMENT/Pilot plant (40%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas River
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To obtain data on the variables in pilot plant production of fertilizer from scrubber product sludges, on the compatibility factors involved in storage and mixing of this fertilizer material with conventional fertilizer, or how scrubber operation affects sludge characteristics, and a detailed physical and chemical characterization of the waste solids from various fluidized bed combustion systems burning coal.
APPROACH: To determine the technical, economic, and environmental feasibility of producing a fertilizer material from scrubber sludge, to determine the range of variability of the solids produced from the scrubbers operated at the Shawnee Test Facility and correlation of this variability with plant and scrubber operating conditions, and an evaluation of disposal methods for and the characteristics of fluidized bed combustion waste products.
RESULTS: (1) A fertilizer material product from scrubber sludge. (2) A disposal method for fluidized bed combustion waste products and understanding of their characteristics. (3) A correlation of the variability of sludge characteristics to scrubber operation.
PROJECT MILESTONES: (1) Pilot plant studies and supporting work with fertilizer September 1976. (2) Shawnee sludge-scrubber correlation work September 1976. (3) Fluidized bed combustion characterization October 1976.
KEYWORDS: SCRUBBING;SOLID WASTES;WASTE DISPOSAL;RECYCLING;FLUIDIZED-BED COMBUSTION;WASTE MANAGEMENT;COMBUSTION PRODUCTS;COAL;AIR POLLUTION;CONTROL;LIMESTONE;FERTILIZERS;PRODUCTION;SLURRIES;SULFUR COMPOUNDS;WATER;SLUDGES

<130023>
TITLE: Use of a Fish Pump to Reduce Fish Impingement at Browns Ferry Nuclear Plant
PROJECT NUMBER: 988-15-990-1030
PRINCIPAL INVESTIGATOR: Ray, S.S.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$50,000
TECHNOLOGY: CONSERVATION/General (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Mechanical damage of fish on intake structures (100%)
CHARACTER OF STUDY: RESEARCH/Applied (20%);DEVELOPMENT/Pilot plant (80%)
REGIONS OF INTEREST: BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Middle Atlantic;GEOGRAPHIC AREAS/South;GEOGRAPHIC AREAS/Southwest;GEOGRAPHIC AREAS/Far West;GEOGRAPHIC AREAS/Northwest;GEOGRAPHIC AREAS/Continental;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf;COASTS/Far West;COASTS/Northwest;COASTS/Alaska;HYDROGRAPHIC AREAS/Continental shelf;HYDROGRAPHIC AREAS/Other hydrographic areas Water body from which cooling water for power plant is withdrawn
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of this project is to determine whether a fish pump can be efficiently utilized to reduce impingement at Browns Ferry Nuclear Plant.
APPROACH: The scope of the project includes the purchase and installation of a fish pump, operation of the pump, data acquisition through identification and enumeration of fish impinged on the screens and of those transported by the pump, data evaluation, and reporting.
RESULTS: The project workplan, environmental evaluation record, and activity authorization have been completed. A 6-inch diameter pump and 7-1/2 hp motor have been purchased and installed at the plant. After operational testing, modifications to improve performance have been made. An operational schedule has been established to allow for two sampling periods per week. The facility began operation in March 1975 and approximately 6 months of data have been obtained on fish pump efficiency and survival rates. The facility did not operate for several months during the winter of 1975-76, while the screen well in which the dust pan is located was dewatered for maintenance. The facility has experienced operation and maintenance problems. Recommendations for modification of the facility are being prepared by a TVA interdivisional work group.
PROJECT MILESTONES: Final report on the project
KEYWORDS: FISHES;IMPINGEMENT;EQUIPMENT;BROWNS FERRY-1 REACTOR;BROWNS FERRY-2 REACTOR;BROWNS FERRY-3 REACTOR;PUMPS;OPERATION;DATA;EFFICIENCY;REACTOR COOLING SYSTEMS;INTAKE STRUCTURES;POWER PLANTS;ENVIRONMENTAL EFFECTS;THERMAL EFFLUENTS;WATER POLLUTION

<130024>
TITLE: Trace Element Study
PROJECT NUMBER: 988-15-990-1020
PRINCIPAL INVESTIGATOR: Flora, H.B. II
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$5-000
TECHNOLCGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Trace (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To summarize and evaluate data pertaining to concentrations of trace elements associated with fossil fuel power plant, to develop and coordinate research to improve knowledge of potential environmental hazards of trace elements, and to review and comment on trace elements studies being conducted by other organizations. The program includes summarizing and evaluating data, reviewing concepts, and possibly developing an experimental program to provide additional data.
APPROACH: The scope of the program includes summarizing and evaluating data, reviewing concepts, and possibly developing an experimental program to provide additional data.
RESULTS: To determine if there is any portion of the research data that requires further development and to suggest or formulate means to suppply the data.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;CHEMICAL EFFLUENTS;ENVIRONMENTAL EFFECTS;TRACE AMOUNTS;DATA ACQUISITION;SURFACE AIR;QUANTITATIVE CHEMICAL ANALYSIS;WATER POLLUTION;WASTE MANAGEMENT;FLY ASH

<130025>
TITLE: Beneficial Uses of Waste Heat-General
PROJECT NUMBER: 988-15-990-6009
PRINCIPAL INVESTIGATOR: Snipes, R.L.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$4,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This program is a study to review and evaluate research programs on beneficial uses of heated water discharges from power plants. The objective of this program is to investigate new technology in the field of beneficial uses of waste heat for possible application for power plants.
APPROACH: Review and evaluate research programs on beneficial uses of heated water discharges from power plants. Define deficient areas that require further development. Formulate projects to complete deficient areas.
RESULTS: A continuing effort is being made to stay abreast of research in beneficial uses of waste heat

throughout the power industry. Testing of full scale facilities, both economically and technically feasible, where it is feasible for these facilities to be located.
KEYWORDS: WASTE HEAT;USES;ENERGY CONSERVATION;THERMAL EFFLUENTS;POWER PLANTS;THERMAL POLLUTION;WATER POLLUTION ABATEMENT;ELECTRIC POWER;ENVIRONMENTAL EFFECTS;ECONOMICS;WATER POLLUTION;WASTE HEAT UTILIZATION;GREENHOUSES

<130027>
TITLE: Alleviation of Power Plant Condenser and Raw Water System Fouling by Corbicula
PROJECT NUMBER: 988-15-990-1037
PRINCIPAL INVESTIGATOR: Flora, H.B. II
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$85,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Toxic biocides (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater lakes and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Investigate methods such as mechanical systems, chlorination, molluscicides, controlled release paints, ozonation, heat treatment, closed-loop designs and other methods potentially feasible for application to the control of corbicula.
APPROACH: A state-of-the-art review and evaluation of potential for application in terms of environmental, technical, and operational feasibility will be prepared for each of these methodologies to provide guidance and direction for the work to be undertaken. This review will be followed by laboratory testing and evaluation of chemical, mechanical, and thermal control systems.
RESULTS: The state-of-the-art review is almost completed. Plans for testing chemicals and controlled release paints are being designed.
KEYWORDS: CORBICULA;MOLLUSCS;BIOLOGICAL FOULING;CONTROL;POWER PLANTS;CONDENSERS;COOLING SYSTEMS;DESIGN;TEMPERATURE EFFECTS;FEASIBILITY STUDIES;ECONOMICS;WATER POLLUTION;THERMAL EFFLUENTS

<130029>
TITLE: Study of Methods to Prevent Saturation of Closed-loop Ash Pond Systems
PROJECT NUMBER: 988-15-990-1028
PRINCIPAL INVESTIGATOR: Flora, H.B. II
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$2,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Trace (15%);PARTICULATES/Particle size (10%);SPECIFIED OTHER POLLUTANTS/Scaling potential (75%)
CHARACTER OF STUDY: RESEARCH/Applied (25%);DEVELOPMENT/Pilot plant (25%);ANALYTICAL (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Fresh water lakes and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This project is to study methods which have potential application for desaturating liquor loops of closed-loop recirculation systems at ash ponds. The objective is to find a method which may be of use in preventing scaling in liquor loops where it is necessary to close ash ponds.
APPROACH: The scope of the program includes summarizing and evaluating data and receiving concepts. Funds are not provided for an extensive experimental program.
RESULTS: Analysis of chemical data from closed loop ash ponds in operation.
KEYWORDS: SCALING POTENTIAL;ASHES;WASTE DISPOSAL;COOLING PONDS;SCALING;CHEMICAL REACTIONS;CORROSION;COOLING SYSTEMS;WATER CHEMISTRY;CLOSED-CYCLE SYSTEMS;COOLANT LOOPS;COAL;ENVIRONMENTAL EFFECTS;WATER POLLUTION;COMPUTER CODES;CHEMICAL EFFLUENTS;CHEMICAL COMPOSITION;MATHEMATICAL MODELS

<130030>
TITLE: Protection of Aquatic Life at Power Plant Cooling Water Intakes
PROJECT NUMBER: 988-15-990-1022
PRINCIPAL INVESTIGATOR: Flora, H.B.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$5,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Fish impingement (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater lakes and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: A study to evaluate and investigate various screening techniques and behavior barriers to divert and protect aquatic life at power plant cooling intakes. The objective of the program is to ensure best alternatives obtained by TVA at both existing and future plants. The scope of the program consists of summarizing and evaluating data, reviewing concepts, development of new concepts, performing preliminary testing of concepts, and developing test programs for concepts which appear most feasible.
APPROACH: Summarize and evaluate data available on fish impingement. Develop and implement projects in deficient areas.
RESULTS: Formulation of tasks and projects needed to gather data in deficient areas.
KEYWORDS: AQUATIC ECOSYSTEMS;INTAKE STRUCTURES;COOLING SYSTEMS;POWER PLANTS;DESIGN;FRESH WATER;BEHAVIOR;ENVIRONMENTAL EFFECTS;BIOLOGICAL EFFECTS;INJURIES;FISHES;IMPINGEMENT;ENVIRONMENT

<130031>
TITLE: Heat Dissipation Technology
PROJECT NUMBER: 988-15-990-1015
PRINCIPAL INVESTIGATOR: Neal, C.V.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$10,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater lakes and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: A study to summarize and evaluate existing heat dissipation methods and devices, reviewing advanced concepts, and developing and reviewing project plans related to heat dissipation from power plants. The program is to evaluate data ensuring that TVA is informed on the state of the act, and insure that project plans are adequate.
APPROACH: Summarize and evaluate data available on heat dissipation technology. Develop and implement projects in deficient areas.
RESULTS: Formulation of tasks and projects to gather data in deficient areas.
KEYWORDS: WASTE HEAT;DIFFUSION;THERMAL POLLUTION;WATER POLLUTION;POWER PLANTS;DATA;TECHNOLOGY ASSESSMENT;METEOROLOGY;MEASURING METHODS;HEAT TRANSFER;THERMAL DIFFUSION;WATER;ECONOMICS;THERMAL EFFLUENTS;WEATHER

<130032>
TITLE: Thermal Effects from Steam-Electric Generating Facilities
PROJECT NUMBER: 988-15-990-1024
PRINCIPAL INVESTIGATOR: Goss, L.B.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$25,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater lakes and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The project will mainly consist of an in-depth literature search to determine the state-of-the-art knowledge of thermal effects from steam generating plants. The potential for use at computer modeling of thermal effects on aquatic ecosystems will be evaluated. The main objectives are to (1) become familiar with different aspects of thermal effects (2) determine whether there is potential for predicting thermal effects from TVA power plants, and (3) develop competence in evaluating systems designed to minimize thermal effects.
APPROACH: Survey existing data and summarize into a state-of-the-art assessment.
RESULTS: Develop ability to evaluate systems designed to minimize thermal effects.
KEYWORDS: THERMAL EFFLUENTS;THERMAL POLLUTION;POWER PLANTS;STEAM GENERATORS;ENVIRONMENTAL EFFECTS;AQUATIC ECOSYSTEMS;TEMPERATURE EFFECTS;MATHEMATICAL MODELS;FORECASTING;TECHNOLOGY ASSESSMENT;DATA ACQUISITION;WATER POLLUTION ABATEMENT;BIOMASS;REPRODUCTION;WATER;ZOOPLANKTON

<130033>
TITLE: Membrane Processes For Refurbishing Power Plant Water Supply
PROJECT NUMBER: 988-15-990.1033
PRINCIPAL INVESTIGATOR: Flora, H.B.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$5,000
TECHNOLOGY: SPECIFIED OTHER TECHNOLOGIES/Water (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Dissolved solids (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Determine whether one or more membrane processes could be beneficially utilized for refurbishing power plant discharge waters.
APPROACH: Review available information. Basic laboratory studies involving candidate membranes.
RESULTS: Conclude whether membrane processes show potential to treat power plant discharge waters. Conclude whether a test facility at a power plant is feasible.
KEYWORDS: DISSOLVED SOLIDS AND SPECIES;REVERSE OSMOSIS;POWER PLANTS;COOLING SYSTEMS;CHEMICAL EFFLUENTS;WATER QUALITY;MEMBRANES;CHEMICAL EFFLUENTS;FILTRATION;PERFORMANCE TESTING;WATER POLLUTION;ECONOMICS;WATER;OSMOSIS;MEMBRANES

<130034>
TITLE: Use of Waste Heat in Sewage Sludge Digestion
PROJECT NUMBER: 988-15-990.103
PRINCIPAL INVESTIGATOR: Goss, L.B.;Hoogheem, T.J.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$15,000
TECHNOLOGY: SPECIFIED OTHER TECHNOLOGIES/Waste heat (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL/Waste heat (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Review and evaluate existing technology on the use of waste heat from steam-electric generating facilities for sewage and sludge treatment. To define the state of the art in this area and determine whether TVA should initiate a development program.
APPROACH: Review and evaluate existing technology, summarize the results of the review. Evaluate cost and technical alternatives.
RESULTS: Conclude whether or not there is justified potential for successfully integrating a sewage or sludge treatment facility with a TVA power plant. The initial review is partially complete and should be completed by the fall of 1976. The final report is now available.
KEYWORDS: POWER PLANTS;WASTE HEAT;THERMAL EFFLUENTS;USES;SEWAGE;SEWAGE SLUDGE;DECOMPOSITION;ECONOMICS;WATER

<130035>
TITLE: Fly Ash Characterization and Disposal
PROJECT NUMBER: EAP I.D. No. 79BBC
PRINCIPAL INVESTIGATOR: Ray, S.S.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Utilities and Industrial Power Division
MONITOR: Jones, Julian A.
TELEPHONE: P629-2915
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS:
METALS/Arsenic;METALS/Selenium;METALS/Antimony;METALS/Titanium;METALS/Vanadium;METALS/Chromium;METALS/Manganese;METALS/Iron;METALS/Cobalt;METALS/Nickel;METALS/Barium;METALS/Copper;METALS/Zinc;METALS/Cadmium;METALS/Lead;METALS/Beryllium;METALS/Mercury;METALS/Silicon;METALS/Aluminum;METALS/Magnesium;METALS/Potassium;METALS/Sodium (70%);PARTICULATES (20%);SPECIFIED OTHER POLLUTANTS/PH, TSS, chemical parameters (10%)
CHARACTER OF STUDY: RESEARCH/Applied (70%);ANALYTICAL (30%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater lakes and reservoirs in Southeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objectives of this project are to characterize ashes and their waste effluents, examine fly ash handling systems and problems associated with ash handling, and determine promising cost-effective systems to reduce disposal problems.
APPROACH: The scope of this project includes summarizing available information on coal and ashes, wet and dry handling systems, disposal and utilization of fly ash, and methods of treatment for water reuse; characterizing coal, ashes, and effluents from two or more TVA plants; evaluations of wet and dry handling systems; and determination of promising handling systems.
RESULTS: Provide information on coal, ashes, and ash effluents from coal-fired utility boilers having different coal sources and boiler types. Provide evaluations of handling systems and state-of-the-art methods of disposal and utilization.
PROJECT MILESTONES: (1) Summary of Data on Coal and Ash 6/76. (2) Characterization of Coal, Ash, and Ash Effluents 2/79. (3) Study on Disposal and Utilization of Fly Ash 12/77. (4) Summary of Methods of Treatment for Water Reuse 12/76. (5) Evaluation of Dry and Wet Flyash Handling Systems 6/79. (6) Final Report 12/79.
KEYWORDS: FLY ASH;WASTE DISPOSAL;CHEMICAL PROPERTIES;COAL;ENVIRONMENTAL EFFECTS;WATER POLLUTION;WASTE MANAGEMENT;ECONOMICS;USES;RESOURCE CONSERVATION;MATERIALS RECOVERY;ECONOMICS;WATER;TRACE AMOUNTS;PUBLIC UTILITIES

<130036>
TITLE: Refuse Burning at Allen Steam Plant
PROJECT NUMBER: 988-15-990-6005
PRINCIPAL INVESTIGATOR: Zitzow, U.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$2,000
TECHNOLOGY: CONSERVATION/General (50%);CONSERVATION/End use (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (90%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH (10%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental;COASTS/Other coasts Unspecified
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To review and comment on proposals and reports concerned with supplying refuse-derived

fuel to TVA's Allen Steam Plant for use as a supplemental fuel.
APPROACH: Working with the city of Memphis to build a demonstration facility.
RESULTS: Generation of electricity from solid waste.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;BOILER FUEL;MUNICIPAL WASTES;COMBUSTION;COST BENEFIT ANALYSIS;PILOT PLANTS;ELECTRIC POWER;PUBLIC UTILITIES;PRODUCTION;AIR QUALITY;WATER QUALITY;LAND USE;SYNTHETIC FUELS

<130037>
TITLE: Widows Creek Unit 8, Limestone West Scrubber
PROJECT NUMBER: 988-15-994.001
PRINCIPAL INVESTIGATOR: McKinney, B.G.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Power Research Staff
MONITOR: McKinney, Billy G.
TELEPHONE: F854-3381
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$800,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (50%);PARTICULATES/Fly ash (50%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Site specific Widows Creek
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Install a full-scale research and demonstration limestone wet scrubber on the 550-MW Widows Creek Steam Plant Unit 8.
APPROACH: (1) Design systems, then (2) construct facilities.
RESULTS: Removal of both fly ash and SO/sub 2/ from the stack gas.
PROJECT MILESTONES: (1) Completion of design. (2) Completion of construction. (3) Start-up and commercialization of facilities.
KEYWORDS: FOSSIL FUELS;ENVIRONMENTAL EFFECTS;AIR POLLUTION CONTROL;SULFUR DIOXIDE;FLY ASH;WIDOWS CREEK STEAM PLANT;SULFUR COMPOUNDS;SCRUBBERS;FOSSIL-FUEL POWER PLANTS;TECHNOLOGY ASSESSMENT;DESULFURIZATION;DESIGN;EQUIPMENT;FLUE GAS

<130038>
TITLE: SO/sub x/ Technology
PROJECT NUMBER: 988-15-990.1014
PRINCIPAL INVESTIGATOR: Hollinden, G.A.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Power Research Staff
MONITOR: Hollinden, Gerald A.
TELEPHONE: F854-3381
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$40,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION IN SITU (10%);ELECTRICITY GENERATION (90%)
POLLUTANTS: NOXIOUS GAS/SO/sub x/ (100%)
CHARACTER OF STUDY: RESEARCH/Applied (10%);ANALYTICAL (90%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: To ensure that TVA is informed on the state of the art of SO/sub x/ removal, that SO/sub x/ removal projects are well-defined, and that implementation of project plans is adequate.
APPROACH: (1) Reviewing and visiting advanced SO/sub x/ removal systems. (2) Reviewing, developing, and commenting on proposals.
RESULTS: (1) Reviews and comments on advanced SO/sub 2/ removal processes. (2) Reviews, comments, and coordination of proposals and projects for SO/sub 2/ removal funded by outside agencies.
PROJECT MILESTONES: Reviews and comments on advanced concepts associated with SO/sub x/ removal.
KEYWORDS: SULFUR DIOXIDE;SULFUR OXIDES;REMOVAL;ELECTRIC POWER;POWER GENERATION;FLUE GAS;DESULFURIZATION;SCRUBBERS;GASEOUS WASTES;AIR POLLUTION CONTROL;FOSSIL-FUEL POWER PLANTS;PLANNING;TECHNOLOGY ASSESSMENT

<130039>
TITLE: Study of Methods to Reduce Chlorine Discharges
PROJECT NUMBER: 988-15-990.1029
PRINCIPAL INVESTIGATOR: Flora, H.B. II
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$4,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Chlorine and chlorine compounds (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Assessment of the overall program needed to comply with chlorine discharge regulations under the NPDES permits program will be made.
APPROACH: The study will evaluate and summarize the methods by which chlorine discharges from once-through cooling systems and cooling tower blowdown may be reduced. Also, alternative mechanisms to treat

biofouling will be studied.
RESULTS: The study will recommend methods to reduce chlorine discharges and may suggest alternative mechanisms to treat biofouling.
KEYWORDS: POWER PLANTS;COOLING SYSTEMS;CHEMICAL EFFLUENTS;WATER QUALITY;CHLORINE;REMOVAL;ENVIRONMENT;MAXIMUM PERMISSIBLE LEVEL;RECOMMENDATIONS;WATER POLLUTION;COOLING TOWERS;BLOWDOWN;BIOLOGICAL FOULING

<130040>
TITLE: Characterization of Effluents from Coal-Fired Utility Boilers
PROJECT NUMBER: EAP I.D. No. 79 BBB
PRINCIPAL INVESTIGATOR: Flora, H.B. II;McKinney, B.G.
ADDRESS: TVA, 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Industrial Processes Division
MONITOR: Venetia, Ron A.;Jones, Julian
TELEPHONE: F629-2547
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$350,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS:
METALS/Trace;METALS/Arsenic;METALS/Selenium;METALS/Antimony;METALS/Titanium;METALS/Vanadium;METALS/Chromium;METALS/Manganese;METALS/Iron;METALS/Cobalt;METALS/Nickel;METALS/Barium;METALS/Copper;METALS/Zinc;METALS/Cadmium;METALS/Lead;METALS/Beryllium;METALS/Mercury;METALS/Silicon;METALS/Aluminum;METALS/Magnesium;METALS/Potassium;METALS/Sodium (60%);ORGANICS/Oil and grease (20%);SPECIFIED OTHER POLLUTANTS/Chemical parameters, pH, TSS (20%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;COASTS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater lakes and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective is to (1) characterize coal pile drainage, (2) assess the pH adjustment on ash pond effluent, (3) assess and then design an effective program for monitoring ash pond effluent, (4) evaluate chlorinated water effluent quality in the discharge canal, (5) assess, characterize, and quantify coal ash leachate effects on ground water, and (6) study gaseous emissions from many types of boilers.
APPROACH: The project will cover (1) characterization and quantification of physical and chemical components of coal pile drainage, (2) assessment and quantification of the chemical and physical nature of ash pond effluent after pH of the ash pond has been adjusted to meet existing standards, (3) evaluation of an ash monitoring program to determine the sampling necessary to obtain reliable, representative information, (4) assessment and characterization of coal ash leachate on ground water quality, (5) evaluation and quantification of chlorinated effluent in the discharge canal, and (6) characterization and quantification of gaseous effluents from tangential and wall-fired units.
RESULTS: Final results will help provide chemical information to design treatment systems for effluent waters. Also, one task will address the efficacy of presently specified monitoring programs. Another task will produce information to define methods to reduce chlorine usage. Another will assess the influence of chemical constituents from the Ash Pond on ground water quality. Finally, one task will provide information to characterize gaseous, vapor and fine particulate emissions from different types of boilers.
PROJECT MILESTONES: Characterization of coal pile drainage 12/78. Assessment of pH adjustment on ash pond effluent 12/78. Complete study on the design of an effective monitoring program for ash pond effluent 8/77. Evaluation of chlorination of once-through condenser systems 6/78. Coal ash leachate effect on ground water quality 6/78. Assessment of gaseous emissions from different boilers 12/79.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;BOILERS;ENVIRONMENTAL EFFECTS;AIR POLLUTION;WATER POLLUTION;PH VALUE;FLY ASH;MONITORING;DESIGN;CHLORINE;ONCE-THROUGH COOLING SYSTEMS;CHEMICAL EFFLUENTS;COAL;STORAGE;GROUND WATER;GASEOUS WASTES;WASTE DISPOSAL;ACID MINE DRAINAGE;SPOIL BANKS;SOILS

<130041>
TITLE: Advanced Waste Heat Control
PROJECT NUMBER: EAP I.D. No. 79BBE
PRINCIPAL INVESTIGATOR: Flora, H.B. II
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Utilities and Industrial Power Division
MONITOR: Maxwell, M.A.
TELEPHONE: F629-2915
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$300,000
TECHNOLOGY: CONSERVATION/General (70%);GENERAL SCIENCE (30%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: METALS/Dissolved species (15%);HEAT, THERMAL (70%);SPECIFIED OTHER POLLUTANTS/Impingement, fish (15%)
CHARACTER OF STUDY: RESEARCH/Applied (15%);DEVELOPMENT/Laboratory scale (15%);FULL SCALE DEMONSTRATION (70%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater lakes and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The objective is to investigate and evaluate various mechanisms for the reduction of intake structure effects at power plants, to investigate alternate cooling devices, and to investigate the application of membrane technology to power plants.
APPROACH: Determine whether one or more mechanisms may be beneficially utilized to reduce entrapment and entrainment. Evaluate the Engineering and Environmental aspects of wet/dry cooling towers by full scale demonstration and to participate in the development of the cherne spray thermal rotor system. Evaluate the use of membrane processes for refurbishing power plant discharge waters by testing on pilot scale test equipment and modules.
SULTS: Definition of the applicability of membranes to treat power plant effluent streams and which membrane best treats a particular effluent stream. Demonstrate full scale the engineering and environmental aspects of wet/dry cooling. Test a field device to reduce fish impingement.
PROJECT MILESTONES: (1) Publish final report on application of membrane technology to power plant water

effluent 6/78. (2) Publish report that evaluates a method to reduce intake structure impact 6/79. (3) Complete operational testing of the wet/dry cooling tower and publish final report 6/79.
KEYWORDS: WASTE HEAT;WATER POLLUTION;THERMAL EFFLUENTS;THERMAL POLLUTION;WASTE MANAGEMENT;COOLING SYSTEMS;POWER PLANTS;ENTRAINMENT;TECHNOLOGY ASSESSMENT;WATER POLLUTION ABATEMENT;MEMBRANES;POLLUTION CONTROL EQUIPMENT;OSMOSIS;FILTRATION;CONTROL;ECONOMICS

<130043>
TITLE: Energy Requirement Conservation Study of Selected Processes for Removing SO/sub 2/ from Power Plant Stack Gases
PROJECT NUMBER: 79BBH
PRINCIPAL INVESTIGATOR: Little, A.F.
ADDRESS: Design Branch, Office of Agricultural and Chemical Development, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: General Technologies Corp., Springfield, Va. (USA)
DIVISION: Office of Energy, Minerals and Industry
MONITOR: Ponder, Wade H.
TELEPHONE: F629-2915
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$50,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
POLLUTANTS: NOXIOUS GAS (90%);PARTICULATES (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Southeast;COASTS/Northwest
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The primary objectives of the study project are to summarize the energy requirements of selected power plant stack gas SO/sub 2/ removal processes and then prepare economic and feasibility analyses of process modifications for reducing and optimizing the energy requirements for the processes. Conceptual design and cost studies will be surveyed for energy requirement data. Also a survey will be made of the energy requirement data for any existing demonstration and commercial units.
APPROACH: Establish premises for study; survey published data on energy requirements for selected processes; survey data on energy requirements for operating and planned demonstration and commercial units; prepare summaries of current energy requirements based on the above surveys; prepare a feasibility and economic evaluation study of process modifications for reducing energy requirements for selected processes.
RESULTS: The data obtained from these surveys will be summarized and analyzed to establish a current base energy requirement level for each of the processes. Feasibility and economic evaluations will then be made of process modifications and variations for reducing and optimizing the energy requirements. Process modifications and variations to be studied will include such items as scrubber type, reheat level and type, heat recovery systems, etc.
PROJECT MILESTONES: (1) Complete premises for study including selection of processes. (2) Establish base energy requirements for the selected processes based on surveys of available data. (3) Complete draft report on the feasibility and economic evaluation of process modifications for reducing and conserving the energy requirements for the selected processes.
KEYWORDS: INSTRUMENTATION;AIR POLLUTION;SULFUR DIOXIDE;FLUE GAS;DESULFURIZATION;REMOVAL;ENERGY CONSERVATION;ENERGY DEMAND;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;ECONOMICS;GASEOUS WASTES;SCRUBBING;POLLUTION CONTROL EQUIPMENT

<130044>
TITLE: Develop Comparative Economics of Major Stack Gas Emission Control Processes
PROJECT NUMBER: 79BBI
PRINCIPAL INVESTIGATOR: Faucett, H.L.
ADDRESS: Design Branch, Office of Agricultural and Chemical Development, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals and Industry
MONITOR: Stern, Richard D.
TELEPHONE: F629-2915
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$300,000
TECHNOLOGY: FOSSIL FUEL/Coal (95%);CONSERVATION/Improved conversion efficiency (5%)
ENERGY CYCLE: PROCESSING, CONVERSION (90%);COMBUSTION OR END USE (10%)
POLLUTANTS: NOXIOUS GAS (90%);PARTICULATES (10%)
CHARACTER OF STUDY: RESEARCH/Applied (80%);DEVELOPMENT/Pilot plant (10%);FULL SCALE DEMONSTRATION (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Southeast;COASTS/Other coasts South
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The initial purposes and corresponding scopes of this project, including the economic reviews of potentially attractive SO/sub 2/ removal processes and assessments of their technical development (Task 1) and an economic study of sludge disposal alternatives for lime-limestone scrubbing processes (Task II), have been stated in previous quarterly reports and remain unchanged. Revision of the subagreement was made during the quarter with three additional tasks being added to the project. Task III consists of continuing assistance to EPA in analyzing published cost estimates of power plant stack gas emission abatement systems and preparing brief reports of critique. In Task IV, a comparative economic study will be made of front-end process alternatives, such as coal conversion systems and coal washing techniques, to stack gas treatment for SO/sub 2/ emission abatement. Task V is an economic and technical assessment of selected NO/sub x/ abatement processes for power plant application.
APPROACH: Selecting of processes for evaluation (by TVA and EPA); defining study objectives and economic premises; contacting sources of technology, preparing flowsheets, material balances, and layouts; estimating equipment costs; preparing capital investments and operating costs; evaluating costs sensitivities; preparing report draft.
RESULTS: Assistance to EPA in analyzing published cost estimates of power plant stack gas emission abatement systems and preparing brief reports of critique.
PROJECT MILESTONES: Continuation of assistance to EPA in selection of processes for demonstration-scale testing. Selection of Phase I processes for economic studies. Phase I will cover three processes: one citrate; one sulfur-producing, regenerable; and one double-alkali. Completion of flowsheets, material

balances, and layouts of Phase I processes. Completion of base-case capital investment and operating costs of Phase I processes.
KEYWORDS: FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;STACK DISPOSAL;AIR POLLUTION;SULFUR DIOXIDE;NITROGEN OXIDES;EPA;TENNESSEE VALLEY AUTHORITY;RESEARCH PROGRAMS;REMOVAL;COST BENEFIT ANALYSIS;ECONOMICS;SCRUBBERS;COMPUTER CODES;FINANCING

<130045>
TITLE: By-product Marketing
PROJECT NUMBER: 79 BBJ
PRINCIPAL INVESTIGATOR: Bucy, J.I.
ADDRESS: Test and Demonstration Branch, Office of Agricultural and Chemical Development, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals and Industry
MONITOR: Chatlynne, Charles
TELEPHONE: F629-2915
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$150,000
TECHNOLOGY: FOSSIL FUEL/Coal (90%);CONSERVATION/End use (10%)
ENERGY CYCLE: EXTRACTION (30%);TRANSPORTATION (20%);STORAGE (10%);PROCESSING, CONVERSION (10%);COMBUSTION OR END USE (10%);ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (10%)
POLLUTANTS: NOXIOUS GAS (70%);PARTICULATES (20%);ORGANICS (10%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast;COASTS/Gulf
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The purpose of this study is (Task I) to identify the quantities of abatement by-products which could be produced with air pollution abatement processes installed at power plants and other significant point sources of sulfur emissions to meet air pollution standards in the 48 contiguous states of the U.S.; (Task II) determine competitive costs of existing processes which utilize elemental sulfur, and analyze existing markets in the 48 contiguous states in the U.S. with respect to potential for an orderly utilization of abatement sulfur by-products into these markets.
APPROACH: Potential marketing of by-products (S, H/sub 2/SO/sub 4/, (NH/sub 4/)/sub 2/SO/sub 4/, CaSO/sub 4/) from power plants in the U.S. through use of systems analysis of SO/sub x/ abatement processes.
RESULTS: (Task III) determine the most economical market, distribution, and transportation systems, and using a systems approach simulate and evaluate alternative strategies for utilization of sulfur by-products with respect to an optimal technology mix considering product markets (sulfur, sulfuric acid, ammonium sulfate, phosphate fertilizers, gypsum wallboard, and etc.); process cost differentials; and clean fuel alternatives.
PROJECT MILESTONES: Preliminary report on economic evaluation of the fertilizer market potential for abatement ammonium sulfate. Refine and verify data basis for abatement production and marketing of sulfur and sulfuric acid. Input data for production and marketing of abatement calcium sulfate. Market simulation runs for abatement sulfur and sulfuric acid. Market simulation runs for abatement calcium sulfate.
KEYWORDS: COAL;AIR POLLUTION;LAND POLLUTION;AIR POLLUTION CONTROL;BY-PRODUCTS;ENVIRONMENTAL EFFECTS;FOSSIL-FUEL POWER PLANTS;POLLUTION CONTROL EQUIPMENT;POLLUTION REGULATIONS;STANDARDS;SULFUR;SULFURIC ACID;AMMONIUM SULFATES;CALCIUM SULFATES;ECONOMICS;MATERIALS RECOVERY;USES;SULFUR DIOXIDE;COMPUTER CODES;SCRUBBERS;MARKET

<130046>
TITLE: Development of Flue Gas Desulfurization Technology, Shawnee Lime/Limestone Scrubbing Program
PROJECT NUMBER: 79 BBL
PRINCIPAL INVESTIGATOR: Schultz, J.J.
ADDRESS: Design Branch, Office of Agricultural and Chemical Development, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals and Industry
MONITOR: Williams, John E.
TELEPHONE: F629-2915
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$3,250,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (20%);PROCESSING, CONVERSION (40%);ELECTRICITY GENERATION (10%);WASTE MANAGEMENT (30%)
POLLUTANTS: NOXIOUS GAS (90%);PARTICULATES (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (30%);DEVELOPMENT/Pilot plant (70%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The primary objectives of the test facility studies are to continue to develop and optimize lime and limestone wet scrubbing technology as it pertains to treating power plant boiler flue gas. The studies are being performed in intermediate size equipment (gas flow is equivalent to a power generating capacity of about 10 megawatts) so that data will more readily transfer to commercial size units.
APPROACH: Two wet scrubbing systems (each equivalent to 10 megawatts) are operated continuously to treat a side stream of flue gas from a commercial size power plant boiler. Lime and limestone are used as the primary absorbents. Additives such as magnesium oxide can be used to alter the process chemistry. The studies are designed to evaluate process variables, and plant operating and design concepts that can be used to guide the design and operation of commercial size systems.
RESULTS: Chemical process, equipment, and operating parameters that are useful to the industry in selecting, designing and operating flue gas cleaning systems.
PROJECT MILESTONES: Study of the fundamentals of calcium-based wet scrubbing of boiler flue gas. Identify primary chemical and mechanical limitations of the flue gas scrubbing process. Optimize chemical, mechanical, and operating components of the scrubbing process. Develop and/or evaluate techniques for ultimate utilization of waste products from the scrubbing process to reduce the environmental and economic

impact of the commercial application of scrubbing technology.
KEYWORDS: FLUE GAS;DESULFURIZATION;TECHNOLOGY ASSESSMENT;COAL;AIR POLLUTION ABATEMENT;ENVIRONMENTAL EFFECTS;SCRUBBING;LIMESTONE;SORPTIVE PROPERTIES;SULFUR DIOXIDE;WASTE MANAGEMENT;MATERIALS RECOVERY;ECONOMICS;FOSSIL-FUEL POWER PLANTS;ENVIRONMENTAL EFFECTS;POLLUTION CONTROL EQUIPMENT;SCRUBBERS;COMPUTER CODES

<130048>
TITLE: Advance Concepts SO/sub 2/ Removal Processes Improvements
PROJECT NUMBER: 79 BBM
PRINCIPAL INVESTIGATOR: Potts, J.M.
ADDRESS: Applied Research Branch, Office of Agricultural and Chemical Development, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy, Minerals and Industry
MONITOR: Borgwardt, Robert H.
TELEPHONE: F755-4857
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (90%);CONSERVATION/Improved conversion efficiency (10%)
ENERGY CYCLE: EXTRACTION (10%);PROCESSING, CONVERSION (50%);COMBUSTION OR END USE (30%);ELECTRICITY GENERATION (10%)
POLLUTANTS: NOXIOUS GAS (90%);PARTICULATES (10%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (90%);DEVELOPMENT/Laboratory scale (10%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental;GEOGRAPHIC AREAS/Global;COASTS/Northeast;COASTS/Southeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: The project provides bench-scale level laboratory investigation of promising concepts for improving SO/sub 2/ removal and recovery processes. Scrubbing systems using ammonia, potassium, calcium, and zinc salts in solutions and slurries will receive attention. Studies will be made of the absorption and regeneration steps including solubility of absorbents and reaction products in scrubbing liquors; oxidation, precipitation, decomposition, and reduction steps for applicable systems; and gas-liquid contacting devices.
APPROACH: Laboratory and bench-scale studies of absorption and regeneration in a potassium-based scrubbing system.
RESULTS: Improvements in utility-energy consumption, raw material requirements, process reliability, and capital cost will be pursued. Test data will be reported; conclusions and recommendations will be made.
PROJECT MILESTONES: Complete laboratory studies of the absorption step including effects of phosphate addition on solubility and oxidation of potassium pyrosulfite. The report will cover tests of antioxidants. Complete laboratory studies of decomposition of potassium pyrosulfite with and without phosphates and antioxidants. Complete laboratory studies of the reduction of potassium sulfate with solid reductants. Complete bench-scale decomposition and reduction studies. Summary report including material and energy balances.
KEYWORDS: SULFUR DIOXIDE;REMOVAL;AIR POLLUTION;MATERIALS RECOVERY;SCRUBBING;AMMONIA;POTASSIUM;CALCIUM;ZINC;SORPTIVE PROPERTIES;FOSSIL FUELS;AIR POLLUTION ABATEMENT;FOSSIL-FUEL POWER PLANTS;AEROSOLS;GASEOUS WASTES;SULFUR;ELECTRIC POWER;SLURRIES;ENVIRONMENTAL EFFECTS;BENCH-SCALE EXPERIMENTS;BIOCHEMISTRY;POLLUTION CONTROL EQUIPMENT

<130049>
TITLE: Home Insulation Research and Demonstration Program
PRINCIPAL INVESTIGATOR: Whisenant, W.C.
ADDRESS: Tennessee Valley Authority, DB-PSC-3, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Division of Power Utilization
MONITOR: Ward, J.W.
TELEPHONE: F854-3726
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$500,000
TECHNOLOGY: CONSERVATION/End use (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (25%);FULL SCALE DEMONSTRATION (75%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Site specific TVA service area
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: To identify and develop the most economic means of applying insulation and reducing heat loss from existing homes heated electrically, especially those owned by people with low income. To demonstrate to such homeowners the potential energy and cost savings for these improvements.
APPROACH: Select a limited number (80) low-income homes with electric heat and high energy use. Determine and implement measures needed to reduce heat losses substantially (add insulation, weatherstripping, etc.) and work with homeowners to better manage heat energy and appliances. Work with local community service agencies to assist in adding ceiling insulation in up to 300 homes of low-income owners as needed.
RESULTS: Demonstrate to others in community and area the energy conservation and cost benefits of adding insulation and other home winterization techniques. Obtain data on energy consumption and results. Publish data for use of consumers, utilities, and insulation contractors.
PROJECT MILESTONES: June 30, 1976 installations completed. July 1, 1976 begin evaluation of methods and procedures. Spring 1977 begin obtaining and disseminating results data.
KEYWORDS: HOUSES;ENERGY CONSERVATION;HEAT LOSSES;HEAT TRANSFER;THERMAL INSULATION;ECONOMICS;SOCIO-ECONOMIC FACTORS;ELECTRIC POWER;HEATING;ENERGY CONSUMPTION;DATA;EDUCATION;PUBLIC RELATIONS;FINANCING

<130050>
TITLE: Load Survey Program
PRINCIPAL INVESTIGATOR: Eskander, S.
ADDRESS: 714 Power Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Division of Power Utilization
MONITOR: Burdeshaw, James R.
TELEPHONE: F854-3011 ext. 2321

TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$200,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: COMBUSTION OR END USE (100%)
CHARACTER OF STUDY: RESEARCH (75%);ANALYTICAL (25%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Site specific Chattanooga, TN
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Our Load Metering Program involves the installation of special metering facilities to determine the time integrated load characteristics for sample groups of retail customers. One purpose of the program will be to evalute metering techniques, sampling theory, and data processing requirements for future load research activities. However, the main purpose of the program will be to yield information that is urgently needed for current cost-of-service, rate design, forecasting, and load management research assignments, and the scope of this initial research has been developed accordingly.
APPROACH: A stratified sample of six hundred retail customers of the Electric Power Board of Chattanooga, Tennessee, was selected and assigned to six residential intervals, eleven commercial-industrial (no demand) intervals, and seven commercial industrial (with demand) class of customers. These customers were next interviewed using questionnaires to obtain pertinent demographic, appliance data, construction characteristic, etc., which may impact energy use patterns of customers. TVA purchased and retains title to all metering equipment, the distributor (Electric Power Board of Chattanooga) will be reimbursed for the cost of installing and removing the equipment and for obtaining customer questionnaire responses for the test customers. The distributor will be responsible for installation and removal of meter tapes at selected intervals. TVA will provide for the translation of meter tapes and such computer programming as may be required to analyze the data.
RESULTS: The electricity demand for the sample customers will be recorded for up to a three-year period. This data will provide us information that is urgently needed to help facilitate current cost of service, rate design, forecasting, and load management research. In addition, this pilot program will help evaluate metering techniques and equipment that will be utilized in later projects to test specific rate designs.
PROJECT MILESTONES: (1) August 14, 1975 The contract for joint services on this program was signed between TVA and the EPB of Chattanooga. (2) November 1975 The first meter was installed on a retail customer's dwelling. (3) April 27, 1976 The last meter was installed to complete the installations for the customers selected in the sample.
KEYWORDS: METERING;ELECTRIC POWER;PLANNING;CONSUMPTION RATES;COMPUTER CODES;HOUSES;INDUSTRY;FORECASTING;CHARGES

<130051>
TITLE: Beneficial Uses of Waste Heat-Muscle-Shoals Greenhouse
PROJECT NUMBER: 988-15-990-6002
PRINCIPAL INVESTIGATOR: Snipes, R.L.
ADDRESS: 1320 Commerce Union Bank Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$2,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: This project is designed to evaluate the feasibility of utilizing power plant heated water discharges for heating and cooling greenhouses. TVA is using a prototype greenhouse at Muscle Shoals, Alabama to develop present technology.
APPROACH: A prototype greenhouse at Muscle Shoals is being used to develop technology for application in a demonstration scale facility at TVA's Browns Ferry Nuclear Plant in Decatur, Alabama.
RESULTS: Information will be gathered from the Muscle Shoals prototype greenhouse for growing several crops in greenhouse environments. This information will be used in the development of the demonstration scale facility at TVA's Browns Ferry Nuclear Plant.
KEYWORDS: POWER PLANTS;THERMAL EFFLUENTS;WASTE HEAT;TENNESSEE VALLEY AUTHORITY;NUCLEAR POWER PLANTS;BROWNS FERRY-1 REACTOR;BROWNS FERRY-2 REACTOR;BROWNS FERRY-3 REACTOR;GREENHOUSES;TEMPERATURE CONTROL;SOCIO-ECONOMIC FACTORS;AGRICULTURE;USES;FEASIBILITY STUDIES

<130053>
TITLE: Fine-mesh Screening Alternatives for Power Plant Intakes
PRINCIPAL INVESTIGATOR: Tomljanovich, D.A.
ADDRESS: TVA Forrestry Building, Norris, TN 37828
AFFILIATION: Tennessee Valley Authority, Norris (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$25,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (70%);DEVELOPMENT/Laboratory scale (30%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Reservoir and river
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) To determine the feasibility of using fine-mesh intake screening to reduce entrainment of ichthyoplankton. (2) To determine the optimal combination of mesh size, intake velocity and duration of exposure for a system to screen ichthyoplankton and obtain survival of same. (3) To incorporate findings in the design of ''best available technology'' intake systems for steam-electric power plants.
APPROACH: (1) Test flume studies to elucidate effects of fish size, mesh size (opening), velocity and duration of exposure on entrainment or impingement of ichthyoplankton. (2) Determination of entrainment percentage and mortality of impinged fish under test conditions (1 above).
SULTS: (1) Complete analysis of test results. (2) Laboratory-scale prototype screening systems. (3)

Operational screening systems.
PROJECT MILESTONES: 1 June 1976 preliminary results. 1 January 1977 completed analysis of 1976 studies. 1 October 1978 prototype system tests.
KEYWORDS: ICHTHYOPLANKTON;AQUATIC ECOSYSTEMS;POWER PLANTS;COOLING SYSTEMS;ENVIRONMENTAL EFFECTS;FISHES;LARVAE;EGGS;ENTRAINMENT;PLANKTON;DESIGN;SCREENS;SIZE

<130056>
TITLE: Ecological Recovery After Reclamation of Toxic Spoils Left by Coal Surface Mining
PROJECT NUMBER: EPA ID No. 79 BDQ (TVA Subagreement No. 9)
PRINCIPAL INVESTIGATOR: Zarger, T.G.
ADDRESS: Tennessee Valley Authority, Division of Forestry, Fisheries, and Wildlife Development, Norris, TN 37828
AFFILIATION: Tennessee Valley Authority, Norris (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Energy Coordination Staff, Office of Energy, Minerals and Industry, Washington, D.C.(RD-681)
MONITOR: Hall, Clinton W.
TELEPHONE: C(202)426-4567
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$70,000
TECHNOLOGY: CONSERVATION/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: VISUAL AESTHETICS (10%);SPECIFIED OTHER POLLUTANTS/Toxic coal surface mine spoils (90%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: To determine the rate of recovery of a damaged ecosystem in response to intensive remedial treatment of a problem surface mine. The project involves a problem watershed in which 400 acres of forested land were disturbed by coal surface mining in the early 1970's. Unsuccessful reclamation efforts resulted in adverse environmental impacts within an 11-square mile watershed that includes a city water supply reservoir.
APPROACH: Project objectives will be accomplished by applying intensive remedial land treatments (TVA funds) and evaluating their effectiveness by measuring the degree of recovery of the affected terrestrial and aquatic ecosystems. Environmental data collected during the period of mining and early reclamation effort will serve as initial baseline study data. Monitoring (soil, vegetation and receiving stream ecology) is being conducted through treatment and will be continued thereafter on a more limited basis as long as significant recovery is noted.
RESULTS: Results should provide new and significant information in the evaluation and correction of problems associated with future mining of a coal seam found extensively in East Tennessee.
PROJECT MILESTONES: (1) 9/76 TVA Internal Report on baseline assessment. (2) 6/77 TVA Internal Report on first year evaluation. (3) 6/78 Milestone Report on first year evaluation. (4) 6/79 TVA Internal Report on second year evaluation. (5) 1/81 Final Report.
KEYWORDS: SURFACE MINING;LAND RECLAMATION;LAND POLLUTION ABATEMENT;ENVIRONMENTAL EFFECTS;AESTHETICS;HEALTH HAZARDS;WATER POLLUTION ABATEMENT;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS;REVEGETATION;BIOLOGICAL RECOVERY;TENNESSEE;TECHNOLOGY ASSESSMENT

<130057>
TITLE: Transmission Line Right-of-Way - North Georgia Avian Study
PROJECT NUMBER: TV-42218A
PRINCIPAL INVESTIGATOR: Meyers, J.M.
ADDRESS: School of Forest Resources - University of Georgia, Athens, GA
AFFILIATION: Georgia Univ., Athens (USA). School of Forest Resources
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Forest Fisheries and Wildlife Development
MONITOR: Fowler, Dale K.
TYPE OF FUNDING: Contract No.-TV-42218A;Agency in-house effort;Interagency agreement-Tennessee Valley Authority
77 FUNDING: Tennessee Valley Authority FY77:$5,625
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: ELECTRICAL TRANSMISSION (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast;GEOGRAPHIC AREAS/Site specific N. GA
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECOLOGICAL PROCESSES AND EFFECTS;INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: (1) Conduct a three-year study of bird populations along a TVA transmission line to determine the impacts of right-of-way clearing methods on bird numbers and species diversity. (2) Compile a state-of-the-knowledge reference list of transmission line construction effects on avian populations.
APPROACH: Field data will be statistically analyzed to determine the effects of three post construction land treatment plots on birds. Plot treatments include: (1) total cleared right-of-way with wildlife food plantings of Orchard grass, clover, and autumn olive; (2) selectively cleared right-of-way plots with no attempt to revegetate; and (3) total cleared right-of-way plots planted with Kentucky 31 fescue.
RESULTS: In power line right-of-way construction and maintenance, secondary vegetation succession is controlled by mechanical and occasionally chemical methods. It is generally assumed that such rights-of-way create habitat conditions beneficial to wildlife, increasing both numbers and diversity. This study is expected to substantiate this hypothesis or to indicate what constitutes enhancement of right of habitat for wildlife (avian).
PROJECT MILESTONES: Quarterly reports of seasonal field survey reports and intermediate assessments and analysis of collected data. A final report will be prepared.
KEYWORDS: POWER TRANSMISSION LINES;SITE SELECTION;LAND USE;ELECTRIC POWER;ENVIRONMENTAL EFFECTS;BIRDS;POPULATION DYNAMICS;CONSTRUCTION;TERRESTRIAL ECOSYSTEMS

<130058>
TITLE: TVA Long Pit Strip Mining Reclamation Demonstration Project
PROJECT NUMBER: K-1 988-90-990.6006
PRINCIPAL INVESTIGATOR: Allen, N.
ADDRESS: 514 Power Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Division of Power Resource Planning
MONITOR: Allen, Natie
TELEPHONE: F854-2827;C(615)755-2827
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$6,000
TECHNOLOGY: FOSSIL FUEL/Coal (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: VISUAL AESTHETICS (50%);SPECIFIED OTHER POLLUTANTS/Land use (50%)
CHARACTER OF STUDY: FULL SCALE DEMONSTRATION (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: Establish an experimental coal surface mining operation in eastern Tennessee to develop improved reclamation methods for surface mining aimed at elimination of highwalls and reduction of outslopes on a multiple seam stripping operation.
APPROACH: Minimum spoil outslopes will be created, and final grading will be obtained on this method of mining for comparison with conventional mining methods in the same area.
RESULTS: An evaluation report will be prepared upon completion of the project.
KEYWORDS: COAL MINING;ENVIRONMENTAL EFFECTS;SURFACE MINING;LAND RECLAMATION;LAND USE;LAND POLLUTION ABATEMENT;TECHNOLOGY ASSESSMENT;TENNESSEE VALLEY AUTHORITY;SPOIL BANKS

<130059>
TITLE: Thermal Impacts on Freshwater Shellfish, Insects, and Other Biota
PROJECT NUMBER: 79 BDR
PRINCIPAL INVESTIGATOR: Crossman, J.S.;Isom, B.G.;Murray, S.A.;Urban, R.D.
ADDRESS: Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: The Office of Energy and Industry
MONITOR: Hall, Clinton
TELEPHONE: F755-2877
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$319,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Unspecified;HYDROGRAPHIC AREAS/Other hydrographic areas Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Consolidation of baseline information, development of methodology, and investigation of thermal impacts on freshwater shellfish, insects, and other biota.
APPROACH: Task 1: Information systems development; Task 2: Acute thermal effects, aquatic insects; Task 3: Biochemical methodologies, aquatic thermal impacts; Task 8: Biomonitoring, mollusks, and others; Task 9: Evaluate water intake, zooplankton entrainment.
RESULTS: Develop baseline information for use in evaluating potential effects of energy technologies including conservation on freshwater resources and ecosystems.
PROJECT MILESTONES: (1) Task 1: Milestone report September 1977; final report December 1980. (2) Task 2: Milestone report November 1978; final report January 1981. (3) Task 3: Milestone report March 1978; final report September 1980. (4) Task 8: Milestone report April 1978; final report November 1980. (5) Task 9: Milestone report September 1978; final report December 1980.
KEYWORDS: FRESH WATER;AQUATIC ORGANISMS;INSECTS;THERMAL EFFLUENTS;BIOLOGICAL EFFECTS;MOLLUSCS;CRUSTACEANS;MONITORING;ENERGY SOURCES;THERMAL POLLUTION;ENVIRONMENTAL TRANSPORT;POPULATION DYNAMICS

<130060>
TITLE: Production of Arthropod Pests and Vectors in Strip Mine Pools
PROJECT NUMBER: 79 BDT
PRINCIPAL INVESTIGATOR: Pickard, E.
ADDRESS: Tennessee Valley Authority, E and D Building, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Office of Energy and Industry
MONITOR: Hall, CLinton
TELEPHONE: F755-2877
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$31,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: EXTRACTION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Strip mining (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Site specific Unspecified
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: The objective of the study is to determine what aquatic arthropod pests, mainly mosquitoes, are breeding in strip mine pools, to what extent, and whether these breeding sites will serve as a focus of annoyance to surrounding communities.
APPROACH: The survey will employ the use of several sampling techniques for both adult and larval forms of aquatic arthropods.
RESULTS: The study should show the species composition of arthropod pests associated with strip mine pools and demonstrate both naturalistic and physical methods of control. Results from the study should reflect both spatial and temporal measurements of vegetation in coal strip mine pools and their probable influence

on production of arthropod pests (mosquitoes).
PROJECT MILESTONES: (1) Milestone Report presenting preliminary results after two years of the planned study June 1978. (2) Final Report discussing results and findings of arthropod pests associated with the different types of coal strip mine pools June 1980.
KEYWORDS: SURFACE MINING;WATER RESERVOIRS;MOSQUITOES;ANIMAL BREEDING;PEST CONTROL;BLOOD;WATER;INSECTS

<130061>
TITLE: Reoxygenation of Reservoirs and Hydroelectric Turbine Releases
PROJECT NUMBER: 811-57-14
PRINCIPAL INVESTIGATOR: Ruane, R.J.
ADDRESS: 246 401 Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Water Quality and Ecology Branch, Division of Environmental Planning
MONITOR: Brooks, R.H.
TELEPHONE: 8854-3167
TYPE OF FUNDING: Agency in-house effort
77 FUNDING: Tennessee Valley Authority FY77:$55,000
TECHNOLOGY: HYDROELECTRIC (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Dissolved oxygen (100%)
CHARACTER OF STUDY: RESEARCH/Applied (30%);DEVELOPMENT/Pilot plant (65%);ANALYTICAL (5%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Southeast;HYDROGRAPHIC AREAS/Other hydrographic areas Large rivers and reservoirs
RESEARCH CATEGORY: ENVIRONMENTAL CONTROL TECHNOLOGY
PROJECT DESCRIPTION: (1) To evaluate alternative methods of aerating reservoirs and reservoir releases. (2) To develop design criteria, cost estimates, and methods of operation for small bubble oxygen injection diffusers. (3) To quantify the aquatic impacts and benefits of aeration to various minimum dissolved oxygen levels.
APPROACH: (1) Feasibility study of alternative aeration techniques and their application. (2) Laboratory experiments to test techniques (e.g., small bubble oxygen diffusers tested in 40' x 7' diameter tank). (3) Field test to develop design criteria, cost data, and operating procedures. (4) Full scale field operations to examine aquatic effects.
RESULTS: Reports containing: (1) Design criteria. (2) Cost estimates. (3) Operating procedures. (4) Identification of potential benefits. Will help define the benefits, costs, and best techniques for increasing DO content in oxygen deficient waters.
PROJECT MILESTONES: (1) Completion of feasibility study. (2) Completion of laboratory tests and reports. (3) Completion of pilot field tests and reports. (4) Completion of background aquatic studies. (5) Completion of aquatic impact studies and reports.
KEYWORDS: RESERVOIR AERATION;OXYGEN INJECTION;AQUATIC ECOSYSTEMS;GAS FLOW;AIR;DISCHARGE CANALS;WATER RESERVOIRS;WATER QUALITY;OXYGEN ENHANCEMENT RATIO;BIOCHEMICAL OXYGEN DEMAND

<130062>
TITLE: Thermal Effluent Computer Modeling Research
PROJECT NUMBER: 79 BDN
PRINCIPAL INVESTIGATOR: Ruane, R.
ADDRESS: Engineering Laboratory, Tennessee Valley Authority, Norris, TN 37377
AFFILIATION: Tennessee Valley Authority, Norris (USA)
MONITORING AGENCY: Tennessee Valley Authority, Norris (USA)
DIVISION: Division of Environmental Planning
MONITOR: Nicholar, William R.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$31,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Freshwater;GEOGRAPHIC AREAS/Global;HYDROGRAPHIC AREAS/Other hydrographic areas Riverine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To extend and verify a theoretical computer model of thermal effluents from power generating plants. Such effluents are generally three-dimensional and turbulent. The computer model which will be utilized is a three-dimensional unsteady finite difference technique. This model is unique in that the conservation equations of all three directions are solved in an efficient manner. Most previous models have attempted to describe a thermal effluent with two-dimensional equations or at the very most made restricting assumptions concerning transport in the third dimension.
APPROACH: TVA has been investigating these phenomena for several years. As a result, TVA has amassed a vast amount of data and experience on effluents under a variety of flow and meteorological conditions. These data include surface and submerged discharges and were obtained from boat surveys, aerial infrared imagery, permanent monitors, and lab experiments. The model to be improved and verified was developed by William R. Waldrop and Richard C. Farmer of the Louisiana State University. Dr. Waldrop is currently employed by the TVA Engineering Laboratory, and Dr. Farmer has shown an interest in spending his sabbatical leave of absence from LSU at the Eng. Lab. participating in this project.
PROJECT MILESTONES: (1) Initiation of study. (2) Progress report on the complete review of field data and the isolation of specific tasks to be studied. (3) Progress report on preliminary results of model studies. (4) Report on model studies and comparison with data.
KEYWORDS: THERMAL POWER PLANTS;THERMAL EFFLUENTS;MATHEMATICAL MODELS;FLUID FLOW;PLUMES

<130063>
TITLE: Develop Economic Projection Modeling Capability Necessary to Drive Modular Energy and Environmental Planning Models at a Multicounty Level
PROJECT NUMBER: 79 BDU
PRINCIPAL INVESTIGATOR: Hinote, H.
ADDRESS: Division of Navigation Development and Regional Studies, Tennessee Valley Authority, Knoxville, TN 37902
AFFILIATION: Tennessee Valley Authority, Knoxville (USA)
MONITORING AGENCY: Tennessee Valley Authority, Knoxville (USA)
DIVISION: Division of Navigation Development and Regional Studies

MONITOR: Hinote, Hubert
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$74,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);NUCLEAR/General (40%);HYDROELECTRIC (20%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/All (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: As a part of its ongoing economic research program, TVA is in the process of developing a Regional Economic Simulation Model of the TVA region and its principal subregions. The objectives of the present work are to expand the existing model for use in: (1) assessing an area's sensitivity to various national parameters; (2) evaluating the impact in small areas (economic area or multicounty planning area) on population, labor force, employment, etc. of a major construction activity; e.g., construction of a large nuclear energy plant; and (3) providing the macroeconomic data base at a multicounty level that is necessary for rigorous site specific analyses. Much of the conceptual work has been done, but a significant effort is required to make the model an operational tool for driving energy and environmental planning models. A demonstration of the two sector model (population-labor force and employment sectors) for a multicounty area will be completed by 12/76.
KEYWORDS: PARAMETER SENSITIVITY;ENERGY MODELS;ENVIRONMENT;MATHEMATICAL MODELS;PLANNING;REGIONAL ANALYSIS;COAL;NUCLEAR ENERGY;HYDROELECTRIC POWER;ENERGY DEMAND;SIMULATION;TENNESSEE VALLEY AUTHORITY;SOCIO-ECONOMIC FACTORS;POPULATION DYNAMICS

<130064>
TITLE: Electric Power System Operation and Expansion Environmental Residual Model
PROJECT NUMBER: 79 BDV
PRINCIPAL INVESTIGATOR: Evans, B.
ADDRESS: Tennessee Valley Authority, 216 Power Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Division of Power Resource Planning
MONITOR: Walters, D. H.
TELEPHONE: C(615)755-2381
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/Coal (30%);NUCLEAR/Fission (50%);HYDROELECTRIC (20%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES (50%);RADIATION (50%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: Output will consist of reports, computers programs with documentation, a demonstration of the program, and consultation as required. The model will be developed in conjunction with and in parallel to the development of the TVA Power System Integrated Planning Model. The model will include the capability to predict the residual output of a power system on a plant-by-plant basis. It will provide inputs for detailed dispersion models for evaluating expansion policies of a power system. The model may also be used independently of the TVA Power System Integrated Planning Model.
APPROACH: The model will be based on a power system simulation model developed by TVA.
RESULTS: A preliminary conceptual design of the model has been completed and interfaced with the overall conceptual design report of the TENNESSEE VALLEY AUTHORITY Power Program Integrated Planning Model. Immediate plans are to modify an existing power system operation model to output environmental residuals.
KEYWORDS: ELECTRIC POWER;ENVIRONMENT;ENERGY MODELS;COAL;FISSION PRODUCTS;HYDROELECTRIC POWER;NUCLEAR ENERGY;COAL INDUSTRY;ENVIRONMENTAL EFFECTS;COMPUTER CODES;PLANNING;TENNESSEE VALLEY AUTHORITY;POWER PLANTS;POWER DEMAND;SOCIO-ECONOMIC FACTORS

<130065>
TITLE: Develop and Demonstrate Applications of Computer Graphics to Site-Specific and Regional Integrated Env. Assessment of Mixed Nuclear Coal Based and Hydroelectric Energy System
PROJECT NUMBER: 79 BDW
PRINCIPAL INVESTIGATOR: Babb, M.C.
ADDRESS: Div. of Environmental Planning, Tennessee Valley Authority, 267 401 Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Tennessee Valley Authority, Chattanooga (USA)
DIVISION: Division of Environmental Planning
MONITOR: Hickey, H. R.
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$164,000
TECHNOLOGY: FOSSIL FUEL/Coal (40%);NUCLEAR/General (40%);HYDROELECTRIC (20%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES (30%);RADIATION (40%);HEAT, THERMAL (30%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:INTEGRATED ASSESSMENT
PROJECT DESCRIPTION: The outputs are demonstration of and reports on the application of computer graphics to environmental analysis of single and combined nuclear, fossil, and hydroelectric energy systems. This will include but not be limited to operation with large data bases covering a broad range of planning variables: Limited-area spatial data bases with topography, land cover, ownership, constrained areas (endangered species, karst geology, etc.), biological data, and air and water quality data. Multi-media residual impact models and control technology cost models will be ''driven by'' a multiplant electric power system simulation model, which is in turn driven by a socioeconomic (including demand forecasting) model, to provide rapid intelligence for planning, siting, and operating a regional energy system.
FYWORDS: COAL INDUSTRY;NUCLEAR ENERGY;HYDROELECTRIC POWER;TECHNOLOGY ASSESSMENT;COMPUTER CALCULATIONS;REGIONAL ANALYSIS;ENERGY MODELS;ENVIRONMENTAL EFFECTS;SOCIO-ECONOMIC FACTORS;BIOLOGICAL MODELS;AIR QUALITY;WATER QUALITY;TERRESTRIAL ECOSYSTEMS;COST;ELECTRIC POWER;COMPUTER GRAPHICS

<130070>
TITLE: Waste Heat Utilization
PROJECT NUMBER: 79BBF
PRINCIPAL INVESTIGATOR: Bond, B.J.
ADDRESS: Tennessee Valley Authority, National Fertilize Development Center, T218, Muscle Shoals, AL 35660
AFFILIATION: Tennessee Valley Authority, Muscle Shoals, Ala. (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Industrial Environmental Research Laboratory, Research Triangle Park, NC 27711
MONITOR: Chasse, James P.
TELEPHONE: F420-4718
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$100,000
TECHNOLOGY: FOSSIL FUEL/General (50%);NUCLEAR/General (50%)
ENERGY CYCLE: WASTE MANAGEMENT (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS;ECT;OS
PROJECT DESCRIPTION: Task I: Investigate soil heating to extend crop growing season. Task II: To optimize biological recycling of nutrients in livestock wastes for utilizing waste heat.
APPROACH: (1) Determination of water temperature as a function of crop response. (2) Testing the effect of heat on phytoplankton growth. (3) Operation of and report on first year's economics, biological and engineering of pilot-scale system. (4) Construction of heated outdoors system. (5) Test and report on fish-phytoplankton harvesting capability. (6) Test of clam-plankton harvesting capability.
RESULTS: Task I: (1) Determine water temperature needed to warm soil enough for good crop response 11/77. (2) Complete report on assessment of water temperature needs 4/78. (3) Evaluate use of hot water to warm greenhouse soil 6/78. (4) Complete report on assessment of greenhouse soil warming 10/78. Task II: (1) Complete a year of testing the effect of heat in pilot-scale phytoplankton growth 4/77. (2) Completion and assessment of report on first year's operation of pilot-scale system (economics, biological and engineering) 7/77. (3) Complete construction of heated outdoors system 12/77. (4) Complete testing and prepare report on first phase of fish-phytoplankton harvesting capability 9/78. (5) Complete testing of first phase of clam-plankton harvesting capability 12/78.
KEYWORDS: WASTE HEAT;SOILS;TEMPERATURE GRADIENTS;CROPS;GROWTH;TEMPERATURE DEPENDENCE;PHYTOPLANKTON;BIOMASS;DEMONSTRATION PLANTS;DESIGN;COST;FISHES;MOLLUSCS;FISHING INDUSTRY;AGRICULTURE;ECONOMICS;GREENHOUSES;AQUACULTURE;HEATING;USES;WASTE HEAT UTILIZATION;NUTRIENTS

<130071>
TITLE: Isolation and Identification of Waterborne Pollutants Associated with the Power Industry (Steam-Electric Power Generation)
PROJECT NUMBER: 79BDH
PRINCIPAL INVESTIGATOR: Holly, C.W.
ADDRESS: 150 401 Building, Chattanooga, TN 37401
AFFILIATION: Tennessee Valley Authority, Chattanooga (USA)
MONITORING AGENCY: Environmental Protection Agency, Washington, D.C. (USA)
DIVISION: Energy Coordination Staff, Office of Energy, Minerals and Industry
MONITOR: D'Alessio, Gregory J.
TELEPHONE: C(202)426-4568
TYPE OF FUNDING: EPA pass-thru funding
77 FUNDING: Environmental Protection Agency FY77:$44,000
TECHNOLOGY: FOSSIL FUEL/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: METALS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Southeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ECT;OS
PROJECT DESCRIPTION: To isolate, identify and measure through improved analytical procedures, waterborne pollutants associated with the power industry (steam-electric power generation).
APPROACH: The following rapid quantitative and/or alternative methods will be developed: Tasks: (1) Acrolein by voltammetry at positive potentials. (2) Total arsenic by voltammetry, and compare to atomic absorption and colorimetry. (3) Cadmium, lead, copper, and zinc simultaneously by voltammetry. (4) Digestion techniques for suspended and dissolved metals by atomic emission plasma and referenced to atomic absorption. (5) Chromium (hexavalent and trivalent) simultaneously by voltammetry and ion chromatography. (6) Particulates (asbestos) by polarized light microscopy.
RESULTS: Task 1: Milestone report on acrolein 2/76; final published 7/76. Task 2: Milestone report on arsenic 3/77. Task 3: Milestone report on Cd, Pb, Cu, Zn 8/77. Task 4: Milestone report on digestion techniques 1/78. Task 5: Milestone report on chromium 7/78. Task 6: Milestone report on particulates 11/79.
KEYWORDS: THERMAL POWER PLANTS;ENVIRONMENTAL EFFECTS;CHEMICAL EFFLUENTS;LIQUID WASTES;MONITORING;ARSENIC;CHROMIUM;COPPER;LEAD;ZINC;ASBESTOS;CADMIUM;ACROLEIN;QUANTITATIVE CHEMICAL ANALYSIS;WATER POLLUTION;SURFACE WATERS;SAMPLING;SOLUBILITY;POWER GENERATION;ELECTRIC POWER;MEASURING METHODS;DIGESTION

Nuclear Regulatory Commission

<150001>
TITLE: Aerosol Release and Transport from LMFBR Fuel
PROJECT NUMBER: B0121
PRINCIPAL INVESTIGATOR: Fontana, M.H.;Kress, T.S.
ADDRESS: Box Y, Building 9201-3, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research (Experimental Fast Reactor Safety Branch)
MONITOR: Silberberg, Melvin
TELEPHONE: F427-4329
TYPE OF FUNDING: Interagency agreement-Nuclear Regulatory Commission
77 FUNDING: Nuclear Regulatory Commission FY77:$1,675,000

TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective of this program is to provide the experimental data and analytical techniques necessary to make conservative and realistic assessments of the quantities, characteristics, and transient behavior of radionuclides that may be released into an LMFBR secondary containment as a result of a range of accident conditions up to and including severe core disruptive accidents.
APPROACH: A multi-faceted experimental and analytical approach is required to meet the objectives. A variety of fuel and fuel simulant aerosol generation techniques are used to study fuel aerosol characteristics and behavior in several different size containments. An electrical technique, using capacitor discharge, is used to place fuel and UO/sub 2/ into appropriate post-CDA states. The mechanisms of conversion of that fuel into airborne materials are studied and release potential established. A sodium facility is used to study the interactions of the molten fuel with the sodium and containment environment to identify (and quantify) possible source alteration as the released material is transported through the sodium. Fuel simulant aerosols are generated and sodium is burned simultaneously in an intermediate-size vessel to establish behavior in secondary containments.
RESULTS: Experimental data and calculational models should result that will allow mechanistic determinations of the quantities and characteristics of the radionuclides released into the secondary containment and to determine the transient behavior there. It is expected that this program will provide initial input data and aerosol characteristics for core dispersal and aerosol behavioral codes (e.g., HAARM-2) and provide experimental validation of the models for a variety of conditions.
PROJECT MILESTONES: (1) Complete UO/sub 2/ experiments and issue draft report to define an ''upper limit'' source term 6/30/77. (2) Complete ''upper limit'' confirmatory tests with real fuel 7/31/78. (3) Complete tests to determine effects of source interactions and transport through sodium (completion date not yet scheduled). (4) Complete tests on effects of radiation level (completion date not yet scheduled). (5) Complete tests to establish co-existent behavior of fuel and sodium aerosol in the presence of sodium fires (completion date not yet scheduled).
KEYWORDS: HCDA;LMFBR TYPE REACTORS;RADIOACTIVE EFFLUENTS;ENVIRONMENT;RADIOACTIVE AEROSOLS;DIFFUSION;RADIATION ACCIDENTS;REACTOR ACCIDENTS;CONTAINMENT SYSTEMS;MAXIMUM PERMISSIBLE CONCENTRATION;SAFETY ENGINEERING;PLUTONIUM;RADIOISOTOPES

<150002>
TITLE: Gas Reactor Safety Assessment: HTGR Safety, Analytical, and Research Support
PROJECT NUMBER: A3016
PRINCIPAL INVESTIGATOR: Schweitzer, D.G.
ADDRESS: Brookhaven National Laboratory, Upton, L.I., NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Schamberger, Robert D.
TELEPHONE: F427-4323
TYPE OF FUNDING: Contract No.-AT(30-1)-16;Grant No.-06-19-03
77 FUNDING: Nuclear Regulatory Commission FY77:$1,700,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This program is designed to provide analytical and research support to the Reactor Safety Research (RSR) Division of the Nuclear Regulatory Commission (NRC) in the area of Safety for High Temperature Gas Reactors (HTGR's). The support includes development of a safety program for HTGR's under guidance of the NRC by organizing a group at Brookhaven National Laboratory (BNL) which will determine, analyze, supervise and delineate the necessary analytical and experimental work required for insuring safe construction and operation of HTGR's.
APPROACH: The support includes a continuing in-depth review of HTGR safety analytical methods and physical and experimental phenomena bearing on the safety of HTGR's as they exist now and as they are developed in cooperation with RSR and Los Alamos Scientific Laboratory (LASL). It will in time provide RSR with a completely independent analytical and experimental capability in HTGR safety. The support will make full use of both BNL and outside expertise and will be coordinated with a similar effort at LASL.
RESULTS: Analytical models are being developed to be used for calculating the courses of, the progression of, and the consequences of HTGR accidents. The completed models will be distributed as packaged comptuer codes. Experimental measurements are being made to establish an independent data base to be used with the analytical models being developed.
PROJECT MILESTONES: FY 77: (1) Complete construction of helium loop for conditioning and environmental control of metallic fatigue and creep test samples. (2) Initiate thermal chromatography measurements with individual fission products. FY 78: (1) Complete high temperature mass spectrometer. (2) Complete assessment of development of localized flammable mixtures in the secondary containment. (3) Initiate high temperature creep test program with controlled helium environment.
KEYWORDS: HTGR TYPE REACTORS;REACTOR SAFETY;REACTOR ACCIDENTS;RESEARCH PROGRAMS

<150003>
TITLE: Technical Coordination, Fast Reactor Safety Research
PROJECT NUMBER: A2015
PRINCIPAL INVESTIGATOR: Hummel, H.H.
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AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Curtis, Robert T.
TELEPHONE: F427-4326
TYPE OF FUNDING: Contract No.-A2015
77 FUNDING: Nuclear Regulatory Commission FY77:$500,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (50%);ANALYTICAL (50%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To provide coordination of fast reactor safety research by the RSR Division of NRC. An independent assessment of basic technical problems in accident analysis is made, and means of validating safety codes are suggested. Progress in safety research is reviewed for NRC and ACRS.

APPROACH: Fast reactor safety analysis studies on a limited scale are undertaken to maintain expertise and to give insight into important safety problems. Discussions and meetings are held with RSR contractors to obtain as to what the important safety problems are and how they should be solved.
RESULTS: Studies are made of the initiating phase of accidents in LMFBR's. An improved fuel-coolant interaction code has been developed. A model of a boiling pool of fuel and steel has been developed and recriticality studies are being made with it. Reactivity coefficients and power distribution for the CRBR demo plant have been calculated.
PROJECT MILESTONES: (1) Oct. 1976 Present paper on loss-of-flow calculations for CRBR using demo and gas. (2) Oct. 1976 Present paper on epic fuel-coolant interaction code. (3) Oct. 1976 Present paper on boiling pool studies. (4) Sept. 1976 Begin calculation of reactor parameters in 2-D and 3-D hexagonal geometry.
KEYWORDS: LMFBR TYPE REACTORS;REACTOR SAFETY;REACTOR ACCIDENTS;RESEARCH PROGRAMS;US NRC;NUCLEAR ENERGY

<150004>
TITLE: Critical Experiment Program for Monte Carlo Code Validation
PROJECT NUMBER: A2018
PRINCIPAL INVESTIGATOR: Gelbard, E.M.;Le Sage, L.G.
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AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Wood, Phillip M.
TELEPHONE: FTS-427-4326
TYPE OF FUNDING: Contract No.-A2018
77 FUNDING: Nuclear Regulatory Commission FY77:$624,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (50%);ANALYTICAL (50%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The NRC program in Fast Reactor Safety currently concentrates heavily upon defining the limiting consequences of severe hypothetical core disruptive accidents (HCDA). This program is designed to provide a method for experimentally validating analytical methods used in the study of such accidents. Subtask A: This subtask relates to the Monte Carlo analysis of safety-related critical experiments so as to verify the Monte Carlo algorithms and basic nuclear-data sets. It includes the development and validation of special computational techniques for the utilization of Monte Carlo in the analysis of such experiments, and the use of Monte Carlo to check other analysis methods. Subtask B: The criticals program planning for safety-related critical experiments encompasses the planning for a program of critical experiments bearing on LMFBR DEMO safety. This also involves the establishment of the objectives of the experimental program, the evaluation of the experimental alternatives, the identification of material requirements for core construction, and the identification of experimental and analytical techniques development required for the successful completion of the program. Subtask C: This subtask covers the actual performance of the safety-related critical experiments. Included are the construction of the core on the critical assembly, operation of the critical assembly, performance of the measurements, evaluation and analysis of the data, and publication of the results.
RESULTS: Subtask A--Monte Carlo Analysis of Safety-Related Criticals: (1) determine the accuracy of various alternative S/sub n/ and diffusion theory techniques, as applied to the analysis of the critical experiment sequence; (2) complete detailed VIM analysis of reference core and one meltdown configuration; and (3) compare R-Z diffusion and S/sub n/ computational results with corresponding results from VIM. Subtask B--Criticals Program Planning: (1) perform ZPR safety analysis; (2) develop program plan for safety-related criticals; and (3) participate in reviews of program plan and obtain program approval. Subtask C--Safety-Related Critical Experiments: (1) start critical experiments (07-01-77); (2) complete experiments on reference core; and (3) start experiments on meltdown configurations.
PROJECT MILESTONES: (1) Oct. 1975 Complete VIM computation of ZPR-3-27. (2) April 1976 Complete VIM computation of ZPR-3-28. (3) Dec. 1976 Complete plans for safety criticals. (4) Sept. 1977 Complete hypothetical core disassembly methods analysis. (5) Jan. 1978 Begin safety-related critical experiments.
KEYWORDS: LMFBR TYPE REACTORS;MONTE CARLO METHOD;REACTOR CORE DISRUPTION;COMPUTER CALCULATIONS;ANALYTICAL SOLUTION;ACCURACY;EXPERIMENT PLANNING;ZERO POWER REACTORS

<150005>
TITLE: Analytical Studies of Aerosol Behavior Predictions for Fast Reactor Safety
PRINCIPAL INVESTIGATOR: Gieseke, J.A.
ADDRESS: 505 King Avenue, Columbus, OH 43201
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MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Silberberg, Mel
TELEPHONE: FTS-427-4329
TYPE OF FUNDING: Contract No.-W-7405-eng-92, Task 56
77 FUNDING: Nuclear Regulatory Commission FY77:$361,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective of this proposed study is to provide improvements and verification for the aerosol behavior models, perform sensitivity analyses for typical LMFBR systems, provide theoretical support and pre-analyses for experimental aerosol studies, obtain experimental data related to specific aerosol agglomerate properties, and provide technical assistance to RSR in the area of aerosol behavior.
APPROACH: Improvements will be made for aerosol behavior models used to predict the leakage of radioactive materials from LMFBR containments under postulated accident conditions. These improvements will be concerned with better representations for aerosol agglomerate properties such as shape factors, effective volumes, effective densities, and particle-particle collision efficiencies. In addition, improved size distribution representations will be used in the analyses and thermal wall deposition included in a more descriptive fashion. Experimental measurements of agglomerate properties and thermal forces will be made to provide information needed in the model improvements. Sensitivity analyses and model verification by comparison with experimental results will be used to evaluate model adequacy and the importance of assumed conditions on aerosol leakage from containments.
RESULTS: Expected results are the development or improvement and verification of analytical models for

predicting aerosol behavior within containments. Detailed improvements in descriptions of agglomerate characteristics will be provided from experimental measurements and incorporated into the model. Verification of behavior models will be made by comparisons with a continuously updated review and compilation of experimental data. Sensitivity analyses with the developed models will provide an assessment of the importance of containment geometry and assumed input parameters.
PROJECT MILESTONES: (1) Report on NA/sub 2/O agglomerate behavior 7-77. (2) Begin PuO/sub 2/ aerosol experiments 7-77. (3) Complete reference aerosol code.
KEYWORDS: LMFBR TYPE REACTORS;REACTOR SAFETY;REACTOR ACCIDENTS;CONTAINMENT SYSTEMS;AEROSOLS;MATHEMATICAL MODELS;RADIOACTIVE AEROSOLS;COMPUTER CODES;FORECASTING;PLUTONIUM

<150006>
TITLE: Safety Considerations of Commercial LMFBR's
PRINCIPAL INVESTIGATOR: Kastenberg, W.E.;Catton, I.
ADDRESS: 5532 Boelter Hall, School of Engineering and Appl. Sci., Los Angeles, CA 90024
AFFILIATION: California Univ., Los Angeles (USA). School of Engineering and Applied Science
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Wright, R.W.
TELEPHONE: F427-4329
TYPE OF FUNDING: Contract No.-AT(49-24)-0246
77 FUNDING: Nuclear Regulatory Commission FY77:$170,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
POLLUTANTS: RADIATION/Plutonium-fission products (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The project is a continuing program of analysis and experiments in phenomenology important to the safety of LMFBR's of commercial size with either oxide or advanced fuels. Included are fuel element behavior intransients, accident analysis, post accident heat removal and fuel-coolant interactions.
APPROACH: Numerical methods are used to investigate phenomena important to accident progression. Experiments will be performed to evaluate methods of post accident heat removal and for understanding the nature of fuel-ccolant interactions.
RESULTS: Modeling of fuel elements in transients including fission gas behavior, analysis of fuel channel plugging, analysis of debris bed dryout, model of fuel-coolant interactions and thermodynamic data for advanced fuels.
PROJECT MILESTONES: Topical reports will be issued as work is completed.
KEYWORDS: LMFBR TYPE REACTORS;REACTOR SAFETY;RESEARCH PROGRAMS;REACTOR CORE DISRUPTION;AFTER-HEAT REMOVAL;PLUTONIUM;RADIOISOTOPES;SODIUM;NUCLEAR FUELS;FUEL ELEMENT FAILURE;RADIATION HAZARDS;FUEL-COOLANT INTERACTIONS

<150007>
TITLE: Fast Reactor Safety Assessment: Code Development for Fast Reactor Safety Evaluation
PROJECT NUMBER: A3015
PRINCIPAL INVESTIGATOR: Agrawal, A.K.
ADDRESS: Fast Reactor Safety Division, Brookhaven National Laboratory, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Kelber, Charles N.
TELEPHONE: F427-4320
TYPE OF FUNDING: Contract No.-AT(30-1)-16;Grant No.-06-19-02-(a)
77 FUNDING: Nuclear Regulatory Commission FY77:$590,000
TECHNOLOGY: NUCLEAR/General (25%);NUCLEAR/Fission Breeders (75%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The prime objective is to develop an advanced system transient code for liquid metal fast breeder reactor (LMFBR) for confirmatory evaluation of these plants under various postulated accident conditions.
APPROACH: The entire LMFBR plant including the reactor core, the primary and intermediate heat transport systems and steam generating system will be modeled. The governing conservation equations are being solved numerically on large scale data processing machines.
RESULTS: A computer code (designated as SSC) which may be run on any major, large computer.
PROJECT MILESTONES: The first version of SSC (SSC-L) is expected to be available on or about September 30, 1977.
KEYWORDS: LMFBR TYPE REACTORS;REACTOR ACCIDENTS;REACTOR SAFETY;RESEARCH PROGRAMS;COMPUTER CODES;MATHEMATICAL MODELS

<150008>
TITLE: Bubble Behavior in LMFBR Accident Environment
PROJECT NUMBER: B5616
PRINCIPAL INVESTIGATOR: Reynolds, A.B.;Erdman, C.A.
ADDRESS: Reactor Facility, University of Virginia, Charlottesville, VA 22901
AFFILIATION: Virginia Univ., Charlottesville (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Silberberg, M.
TELEPHONE: F427-4329
TYPE OF FUNDING: Contract No.-E-(40-1)-4922
77 FUNDING: Nuclear Regulatory Commission
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Selected problems in the release and transport of aerosols in an LMFBR core disruptive accident are being investigated as part of NRC's Aerosol Release and Transport (ART) program. One objective is to coordinate with and assist the model development and experimental program underway in the ART program at ORNL.

APPROACH: Classical analytical methods are being applied in the following areas of study of interest to the ART program: (1) Transport of core materials from the core location to the sodium pool above the fission gas plenum. (2) The generation of small (submicron) size fuel particles from homogeneous nucleation, with particular emphasis on results from the ORNL fuel vaporization tests. (3) Generation of particles from mechanical fragmentation of liquids. (4) Particle interactions at liquid sodium surfaces, with the objective of examining phenomena which might provide effective removal mechanisms for aerosols from a two-phase bubble in the sodium pool. (5) Nonequilibrium evaporation and condensation during uranium oxide fuel expansion.
RESULTS: In fiscal year 1976, a final report for the study of nonequilibrium evaporation and condensation during uranium oxide fuel expansion is expected. Detailed definitions and initial analysis of problem areas (1) and (2) above will be made.
PROJECT MILESTONES: (1) Report on effects of transport phenomena on HCDA Bubble dynamics, 8-77. (2) Report on fuel particle size analysis, 9-77.
KEYWORDS: PARTICLE SOURCE TERM;FUEL VAPOR EXPANSION;HCDA BUBBLE;LMFBR ACCIDENT ANALYSIS;LMFBR TYPE REACTORS;REACTOR CORE DISRUPTION;RADIOACTIVE AEROSOLS;BUBBLES;RESEARCH PROGRAMS;ENVIRONMENTAL TRANSPORT

<150009>
TITLE: High Temperature Gas Reactor Safety
PROJECT NUMBER: A7014
PRINCIPAL INVESTIGATOR: Jackson, J.F.
ADDRESS: Los Alamos Scientific Laboratory, Mail Stop 561, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Schamberger, Robert D.
TELEPHONE: P427-4323
TYPE OF FUNDING: Interagency agreement-Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$1,600,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective of the program is to provide an independent technical basis for assessment of HTGR safety. Within the scope of the program are the review of HTGR vendor research, computer codes, and experiments, as well as the independent development of computer codes and the performance of experiments. Coordination with all U.S. HTGR safety-related activities is required. The immediate focus of the program is on HTGR designs in the licensing process, but the scope of safety research will include advanced designs and applicable Gas-Cooled Fast Reactor technology.
APPROACH: The LASL program is subdivided into six tasks: (1) Fission Product Release and Transport, (2) Primary Coolant Impurities, (3) Structural Evaluation, (4) Safety Instrumentation and Control Systems, (5) Accident Delineation, and (6) Phenomena Modeling and Systems Analysis. The emphasis in the program is placed on analysis and study of problems arising from abnormal or accident conditions.
RESULTS: Analytical models are being developed to be used for calculating the causes of, the progression of, and the consequences of HTGR accidents. The completed models will be distributed as packaged computer codes. Experimental measurements are being made to establish an independent data base to be used with the analytical models being developed.
PROJECT MILESTONES: Initial versions of computer codes developed for fission product transport (LARC and SUVIUS), coolant impurities (CIMPRE), chemical equilibrium (QUIL) and systems modeling (CHAP) will be published in FY-1976 and FY-1977. Experiments relating to fission product transport and seismic modeling will be well underway in FY-1977. FY 78: (1) Publish Fort St. Vrain version of CHAP, (2) Complete transient fuel failure experiments.
KEYWORDS: HTGR TYPE REACTORS;REACTOR SAFETY;RESEARCH PROGRAMS;REACTOR ACCIDENTS;MATHEMATICAL MODELS

<150010>
TITLE: LMFBR Safety
PROJECT NUMBER: A7015
PRINCIPAL INVESTIGATOR: Boudreau, J.E.;Smith, L.L.
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AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Curtis, Robert T.
TELEPHONE: P427-4320
TYPE OF FUNDING: Contract No.-W-7405-eng-36;Interagency agreement-Nuclear Regulatory Commission
77 FUNDING: Nuclear Regulatory Commission FY77:$800,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
PROJECT DESCRIPTION: The objective is to develop and validate computational techniques for analysis of postulated, low-probability, core disruptive accidents in fast breeder reactors.
APPROACH: The approach is to combine sophisticated numerical techniques for multiphase, multicomponent fluid dynamics and for time-dependent neutron transport with detailed models and data for materials behavior and equations-of-state and of materials interactions. The resulting computer codes are used to analyze experiments in a comprehensive validation program.
RESULTS: A series of documented and validated computer codes is expected.
PROJECT MILESTONES: (1) July 30, 1976 release of SIMMER-I. (2) Sept. 30, 1977 release of SIMMER-II. (3) Sept. 30, 1979 release of SIMMER-III.
KEYWORDS: ACCIDENT ANALYSIS;LMFBR TYPE REACTORS;REACTOR SAFETY;RESEARCH PROGRAMS;COMPUTER CODES

<150011>
TITLE: Review of Safety Test Facilities for Fast Reactors
PROJECT NUMBER: A7013
PRINCIPAL INVESTIGATOR: Stevenson, M.G.
ADDRESS: P.O. Box 1663, Los Alamos Scientific Laboratory, R-Division, MS/616, Los Alamos, NM 87545
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MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Curtis, Robert T.

TELEPHONE: FTS 427-4326
TYPE OF FUNDING: Contract No.-W-7405-eng-36;Interagency agreement-Nuclear Regulatory Commission
77 FUNDING: Nuclear Regulatory Commission FY77:$1,110,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (70%);ANALYTICAL (30%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective of this project is to provide plans, analyses, and recommendations for fast breeder reactor safety experiments, experiment facilities, and experiment diagnostic instrumentation.
APPROACH: The approach proceeds from (1) a review of safety information needs, to (2) definition of experiment requirements, and then to (3) setting of facility requirements. Facility concepts are analyzed to determine capabilities and desired experiments are analyzed to refine experiment and facility requirements. Diagnostic instrumentation systems are experimentally evaluated to determine capabilities.
RESULTS: Specific plans and recommendations for experiment programs, facility types and designs and instrumentation systems are provided.
PROJECT MILESTONES: (1) June 30, 1975 provide preliminary experiment and facility requirements. (2) September 30, 1977 complete analyses of experiment nonprototypicalities. Provide experiment requirements. (3) September 30, 1979 provide conceptual facility designs and experiment vehicle designs.
KEYWORDS: INSTRUMENTATION;LMFBR TYPE REACTORS;REACTOR SAFETY;TEST FACILITIES;REVIEWS;REACTOR ACCIDENTS

<150012>
TITLE: Modeling of Cladding and Fuel Motion
PROJECT NUMBER: A 4064
PRINCIPAL INVESTIGATOR: Eggen, D.T.
ADDRESS: Nuclear Engineering Program, TECH, Northwestern University, Evanston, IL 60201
AFFILIATION: Northwestern Univ., Evanston, Ill. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Advanced Reactor Safety Research Division of Reactor Safety Research
MONITOR: Wright, Robert W.
TELEPHONE: FTS 427-4329
TYPE OF FUNDING: Contract No.-AT(49-24)-0199
77 FUNDING: Nuclear Regulatory Commission FY77:$100,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
CHARACTER OF STUDY: RESEARCH/General (70%);ANALYTICAL (30%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The objective of the project is to perform the necessary experiments and develop an analytical numerical model of fuel and cladding melting, motion, and disposition in a Gas Cooled Fast Reactor (GCFR) fuel assembly following a loss of flow (LOF) situation. The numerical code may be used as a part of a safety analysis program.
APPROACH: Experimental models using Pb/Sn alloys to simulate stainless cladding and shaped electrical heating elements are used to gain insight into the mechanisms of cladding melting, motion and disposition in fuel channels. Analytical models are developed for fuel and cladding actions in LOF situations and numerical codes are prepared as modules for safety analysis programs.
RESULTS: Computer code modules of fuel and cladding motion and disposition for GCFR-LOF safety analysis.
PROJECT MILESTONES: (1) Model for cladding disposition 12/76. (2) Model for fuel motion and disposition 9/77. (3) Model for cladding, melting and motion 12/77.
KEYWORDS: FAST REACTORS;FUEL ELEMENT ;GCFR TYPE REACTORS;LOSS OF FLOW;FUEL CANS;FUEL ELEMENTS;MELTDOWN;COMPUTER CODES;MATHEMATICAL MODELS;REACTOR SAFETY

<150013>
TITLE: Thermohydraulic LMFBR Safety Experiments
PROJECT NUMBER: A-3024
PRINCIPAL INVESTIGATOR: Jones, O.C.
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AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
MONITOR: Wright, R.W.
TELEPHONE: FTS 427-4329
TYPE OF FUNDING: Interagency agreement-NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$348,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
CHARACTER OF STUDY: RESEARCH/General (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This program involves investigation of thermohydraulic phenomena of importance in fuel relocation and heat removal following a hypothetical disruptive accident in liquid metal fast breeder reactors (LMFBR). The models describing such phenomena, as applied to LMFBR safety assessment are to be verified. Initially the program will concentrate on (1) heat transfer and fluid mechanics characteristic of heat generating pools and (2) dynamics of molten material streaming/freezing in cold channels, and (3) the dispersion characterization of boiling pools with internal heat generation.
APPROACH: Perform relevant laboratory experiments with non-reactor materials and develop appropriate phenomenological models.
RESULTS: Experiments will be performed to measure local heat transfer from a heat-generating boiling pool to test plates in vertical, inclined and lenticular geometries. A calculational model will be developed to allow prediction of the local heat transfer from a pool to the surrounding walls. A series of experiments on fluid freezing/streaming will be performed. Experiments on the dispersion characteristics of boiling pools with internal heat generation will be started. Appropriate analytical models will be develcped.
PROJECT MILESTONES: (1) Complete experiments on boiling pool heat transfer to vertical and inclined walls, 12-77. (2) Complete experiments and models for single-phase fuel streaming, 4-77.
KEYWORDS: LMFBR TYPE REACTORS;REACTOR CORE DISRUPTION;HYDRAULICS;HEAT TRANSFER;REACTOR SAFETY;LIQUID FLOW;AFTER-HEAT REMOVAL;MELTDOWN

<150016>
TITLE: Sodium Containment/Structural Integrity
PROJECT NUMBER: A-1054
PRINCIPAL INVESTIGATOR: Dahlgren, D.A.;Butcher, B.M.
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AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Silberberg, M.
TELEPHONE: F427-4329
TYPE OF FUNDING: Contract No.-E(29-1)-789
77 FUNDING: Nuclear Regulatory Commission FY77:$564,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This project is a program for the development of an experimental study for large-scale sodium interactions with reactor materials in support of the NRC confirmatory research program for the LMFBR. The sodium/concrete interaction task has four objectives: (a) Quantitative measurement of the quantity and composition of the evolved gases. (b) Quantitative measurement of the penetration rate of the sodium reaction zone into the concrete, including estimates of thermal cracking and exfoliation. (c) Identification of the influence of specific engineering features such as the presence of cracks and steel reinforcement on the sodium penetration rate. (d) Development or confirmation of an analytic model of the process for use in licensing verification. The sodium/liner interaction task will be an experimental and analytic program to explore the consequences of hot sodium spills or sprays on steel liners over concrete substructures. Both hot and cold liner designs will be studied in the situation where a flaw is present to allow direct sodium/concrete interaction.
APPROACH: The general approach is to develop an experimental facility which has sufficient flexibility to perform both current and future tests. The concept is to develop a reaction chamber approximately 8 feet by 8 feet by 7 feet high to contain the sodium reactor products, which will be located at a remote testing site. Utilizing this facility, large scale sodium interaction tests will be conducted with substantial instrumentation employed to produce the desired data.
RESULTS: The results will have immediate applicability to LMFBR licensing. The longer term program will provide the technical base for evaluating and interpreting other experimental work, for providing the required support for licensing future LMFBRs and for laying the basis for regulatory guides.
PROJECT MILESTONES: (1) October 1, 1976 Sodium/concrete test chamber fabricated. (2) December 31, 1976 Concrete cured, sodium/liner test chamber fabricated, and sodium/concrete interactions initiated. (3) February 15, 1977 Liner test specimens fabricated. (4) March 15, 1977 Sodium/liner interactions initiated. (5) November 1, 1977 Investigation of additional liner concepts initiated. (6) December 15, 1977 Report on analysis and implication of FY 77 program prepared. (7) March 1, 1978 Tests on other concrete types initiated.
KEYWORDS: LMFBR TYPE REACTORS;REACTOR MATERIALS;MATERIALS TESTING;SODIUM;CONCRETES;CHEMICAL REACTIONS;CONTAINMENT RESEARCH INSTALLATION

<150017>
TITLE: A Reactor Safety Research Program
PROJECT NUMBER: (A-1021) A-1016
PRINCIPAL INVESTIGATOR: Coats, R.L.;Dahlgren, D.A.;Powell, J.E.;Butcher, B.
ADDRESS: Organizations 5411, 5422, 5423, and 5167, respectively, Sandia Labs, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Wright, Robert W.
TELEPHONE: F427-4329
TYPE OF FUNDING: Contract No.-E(29-1)-789
77 FUNDING: Energy Research and Development Administration Nuclear Regulatory Commission FY77:$3,010,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This project is a broad program of fast reactor safety research with emphasis on experimental studies and the development of phenomenological models for use in the safety assessment of fast reactors.
APPROACH: The following tasks are included in this program: (1) prompt burst energetic experiments will be performed on single-pin geometries, (2) in-pile post-accident heat removal debris bed experiments have been undertaken to characterize the thermal behavior of internal heated debris beds to determine their melt-through potential in order to provide information needed for analysis of post-accident containment, (3) fuel motion diagnostic scoping studies for fast reactor safety test situations will be performed with various techniques, (4) planning for in-pile experiments on post-accident heat removal from molten fuel pools will be conducted, (5) equation-of-state high temperature vapor data for fresh and irradiated oxide fuels and advanced fuels and advanced fuels will be obtained, and (6) transition phase studies will be performed.
RESULTS: This program will provide understanding of accident phenomenology for use in the safety assessment and licensing of liquid metal fast breeder reactors.
PROJECT MILESTONES: (1) Complete initial series of single-pin fresh-oxide-fuel prompt-burst energetics test in ACPR, 10/77. (2) Complete initial series of debris-bed dry-out experiments in ACPR, 10/77. (3) Perform initial small-scale molten-fuel pool experiments in ACPR, 9/77. (4) Complete dynamic measurements of UO/sub 2/ vapor pressure, 9/77. (5) Prepare 37-pin in-core fuel-motion diagnostics experiment, 12/77.
KEYWORDS: IN-PILE TESTING;ACCIDENT ENERGETICS;POST-ACCIDENT;ACPR;PROMPT-BURST;LMFBR TYPE REACTORS;REACTOR SAFETY;RESEARCH PROGRAMS;REACTOR ACCIDENTS;AFTER-HEAT REMOVAL;RADIOACTIVE AEROSOLS;PLUTONIUM;COMPUTER CODES

<150018>
TITLE: HTGR Safety Analysis and Research
PROJECT NUMBER: B0122
PRINCIPAL INVESTIGATOR: Ball, S.J.
ADDRESS: Building 9201-3, mail Stop 7, P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission
MONITOR: Schamberger, Robert D.
TELEPHONE: P427-4323
TYPE OF FUNDING: Interagency agreement-U.S. NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$230,000
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Identify, acquire, develop, and implement analytical methods for study of system and component response characteristics and perform certain tests on the Fort St. Vrain reactor to verify the adequacy of methods and data used in analyses. Develop information concerning behavior of HTGR systems under accident conditions, with particular reference to transient response characteristics of the system as a whole and of critical safety-related components. Provide a firm basis for verification of analyses contained in safety analysis reports and for improving definition of design safety margins and overall risks. Perform safety-related research in areas as indicated by the results from studies.
APPROACH: Computational methods will be obtained from the General Atomic Company, vendor for the HTGR; these methods will be evaluated by executing parametric studies for input variables and comparing the results with those from self-generated computations. Primary system component models developed in this study will be used to develop a system dynamics code. The overall system code will be used to predict and correlate data obtained from the Fort St. Vrain operation.
RESULTS: This task will produce an evaluation of analytical models of components of the type found in the primary system of HTGRs. A primary system dynamics computer program will be produced that is specifically applicable to the Fort St. Vrain reactor design. An evaluation will be made of the computational methods used by the vendor, General Atomic Company, to design and evaluate the performance of large HTGR plants.
PROJECT MILESTONES: (1) System and Safety Analysis Methods: (a) Adapt primary system code to the Fort St. Vrain reactor. (b) Plan and implement experimental verification tests. (c) Document evaluation of TAP and RECA codes of GAC. (2) Systems and Safety Analysis: (a) Complete initial LOFC and DBDA analyses. (b) Complete FSV system response predictions. (c) Complete initial analysis of reactivity accidents.
KEYWORDS: REACTORS;DYNAMICS;HTGR TYPE REACTORS;REACTOR SAFETY;REACTOR ACCIDENTS;COMPUTER CODES;HELIUM

<150021>
TITLE: Fire Protection
PROJECT NUMBER: A1057
PRINCIPAL INVESTIGATOR: Klamerus, L.
ADDRESS: P.O. Box 5800, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Feit, Ronald
TELEPHONE: P427-4272
TYPE OF FUNDING: Interagency agreement-US Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$223,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To provide data needed to confirm current NRC cable separation requirements (RG 1.75) and to determine ways to decrease the vulnerability of a water reactor plant to fire, to determine ways for better control of fires and to determine ways to mitigate the effects of fires on plant safety systems.
APPROACH: (1) Cable fire separation tests will be conducted on currently utilized cable types. (2) Tests of cable in conduit and with fire barrier will be conducted. (3) Tests will be conducted to evaluate the effectiveness of fire retardent coatings. (4) Aged cable and coating materials will be tested. (5) Fire extinguishing agents and detection systems will be evaluated.
RESULTS: Test procedures will be developed and test equipment will be evaluated.
PROJECT MILESTONES: FY 76: (1) Identify program elements. (2) Preliminary information on adequacy of RG 1.75 (Physical Separation Criteria). FY 77: (1) Final results on adequacy of RG 1.75 (Physical Separation Criteria). (2) Computation of list of combustable products in nuclear power plants. (3) Define tests for aged cable and coating materials. (4) Preliminary data on the effectiveness of cable coating materials.
KEYWORDS: PWR TYPE REACTORS;BWR TYPE REACTORS;ELECTRIC CABLES;FIRE RESISTANCE;FIRE PREVENTION;TESTING

<150022>
TITLE: Nuclear Safety Information Center
PROJECT NUMBER: B0126
PRINCIPAL INVESTIGATOR: Cottrell, W.B.
ADDRESS: P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Norry, Patricia G.
TELEPHONE: P427-4344
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Commission
77 FUNDING: Nuclear Regulatory Commission FY77:$575,000
TECHNOLOGY: NUCLEAR/General (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To provide a focal point for the collection, evaluation, storage and dissemination of safety information generated in the U.S. and abroad on reactors and other nuclear facilities.
APPROACH: Collect, abstract, index and computer-store safety information.
RESULTS: Complete nuclear safety data file.
PROJECT MILESTONES: Continuing effort.
KEYWORDS: INFORMATION CENTERS;REACTOR SAFETY;NUCLEAR FACILITIES;SAFETY

<150025>
TITLE: THOR, Advanced One Dimensional Systems Code
PROJECT NUMBER: A3014
PRINCIPAL INVESTIGATOR: Wulff, W.
ADDRESS: Associated Universities, Inc., Upton, Long Island, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Zuber, Novak
TELEPHONE: F427-4275
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$1,255,000
TECHNOLOGY: NUCLEAR/Fissicn Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The research objective is to develop an advanced computer code for the prediction of accident-induced thermohydraulic transients in light water reactors with: (1) Implementation of one-dimensional drift flux model to describe nonhomogeneous nonequilibrium flow in reactor components. (2) Component modeling to accommodate processes characteristic of individual components. (3) Automatic computation of steady-state and initial conditions. (4) Prediction of transient one-dimensional neutron kinetics. (5) Freedom to select spatial detail of computation through discrete, as well as lumped-parameter descriptions, wherever possible. (6) Self-sufficient program sets for constitutive descriptions. (7) Modular code structure. (8) Model two and three dimensional mist flow effects on heat transfer during reflood. (9) Provide consulting services.
APPROACH: Build up the code through the development and verification of component modules.
RESULTS: Task 1: (1) Preliminary system code assembly completed. (2) Preliminary comparison with data from integral system experiments. Task 2: (1) Measurement capabilities with Laser-Doppler anemometer have been established. (2) Analytical model for solid particles suspensions in gas are being verified.
PROJECT MILESTONES: (1) Complete PWR Code Assembly (THOR-1) 12/31/77. (2) Complete BWR Code Assembly (THOR-1) 4/30/78. Final code verification (THOR-2) 9/30/78.
KEYWORDS: THERMAL HYDRAULICS;DRIFT FLUX;MIST FLOW;BWR TYPE REACTORS;PWR TYPE REACTORS;REACTOR ACCIDENTS;HYDRAULICS;HEAT TRANSFER;COMPUTER CODES;T CODES

<150026>
TITLE: COBRA-Coolant Boiling and Rod Arrays
PROJECT NUMBER: B2041
PRINCIPAL INVESTIGATOR: Trent, D.S.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Fabic, Stanislav
TELEPHONE: F427-4275
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$400,000
TECHNOLOGY: NUCLEAR/Fissicn Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop a computer code capable of analyzing transient two-phase flow and heat transfer within the reactor vessel (PWR and BWR). The particular objective during 1977/78 is to apply the code to the analysis of PWR upper heat injection (UHI), which is an alternate ECC system. Of interest is the multi-dimensional, time-dependent flow pattern and heat transfer in the upper head, upper plenum, and in the core, during the blowdown and the reflood phases of LOCA.
APPROACH: Perform water and air single phase flow blockage tests and develop computer model of thermal hydraulic performance of nuclear fuel rod bundles.
RESULTS: Analysis. (1) 1-D and 2-D Reflood Computations will be demonstrated. (2) The applicability of the Drift Flux Model for PWR downcomer analysis will be evaluated. Experiments. Water and air single phase flow blockage experimental data will be reported.
PROJECT MILESTONES: (1) Synthesis of fuel rod quench test transfer model compatible with COBRA-IV numerical hydrodynamic techniques (top and bottom quench). (2) Simulation of decoupled hydraulic phenomena in UHI guide tubes and support columns. (3) Simulation of upper headmixing pertinent for UHI analysis. (4) Preliminary simulations of PWR vessel blowdown and lower plenum refill including upper head draining. (5) Extend UHI simulation in 4 above to include reflood.
KEYWORDS: DRIFT FLUX;PWR TYPE REACTORS;REACTOR ACCIDENTS;FUEL ELEMENT CLUSTERS;HEAT TRANSFER;HYDRAULICS;C CODES;FLOW BLOCKAGE;COMPUTER CODES

<150027>
TITLE: Containment Analysis Development
PROJECT NUMBER: A6042
PRINCIPAL INVESTIGATOR: Sullivan, H.
ADDRESS: 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: Aerojet Nuclear Co., Idaho Falls, Idaho (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Slegers, Leonard
TELEPHONE: F427-4275
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$420,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This task covers development of a multidimensional transient compressible flow program based on the LASL KACHINA code, which provides a general short-term code for independent evaluation of water reactor containment systems. Work is planned to simplify and extend the program to also provide long-term containment analysis capabilities.
APPROACH: Modify existing KACHINA code to evaluate reactor containment systems.
RESULTS: (1) Perform analytical model review of KACHINA to provide comprehensive understanding of program capabilities with report on limitation and capabilities. Provide technical representative to the Marviken

containment program. (2) INEL plans to develop BEACON, based on numeric and hydrodynamic capabilities of KACHINA developed by LASL, to include: mixed dimensional cell geometry, modified equation of state for air and water system, addition of fluid obstacles, modification of boundary conditions, addition of source cells, essentially single component and single phase flow, initiate interphase mass transfer model develcpment, and general code improvements.
PROJECT MILESTONES: (1) Continue adaptation of KACHINA to containment modeling 7/1/76. (2) Provide support for Marviken test program FY 1977.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;CONTAINMENT SYSTEMS;MATHEMATICAL MODELS;COMPUTER CODES;K CODES;COMPRESSIBLE FLOW

<150028>
TITLE: Loss of Coolant Accident (LOCA) Analysis
PROJECT NUMBER: A6052
PRINCIPAL INVESTIGATOR: Sullivan, L.H.
ADDRESS: P.O. Box 1625, Idaho Falls, ID 83401
AFFILIATION: SEE CODE- 9502158 EG and G Idaho, Inc., Idaho Falls (USA). Idaho National Engineering Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Lyon, Warren C.
TELEPHCNE: F427-4275
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$1,335,000
TECHNOLOGY: NUCLEAR/Fissicn Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGCRY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: CATEGORY I: The basic purpose of this activity is the improvement and addition of new analytical models to the RELAP code. This includes modifying advanced model concepts and developing programming techniques so that new models can be introduced into the RELAP code structure, improving existing RELAP models, maintaining an operational code, and maintaining RELAP configuration control. CATEGORY II: The objective of this task is to select, from the NRC analysis development results, improved analytical models for the LOCA hydrodynamic processes and to establish, in conjunction with the RELAP Experimental Code Development effort, methods for incorporation of these models into RELAP. The improvements sought under this effort are for the purpose of establishing more accurate best-estimate models for the physical processes which occur during a LOCA and to improve the evaluation model codes.
APPROACH: Using existing experimental data, develop improved computer models of the hypothetical LOCA.
RESULTS: CATEGORY I: (1) RELAP4/MOD006, an improvement of MOD5 blowdown and an extensionn of MOD5 into PWR reflood, was developed and released internally. (2) An experimental version of RELAP4/MOD007, an extension to BWR reflood, was written. (3) RELAP4 configuration control was maintained and service provided to all code users. This includes change control and documentation of all changes. CATEGORY II: The two principal tasks conducted included 1-D hydrodynamic model development and coding (RELAP 5) and 3-D component code development. The first of these tasks includes: drift flux model development, flow regimes map improvement, and initiation of RELAP modularization. The second task includes development of a user convenient SCORE/EVET code and documentation, incorporation of a set of heat transfer, friction factor, and cther correlations in SCORE/EVET, completion of PWR reflood and blowdown problems using SCORE/EVET, and release of SCORE/EVET to the Argonne Code Center.
PROJECT MILESTONES: (1) Release of MOD 6 for NRC use, Version 1 on 12/31/76 and Version 2 on 5/31/77. (2) Release of SCORE/EVET to Argonne Code Center on 4/14/77.
KEYWORDS: DRIFT FLUX;PWR TYPE REACTORS;BWR TYPE REACTORS;LOSS OF COOLANT;MATHEMATICAL MODELS;COMPUTER CODES;REACTOR SAFETY;HYDRODYNAMICS

<150029>
TITLE: Steam Explosion Phenomena
PROJECT NUMBER: A1030
PRINCIPAL INVESTIGATOR: Buxton, L.D.
ADDRESS: P.O. Box 5800, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: DiSalvo, Raymond
TELEPHCNE: F427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Commission (NRC)
77 FUNDING: Nuclear Regulatory Commission FY77:$240,000
TECHNOLOGY: NUCLEAR/Fissicn Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGCRY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To identify and characterize the physical conditions which must be met in order for a steam explosion to occur when molten LWR core materials cotact water. The information will be used to estimate the probability of occurrence of steam explosions under a variety of hypothetical LWR accident situations. An objective is to set realistic limits on the magnitudes and time characteristics of pressure pulses, (1) which are needed to trigger explosive interactions, and (2) which result from explosive interactions.
APPROACH: Expose small masses of molten material to external pressure pulses while submerged under water. An experimental apparatus will be designed and constructed in which small masses (25g) of molten materials experiencing film boiling will be subjected to transient external pressure pulses while submerged under water. The following parameters will be investigated: temperature of hot and cold liquids, composition of hot molten phases (steel and UO/sub 2/-Zr-steel mixtures), total external pressure, and magnitude and duratiCn of transient pressure pulse.
RESULTS: Data on measured temperature, composition-pressure of liquid systems leading to a characterization of conditions, which must be met in order for a steam explosion to occur, have been generated. The ability to artificially trigger an energetic interaction between molten core materials and water has been demonstrated.
PROJECT MILESTONES: (1) Complete laboratory scale testing 12/31/77. (2) Complete larger scale scoping tests 6/30/78. (3) Complete analysis of containment failure via vapor explosion 9/30/78.
KEYWORDS: PWR TYPE REACTORS;BWR TYPE REACTORS;REACTOR SAFETY;MELTDOWN;FUEL-CLADDING INTERACTIONS;FUEL-COOLANT INTERACTIONS;STEAM;EXPLOSIONS;VAPORS;CONTAINMENT;FAILURES

<150030>
TITLE: Molten Core Interactions
PROJECT NUMBER: A1019
PRINCIPAL INVESTIGATOR: Powers, D.A.
ADDRESS: P.O. Box 5800, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: DiSalvo, Raymond
TELEPHONE: P427-4266
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$213,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To characterize the chemical and physical interactions between prototypical materials likely to be encountered during hypothetical core melt accidents in LWRs. This program will concentrate on identifying and understanding the response of concrete to molten LWR core materials in order to evaluate: (1) the generation rate of water vapor and non-condensable gases; (2) the effects of gas generation on fission product release; and (3) the chemical reactions occurring in the complex system.
APPROACH: The principal safety-related and scale-dependent phenomena will be identified through experiment and modeled.
RESULTS: Experiments will be planned and conducted in the following areas: (1) response of concrete to high heat fluxes; (2) phenomenological studies of interfacial phenomena with simulant materials; (3) thermal decomposition of concrete by DTA, TGA, and other laboratory thermal decomposition techniques; and (4) phenomenological experiments on small-scale (approx. equal to 10 kg melt) and large-scale (approx. equal to 100 kg melt) examining the response of concretes made with limestone and basaltic aggregates. Large- and small-scale experiments will be related through scaling analyses. Concrete penetration has been shown to be dominated by thermal effects. Aggregate composition has secondary effects on physical phenomena but possibly primary effects on chemical phenomena.
PROJECT MILESTONES: (1) Develop improved model of core-concrete interaction, 10/30/77. (2) Perform small-scale experiments with capability to sustain melt, 12/30/77.
KEYWORDS: PHYSICAL INTERACTION;PWR TYPE REACTORS;BWR TYPE REACTORS;REACTOR SAFETY;MELTDOWN;REACTOR MATERIALS;CHEMICAL REACTIONS;REACTOR CORE DISRUPTION

<150031>
TITLE: Power Burst Facility
PROJECT NUMBER: A6041
PRINCIPAL INVESTIGATOR: Zane, J.O.
ADDRESS: P.O. Box 1625, Idaho Falls, ID 83401
AFFILIATION: SEE CODE- 9502158 EG and G Idaho, Inc., Idaho Falls (USA). Idaho National Engineering Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Van Houten, Robert
TELEPHONE: P427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$12,900,000
TECHNOLOGY: NUCLEAR/Fission Breeders (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The Power Burst Facility (PBF) is a testing tool to obtain data on the performance of fuel rod clusters under abnormal power, flow and energy density conditions. The data obtained will be used to develop or confirm analytical capability which can be used to predict fuel response in power reactors during off-normal operating conditions.
APPROACH: Perform nuclear irradiation tests on single fuel rods or clusters of fuel rods under abnormal conditions.
RESULTS: A. The following tests are scheduled for FY 1977: (1) PCM (Power-Cooling Mismatch) 1 test; (2) IE (Irradiation Effects) 3 tests; (3) Gap Con (Gap Conductance) 3 tests; (4) Gap Conductance (Piggyback) 3 tests; and (5) LOCA 1 test. B. PCM tests will be performed to characterize the behavior of single unirradiated PWR fuel rods at power densities from the normal operating range through the range where critical heat flux (CHF) is exceeded. Other tests determine the modes, mechanisms and consequences of fuel cladding failure under various overpower or undercooling conditions. The tests to be performed are: (1) PCM 4 (Completed). C. IE Tests will be performed with fuel rods and components obtained from the Saxton Experiment Reactor Program: (1) IE Test No. 2 (Completed); (2) IE Test No. 3 (Completed); (3) IE Test No. 5 (Completed). D. Gap Con Tests will be performed with a 4-rod array, to measure fuel pellet centerline, fuel pellet surface, and fuel cladding surface temperatures pending development of adequate surface temperature measuring capability. In addition, 3 piggyback tests are planned. (1) Gap Con 2-1 (Completed); Gap Con 2-2 (Completed); Gap Con 2-3 (Completed). E. LOCA (Loss of Cooling) test No. 11. F. Instrumentation Development and ID Services; Instrumentation Development will be supported as necessary. Tests to be initiated after FY 1976: (1) LOCA Tests; (2) PCM Small Cluster Tests; (3) Inlet Flow Blockage Tests; (4) RIA Tests; (5) Lead Rod Transient Test.
PROJECT MILESTONES: Conduct LOCA Test No. 11 10/1/77.
KEYWORDS: PBF REACTOR;REACTOR OPERATION;PWR TYPE REACTORS;FUEL ELEMENTS;FUEL ELEMENT CLUSTERS;REACTOR ACCIDENTS;REACTOR SAFETY;FUEL ELEMENT FAILURE;LOSS OF COOLANT

<150032>
TITLE: Fission-Product Decay Heat Studies
PROJECT NUMBER: A7012
PRINCIPAL INVESTIGATOR: Yarnell, J.L.
ADDRESS: P.O. Box 1663, Los Alamos, NM 87545
AFFILIATION: Los Alamos Scientific Lab., N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: DiSalvo, Raymond
TELEPHONE: P427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm. (NRC)
77 FUNDING: Nuclear Regulatory Commission FY77:$183,000

TECHNOLOGY: NUCLEAR/Fissicn Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The purpose of this project is to study fission product decay heating rates, with emphasis on short decay times. Isothermal calorimetry will be used to perform benchmark experiments for decay times between 20 seconds and 2000 seconds with an absolute accuracy of better than 5 percent. Experiments will be done with U-235 (TASK 1) and eventually Pu-239 (TASK 2). Thermal neutron spectra will be used for the irradiations. It is expected that this program will be of immediate use in nuclear safety evaluations for reducing the uncertainty in fission product decay heating at short cooling times, and that the experimental data will be a suitable benchmark for summation calculations and reduce undertainties of the error band associated with comparisons to summation calculations.
APPROACH: Use isothermal calorimetry to measure decay heat of U-235 and Pu-239.
RESULTS: Final results have been obtained on integral decay heat from thermal fission of U-235 and have been incorporated intc a revised ANS standard.
PROJECT MILESTONES: (1) Prepare U-235 thermal fission decay heat report 9/30/76. (2) Prepare Pu-239 thermal fission decay heat report 3/31/76.
KEYWORDS: FISSION PRODUCTS;DECAY;TEMPERATURE MEASUREMENT;URANIUM 235;PLUTONIUM 239;NUCLEAR FUELS

<150033>
TITLE: Transient Fuel Response and Fission Product Release
PROJECT NUMBER: A2016
PRINCIPAL INVESTIGATOR: Kelman, L.R.
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AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: DiSalvo, Raymond
TELEPHCNE: F427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm. (NRC)
77 FUNDING: Nuclear Regulatory Commission FY77:$350,000
TECHNOLOGY: NUCLEAR/Fissicn Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Develop a comprehensive fission product release model based on mechanistic understanding of fuel behavior in LWR fuel elements undergoing a wide range of accidental overheating conditions. The need for a physically realistic description of fission product release and fuel swelling has been indicated for certain hypothetical LWR accidents. Complementary information on fission product release during steady-state and load-following operation may also be obtained.
APPROACH: Use a direct electrical heating apparatus to cause fission products to leave irradiated fuel pellets and then characterize these fission products. Develop a computer model for fission product release. The direct electrical heating apparatus (DEH) which has been designed and constructed for this program will be used to subject fuel pellets irradiated in the H. B. Robinson-2 power reactor to a series of programmed thermal transients. Auxiliary activities include: (1) Optimization of the technique for removing fuel pellets from the clad. (2) Pre- and post-test examination of the fuel. (3) Optimization of the techniques for measuring temperature and calculating thermal profiles. (4) Collection and characterization of the fission products released during the test. The thermal conditions examined during FY 76 are expected to encompass those anticipated in hypothetical power-cooling mismatch (PCM) accidents. Empirical correlations may be derived from the data. The modifications to the apparatus needed to generate thermal ccnditions typical of other types of accidents (LOCA, ATWS, RIA, BWR flow blockage) will be identified. A concurrent analytical effort will develop the mechanistic models of fission product release. The SST (Steady-State and Transient) subcode has been developed based on a similar LMFBR model and calibrated against in-pile fuel rod data. During FY 76 the GRASS (Gas Release
RESULTS: A comprehensive fission product release model has been developed, based on both analytical and experimental investigations of LWR fuel. Rates and total amounts of fission gas released during PCM thermal transients have been correlated to the total surface area of the fuel created by interconnected porosity. Similar behavior has been observed between DEH-tested fuel and fuel subjected to similar thermal transients in the Power Burst facility test reactor.
PROJECT MILESTONES: (1) Provide final models of gas release and fuel swelling 9/30/77. (2) Prepare and submit draft report 12/31/77.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;FUEL ELEMENT FAILURE;FISSION PRODUCT RELEASE;FUEL ELEMENTS;SWELLING;TRANSIENTS;SIMULATION;REACTOR SAFETY;RADIOISOTOPES

<150034>
TITLE: Fission Product Transport Analysis
PROJECT NUMBER: A4078
PRINCIPAL INVESTIGATOR: Gieseke, J.A.
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DIVISION: Division of Reactor Safety Research
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TELEPHONE: F427-4266
TYPE OF FUNDING: Contract No.-AT(49-24)-0220
77 FUNDING: Nuclear Regulatory Commission FY77:$225,000
TECHNOLOGY: NUCLEAR/Fissicn Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To provide methodology for analyzing fission product transport and deposition for light water reactor primary systems and spent fuel shipping casks during hypothetical LOCA conditions. The results of the analyses can be used to: (1) help evaluate the degree of conservatism in current accident analysis assumptions; e.g., estimate the reduction in the radiological source term by deposition on the walls of the primary system; (2) assist in the design of verification experiments; and (3) form the basis for more detailed model development if the need arises.
APPROACH: The technical approach to be followed superimposes analytical models of the transport properties of the various chemical and physical forms of fission products in a steam environment on state-of-the-art

calculations of thermal hydraulic conditions during design basis LOCA (e.g., RELAP-4 FLOOD). The collection of available data on chemical and physical interactions of fission products is an auxiliary activity to model development. The analytical unit which is assembled will be modular, and provisions for parametric variation will be made where insufficient data exist.
RESULTS: Results to date include: (1) available data compiled on chemical interactions, fission product deposition, reactor and cask geometries, and thermal hydraulic conditions; (2) PWR model designed and assembled; (3) BWR model designed and assembled; and (4) fuel cask model designed and assembled.
PROJECT MILESTONES: (1) Complete sensitivity analysis of pressurized water reactor during controlled LOCA 7/31/77. (2) Modify model for meltdown accidents 7/30/78.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;LOSS OF COOLANT;SPENT FUEL CASKS;PRIMARY COOLANT CIRCUITS;FISSION PRODUCTS;DEPOSITION;RADIONUCLIDE MIGRATION;RADIOACTIVE AEROSOLS;TRANSPORT

<150035>
TITLE: Natural Convection in Molten Pools
PROJECT NUMBER: A4061
PRINCIPAL INVESTIGATOR: Kulacki, F.A.
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DIVISION: Division of Reactor Safety Research
MONITOR: DiSalvo, Raymond
TELEPHONE: F427-4266
TYPE OF FUNDING: Contract No.-AT(49-24)-0149
77 FUNDING: Nuclear Regulatory Commission FY77:$45,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop correlations for determining heat transfer rates by natural convection from enclosed fluid volumes having internal heat generation. This is an important safety consideration in the evaluation of the postaccident heat removal capabilities for both thermal and fast reactors under postulated core melt conditions.
APPROACH: Perform heat transfer experiments examining effects of geometry and multiple layers and derive analytical representations of the results.
RESULTS: (1) Correlations of the form NU - cRa/sup m/ have been reported for horizontal layers with an upper isothermal and a lower insulated boundary having Ra approximately equal to 10/sup 13/ and steady-state internal heat generation. (2) Horizontal layers with transient internal heat generation have been used to observe phenomenological heat transfer behavior and times to onset of steady-state conditions. (3) A hemispherical dish model has been constructed and used to determine heat transfer rates by natural convection under steady-state conditions.
PROJECT MILESTONES: (1) Complete transient tests and report initial results for hemispherical geometry 8/31/77. (2) Complete horizontal layer and hemispherical dish tests with multifluids 8/31/77.
KEYWORDS: POWER REACTORS;REACTOR CORES;MELTDOWN;LIQUID METALS;HEAT TRANSFER;NATURAL CONVECTION;SAFETY;PONDS

<150036>
TITLE: Vapor Explosion Triggering
PROJECT NUMBER: A2029
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MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: DiSalvo, Raymond
TELEPHONE: F427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm. (NRC)
77 FUNDING: Nuclear Regulatory Commission FY77:$125,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To identify and understand the physical conditions which must be met in order to trigger explosive interactions between two liquid phases. This information will be used to estimate the probability of occurrence of a steam explosion during hypothetical LWR accidents in which contact between molten LWR core materials and water is postulated. Information generated by related work in foreign countries will also be assimilated into the state-of-the-art.
APPROACH: Establish criteria for the occurrence of vapor explosions based on experiments in which pairs of liquids are brought into contact and provide a mechanistic interpretation of these criteria.
RESULTS: Subtask A: The applicability of the ANL interfacial temperature criterion to pairs of fluids having instantaneous interfacial contact temperature far above the critical temperature of the cold liquid has been demonstrated. Low and high temperature cutoffs for the occurrence of explosive interaction has been demonstrated. A high-pressure cutoff has also been demonstrated. Subtask B: The effects of localized chemical reaction on the explosive potential of the fluid system is being tested. Subtask C: Interfaces for exchange of research results with foreign laboratories have been established. Cooperative tests using several kg of molten NaCl and water at Ispra are being planned.
PROJECT MILESTONES: (1) Issue summary report on small-scale tests 9/15/77. (2) Complete experiments with simulant fluids to measure effects of mass on energy conversion efficiency 6/30/78. (3) Complete NaCl--H/sub 2/O experiments 10/30/78.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;WATER;STEAM;EXPLOSIONS;VAPORS;SIMULATION;FUEL-COOLANT INTERACTIONS;MELTDOWN;SAFETY

<150037>
TITLE: Fission Product Release from LWR Fuel
PROJECT NUMBER: B0127
PRINCIPAL INVESTIGATOR: Malinauskas, A.D.
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DIVISION: Division of Reactor Safety Research
MONITOR: DiSalvo, Raymond

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TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm. (NRC)
77 FUNDING: Nuclear Regulatory Commission FY77:$322,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Characterize the radionuclide release from LWR fuels under a range of conditions applicable to spent fuel transportation accidents and successfully terminated in-reactor LOCA in order to provide source term data for use in accident analysis. Particular attention will be given to determining chemical and physical states for incorporating into fission product transport models. Analytical techniques to characterize the fission products will be developed.
APPROACH: The principle experiments examine the nature of the fission product source term (particularly I and Cs) released from simulated and irradiated LWR fuel segments as functions of temperature and environmental conditions. Knudsen cell mass spectrometric tests examine the potential for formation of compounds between fuel and fission products before they are released from the rod. Control tests are used to check out the experimental apparatus and to develop characterization techniques by injecting a known fission product source into the test train environment. The test train consists of an injection interaction zone in which specimens are heated in flowing gas, a thermal gradient tube, and a series of filters and gas traps. Implant tests combine the previously-mentioned test aspects and provide preliminary information of an integral rod nature and can be used to examine specific phenomena identified in tests with irradiated fuel. Tests with low and high burnup irradiated fuel provide prototypicality to the experimental program so that the results may be applied with some confidence to real reactor and spent fuel cask conditions.
RESULTS: Correlations of fission product release from LWR fuel as functions of time, temperature, and environmental conditions have been generated for commercial LWR fuel in steam at 500 to 1100 C.
PROJECT MILESTONES: (1) Submit draft report on implant tests 8/15/77. (2) Submit draft report on high burnup fuel tests 1/1/78.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;FUEL ELEMENTS;FISSION PRODUCT RELEASE;RADIONUCLIDE MIGRATION;NUCLEAR FUELS

<150038>
TITLE: Decay Heat Studies
PROJECT NUMBER: B2040
PRINCIPAL INVESTIGATOR: Spinrad, B.I.
ADDRESS: Department of Nuclear Engineering, Corvallis, OR 97331
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DIVISION: Division of Reactor Safety Research
MONITOR: DiSalvo, Raymond
TELEPHONE: F427-4266
TYPE OF FUNDING: Contract No.-AT(49-24)0157
77 FUNDING: Nuclear Regulatory Commission FY77:$65,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop a scientifically defensible method of predicting decay heat and its standard deviation for thermal converter reactors by using available experimental data and established physical laws.
APPROACH: Calculation from listed ENDF/B-IV data is the standard method, to be analyzed according to the uncertainties of the data and validated by comparison with integral experiments at LASL and HNL (ORNL).
RESULTS: Computation of the error caused by yield uncertainties has produced a working standard shutdown power algorithm complete with defensible standard deviation. This has been confirmed by review of errors caused by other uncertainties, currently believed to be either small or well-defined. Since yield errors are not part of ENDF/B-IV, their documentation will be systematized. Constraints such as mass, neutron emission and charge balance in fission, have been used to keep the errors consonant with physical laws. A power reactor operating history is only simulated approximately by a constant U-235 fission rate, constant flux history. An appreciable fraction of the power comes from fast fission of U-238, and at the end of life a major fraction comes from thermal fission of Pu-239. This latter is also of importance for mixed oxide fuel. The properties of shutdown heating following Pu-239 and U-238 fission have been investigated analytically by the methods already developed for U-235, and shutdown heating from realistic reactor histories incorporating these fissions has been modeled. Pre- and post-operational analysis of the LASL and HNL shutdown heating experiments will be performed and pre-operational analysis will be completed and reported. Emphasis will be on predicting the gamma-ray spectra from fission-product decay as escape of gamma-rays from the experiments (a spectrum-dependent escape) is a major source of experimental uncertainty. Liaison will be maintained with EPRI programs on gamma transport, which are related to this phenomenon.
PROJECT MILESTONES: Complete final verified correlation for UO/sub 2/ 12/31/77.
KEYWORDS: POWER REACTORS;AFTER-HEAT REMOVAL;URANIUM DIOXIDE;FISSION PRODUCTS;GAMMA RADIATION;MATHEMATICAL MODELS;THERMAL REACTORS;AFTER-HEAT

<150039>
TITLE: Fission Product Beta and Gamma Energy Release
PROJECT NUMBER: B0095
PRINCIPAL INVESTIGATOR: Peelle, R.W.
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DIVISION: Division of Reactor Safety Research
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TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$250,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The purpose of this experiment is to measure total beta and gamma energy release rate

from fission product decay following thermal neutron fission of fuel materials U-235 and Pu-239. The accuracy goal is 3% to 5% of the overall energy release rate; interim reports of moderate precision data (7% to 10%) will be provided for U-235. Energy release rates will be determined for approx. 2 to 2000 (or longer) seconds after fission by thermal neutrons separately for beta and gamma rays using spectrometers; as a side benefit, the corresponding spectra of beta and gamma rays will be available at modest resolution.
APPROACH: Perform in-pile irradiation experiments and measure the fission product decay energy.
RESULTS: Measurements of decay energy release from thermal neutron fission of U-235 have been completed. Final results have been released and reported and incorporated into a revised ANS standard for decay heat. Planning and initial work on the external beam normalization check will be completed and necessary system changes for Pu-239 studies will be determined.
PROJECT MILESTONES: (1) Prepare final U-235 article 8/30/77. (2) Prepare final Pu-239 article 12/30/77.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;AFTER-HEAT;FISSION PRODUCTS;ENERGY YIELD;URANIUM 235;PLUTONIUM 239;HEAT TRANSFER;BETA DECAY;GAMMA RADIATION

<150040>
TITLE: Fuel Behavior Verification
PROJECT NUMBER: A6046
PRINCIPAL INVESTIGATOR: MacDonald, P.E.
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AFFILIATION: SEE CODE- 9502158 EG and G Idaho, Inc., Idaho Falls (USA). Idaho National Engineering Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Scott, Harold
TELEPHONE: F427-4284
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$1,675,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This project encompasses: (1) assistance to the Division of Reactor Safety Research in the development and coordination of a comprehensive program for determining the behavior of reactor fuels under abnormal and accident conditions, (2) the development of detailed analytical and experimental project descriptions, (3) the evaluation of experimental data and the development and verification of LWR fuel and cladding material property correlations, including properties for plutonium recycle fuel, (4) the verification of analytical fuel behavior models by comparison of calculations with appropriate experimental data, (5) the fabrication and irradiation of certain instrumented test assemblies in the Halden Reactor, and (6) the development and execution of a program for postirradiation examination of typical power reactor fuel.
APPROACH: Obtain pertinent experimental data and check codes against these dates.
RESULTS: (1) The program description will be updated. Assist NRC-RES with Fuel Behavior Program coordination and provide short-term analytical and technical support. (2) Direct the acquisition of data from test assembly, IFA-429. Complete the design and fabrication of the second Halden test assembly IFA-430. Compile, reduce and present Halden data. Initiation of post irradiation examination of IFA-429 rods will be conducted if warranted. (3) Plutonium recycle properties, transient cladding, transient fuels and steady-state fuel and cladding models will be developed or improved. MATPRO correlation uncertainties will be determined. Gap conductance and transient gas pressure evaluation of PBF data will be conducted. (4) Design and conduct steady-state and transient gas flow tests at room temperature and 500 degrees F. Characterization of CP and L cladding by eddy current, dimensional and metallographic methods will begin. (5) FRAP-S3 and FRAP-T3 will be compared with appropriate experimental data, the models will be reviewed, checked and a verification report issued. Sensitivity studies will be conducted and reported.
PROJECT MILESTONES: (1) Issue four Experimental Needs Specifications 2/15/77. (2) Prepare MATPRO Documentation (TREE-NUREG-1005) 12/30/76. (3) Transmit FRAP-T3 Report to NRC 2/15/77.
KEYWORDS: MODEL;VERIFICATION;BWR TYPE REACTORS;PWR TYPE REACTORS;FUEL ELEMENTS;FUEL ELEMENT FAILURE;PERFORMANCE;TRANSIENTS;REACTOR ACCIDENTS

<150041>
TITLE: Fuel Behavior Model Development
PROJECT NUMBER: A6050
PRINCIPAL INVESTIGATOR: Dearien, J.A.
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DIVISION: Division of Reactor Safety Research
MONITOR: Scott, Harold
TELEPHONE: F427-4284
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$500,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This task is scoped in terms of: development of models particular to the transient code FRAP-T, models particular to the steady-state code FRAP-S, models common to both codes, and activities directed toward the actual generation of the computer codes.
APPROACH: Review literature and develop computer models of fuel rod behavior under steady state and transient conditions.
RESULTS: (1) Development of models in modular form to describe the deformation of cladding during thermal cycling and irradiation. (2) The updating and incorporation into FRAP of gas release and gas conditions as subcodes to couple to the thermal and/or mechanical subcodes. (3) Extend the present one-dimensional conduction analysis into a two-dimensional radial and azimuthal analysis. (4) Develop analytical procedures to show failure criteria for clad failure and the effect of a statistical spread in MATPRO (material properties data). (5) FRAP is developed to calculate the response of a fuel rod during: transient accident conditions such as LOCA, PCM and RIA; steady-state operation for initial conditions. (6) Integrate material property subcodes in the FRAP computer code.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;FUEL ELEMENTS;TRANSIENTS;MATHEMATICAL MODELS;F CODES;COMPUTER CODES

<150042>
TITLE: Experimental Verification of Steady State Fuel Codes
PROJECT NUMBER: B2043
PRINCIPAL INVESTIGATOR: Hann, C.
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MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Scott, Harold H.
TELEPHONE: P427-4284
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$595,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Gap Conductance is a study of the heat transfer coefficient between the fuel and the cladding. The purpose of this experimental project is to determine the proper fuel temperature under conditions prior to and during LOCA. It is expected that existing models will be verified and improved for SS fuel computer codes.
APPROACH: Perform both in-reactor and ex-reactor experiments to measure the thermal conductance of the gap between the urania fuel and Zircaloy cladding.
RESULTS: The primary objective of the proposed work is to obtain well characterized experimental data that will be used in the verification of the best estimate version GAPCON-THERMAL and FRAP-S computer codes. This data will also provide a series of benchmarks for indexing other thermal performance codes used for reactor safety analyses. These objectives will be attained by conducting a series of in-reactor and ex-reactor tests. The ex-reactor tests will be conducted to extend the contact conductance work of Ross and Stcute to more relevant gas pressure, temperatures, and gas compositions. The in-reactor tests will be conducted in the Halden Reactor. The initial irradiation experiments will be directed towards obtaining data cn fuel relocatien mechanism and kinetics. Fission gas release kinetics and the effects of various gas compositions will also be investigated to obtain sufficient data for code verification. (A-1) Pretest predictions for IFA-432, liaison with U.S. Halden representative, complete fuel pellet pre-characterization, issue topical report on fuel rod component characterization. (A-2) Receive raw data on magnetic tape and establish masterfile, perform error analysis, analyze dynamic temperature data from IFA 431 and 432, evaluate effects of pellet eccentricity, prepare topical report incorporating irradiation results from 431. (A-3) Select site to perform PIE, perform destructive and nondestructive exam to include profilometry, gamma scan, fission gas analysis, metallography and immersion density.
PROJECT MILESTONES: (1) Prepare first topical report on conductance models 8/30/77. (2) Prepare topical report cn post irradiation examination of assembly 431 6/30/78.
KEYWORDS: CONTACT CONDUCTANCE;PWR TYPE REACTORS;BWR TYPE REACTORS;FUEL ELEMENTS;HEAT TRANSFER;FUEL CANS;ZIRCALOY;COMPUTER CODES;SAFETY

<150043>
TITLE: Mechanical Properties of Zircaloy Containing Oxygen
PROJECT NUMBER: A2017
PRINCIPAL INVESTIGATOR: Weeks, R.W.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
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MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Picklesimer, Marion L.
TELEPHONE: P427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$500,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The purpose of this project is to obtain quantitative information on the effect of oxidation on the mechanical behavior of Zircaloy in order to evaluate the conservatism of the acceptance criteria for emergency core cooling systems in light-water reactors. This program will provide data on the strength and ductility of Zircaloy-2 and -4 as a function of temperature, oxygen concentration, microstructure, and strain rate by conducting uniaxial tensile, four-point bend, biaxial tube-burst, and impact on tests on the materials. While the range of test variables in this program encompasses the conditions of interest in postulated LOCA situations, the mechanical-property results will also provide a data-base for fuel-element modeling codes that are used to predict cladding deformation for other power-cooling mismatch (PCM) situations.
APPROACH: Perform tensile tests and burst tests on Zircaloy containing oxygen. Develop finite analysis code for determining the strength and ductility of Zircaloy fuel cladding containing oxygen gradients.
RESULTS: Subtasks (A) Development and Characterization of Test Specimens: The investigation of the effect of temperature and oxygen concentration on the kinetics of grain growth in Zircaloy has been completed and the results reported. Information on the Zircaloy-oxygen phase diagram has been reported. (B) Mechanical Properties of Zircaloy-Oxygen Fuel Cladding: Tests have been conducted to determine the strength and ductility of Zircaloy fuel cladding as a function of oxygen content, temperature and internal pressure. (C) Development of Failure Criterion for Oxygen-embrittled Zircaloy Fuel Cladding: An elastic-plastic, finite element analysis for the strength and ductility of Zircaloy will be developed for uniaxial and biaxial loading conditions. Results from subtasks (a) and (b) will be incorporated into the analysis, and the results reported. Test parameters from the ORNL multi-rod burst tests will be used in the analysis to complete the deformatien of Zircaloy cladding for comparison with the experimental results. A tentative embrittlement criterion will be developed.
PROJECT MILESTONES: (1) Determine the effect of temperature, oxygen concentration, microstructure and strain rate on the tensile properties of Zircaloy 6/30/77. (2) Develop finite analysis code 6/30/78. (3) Issue final reports 9/30/78.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;ZIRCALOY 2;ZIRCALOY 4;FUEL CANS;MECHANICAL PROPERTIES;YIELD STRENGTH;DUCTILITY;MECHANICAL TESTS

<150044>
TITLE: Multi-Rod Burst Test
PROJECT NUMBER: B0120
PRINCIPAL INVESTIGATOR: Chapman, R.H.
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MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Picklesimer, Marion L.
TELEPHONE: F427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$1,000,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Characterize deformation behavior of LWR fuel cladding under conditions predicted for LOCA, using single and multirod, internally pressurized electrically heated fuel pin simulators to determine the effects of rod interactions, blockage patterns, rupture temperature-pressure relationship and flow resistance coefficients.
APPROACH: Build and test bundles of zircaloy tubing to determine how tubing responds to pressure and temperature transients.
RESULTS: Task 1: Planning Analysis. Published report on Zircaloy tubing characteristics. Continue development of program plans and schedules for large bundles and analysis of single rod tests. Task 2: Experimental Facilities. Complete design of multirod test facility to permit testing of 4 x 4 arrays; prepared site, install services and utilities and construct DC power modifications. Task 3: Single Rod Tests. Fabricated and tested 15 fuel pin simulators without heated shroud. Initiate examinations of simulators and analysis of data. Task 4: 4 x 4 Bundle Tests. First 4 x 4 bundle constructed and installed for test. Take partial delivery of heaters for second and third bundles. Place order for internal thermocouples for 3rd bundle. Procure and perform in-house preparations (end seals) on exterior thermocouples for bundle to be used in temperature mapping experiment. Task 5: 8 x 8 Bundle Tests. Initiate development of test criteria and bundle configuration.
PROJECT MILESTONES: (1) Constructed multirod burst test facility 1/1/77. (2) Complete first group of 4 x 4 tests 1/1/78. (3) Analyze and report data on first group of 4 x 4 PWR bundles 10/1/78.
KEYWORDS: BWR TYPE REACTORS;PWR TYPE REACTORS;LOSS OF COOLANT;FUEL ELEMENT FAILURE;SIMULATION;ZIRCALOY;FUEL CANS;DEFORMATION

<150045>
TITLE: Zircaloy Fuel Cladding Collapse Studies
PROJECT NUMBER: B0124
PRINCIPAL INVESTIGATOR: Hobson, D.O.
ADDRESS: Post Office Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Picklesimer, Marion L.
TELEPHONE: F427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Commission
77 FUNDING: Nuclear Regulatory Commission FY77:$275,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: This work will determine the factors that affect the collapse behavior of Zircaloy fuel cladding, including temperature, pressure differential across the cladding wall, and the stress state of the cladding. It is expected that this work will define the collapse and creep limits below which such deformation is not a significant factor.
APPROACH: Build facilities for creepdown, collapse and multi-axial yield tests perform experiments in these facilities and compare data with BUCKLE code predictions.
RESULTS: Out-of-reactor collapse and creepdown tests will be completed and results reported. Design of in-reactor tests has been completed. Characterization of cladding through dimensional measurements, metallography, and X-ray texture work will continue throughout the year.
PROJECT MILESTONES: (1) Perform and report interim results on creepdown tests 6/15/76. (2) Perform and report final results on creepdown tests 9/1/77. (3) Perform in-reactor creep tests FY 77-78.
KEYWORDS: FUEL CANS;ZIRCALOY;CREEP;FAILURES;STRESSES;PRESSURE DEPENDENCE;TEMPERATURE DEPENDENCE

<150046>
TITLE: Strength and Ductility of Irradiated Zircaloy
PROJECT NUMBER: A4068
PRINCIPAL INVESTIGATOR: Bauer, A.A.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Picklesimer, Marion L.
TELEPHONE: F427-4266
TYPE OF FUNDING: Contract No.-AT-49-24 0293 Task No. 5
77 FUNDING: Nuclear Regulatory Commission FY77:$400,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To provide a mechanical property data base on irradiated cladding that can be used to predict the performance of Zircaloy cladding under various off-normal, transient, and reactor accident conditions. Data will be obtained for development of strain-to-failure correlations when burnup is high and failure is probable by mechanical interaction with fuel at relatively low temperatures. Correlations will be obtained also between pressure, heating rate and temperature of failure under transient heating conditions.
APPROACH: Perform tensile, bend, expanding mandrel and transient heating burst tests on irradiated cladding.
RESULTS: (1) Annealing of radiation damage in both isothermal and transient heating tests has been determined by hardness measurements on one lot of material in scoping tests. (2) The master lot of irradiated

cladding has been obtained and preliminary for defects, crud, ridging, gamma scanning, etc. has been completed on several rods. (3) Design and construction of equipment for bend, expanding mandrel, and transient burst tests will be completed, and the equipment has been installed in the hot-cells. (4) Tensile, bend, expanding mandrel, and transient heating burst tests have been conducted on the master lot of material at several temperatures and data reported.
PROJECT MILESTONES: (1) Complete tests on lot 1, 12/31/77. (2) Complete tests on lot 2, 4/30/78. (3) Complete all property tests and provide verified correlation, 9/30/79.
KEYWORDS: FUEL CANS;ZIRCALOY;MECHANICAL PROPERTIES;STRAINS;FAILURES;CORRELATIONS;BURNUP;PRESSURE DEPENDENCE;TEMPERATURE DEPENDENCE;TRANSIENTS;REACTOR ACCIDENTS;FUEL-CLADDING INTERACTIONS;PHYSICAL RADIATION EFFECTS;DUCTILITY

<150047>
TITLE: Zirconium Metal-Water Oxidation Kinetics
PROJECT NUMBER: B0128
PRINCIPAL INVESTIGATOR: Cathcart, J.V.
ADDRESS: Post Office Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Picklesimer, Marion L.
TELEPHONE: F427-4266
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$290,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The purpose of this project is to provide highly reliable kinetic data pertaining to zircaloy metal water oxidation phenomena. This effort will provide additional information regarding cladding oxidation phenomena expected to occur in case of LOCA with resulting operation of ECCS. This research is primarily applicable to the LWR's that have zirconium alloys as cladding for nuclear fuel pins. The Zirconium-Water Oxidation Kinetics (ZMWOK) Program will supply information on reaction rates and diffusion required to predict the oxidation behavior of LWR fuel claddings during various temperature excursions postulated for LOCA's.
APPROACH: Perform experiments to determine transient oxidation and reaction rate behavior.
RESULTS: Measurements of oxygen diffusivity in beta Zircaloy between 900 and 1500 deg C have been completed using two different techniques. Thermometry Error Analysis, Modeling Analysis, and Diffusion of Oxygen in beta-Zircaloy Reports have been issued. Isothermal and transient temperature oxidation experiments are completed as are scoping experiments in the steam pressure effect study.
PROJECT MILESTONES: (1) Complete and issue final report on diffusion of oxygen in beta-Zircaloy 6/30/76. (2) Complete and issue final report on reaction rates and correlations 8/31/77.
KEYWORDS: PWR TYPE REACTORS;BWR TYPE REACTORS;LOSS OF COOLANT;ZIRCALOY;FUEL CANS;OXIDATION;VERY HIGH TEMPERATURE;KINETICS

<150049>
TITLE: Downcomer Effects Experimental Program
PROJECT NUMBER: A4070
PRINCIPAL INVESTIGATOR: Bloczk, J.A.
ADDRESS: Creare, Inc., Hanover, NH 03755
AFFILIATION: Creare, Inc., Hanover, N.H. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Serkiz, Aleck W.
TELEPHONE: F427-4370
TYPE OF FUNDING: Contract No.-AT(49-24)-0162
77 FUNDING: Nuclear Regulatory Commission FY77:$180,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To conduct experimental studies that investigate the steam-water interactions including ECC penetration, hot wall delay, and lower plenum voiding in 1/15 and 2/15 scale models of typical PWR's. FY 77 plans call for (1) obtaining correlations of penetration and entrainment data in 1/15- and 2/15-scale models of PWR's for model development; (2) investigate the scaling of these small scale data; (3) investigate the applicability of steady-state penetration and entrainment data to transient (steam flow) conditions; (4) provide lead-in information for experiments planned in larger scale systems; (5) develop correlation based models of penetrative and entrainment behavior and incorporate into the RELAP code; and (6) provide technical assistance to RSR (as requested) and participate in review group activities.
APPROACH: Experimental studies of ECC penetration and lower plenum voiding under steady-state conditions in a 1/15-scale steel vessel; ECC penetration and lower plenum voiding in a 2/15-scale vessel under steady-state conditions and transient (steam flow) conditions with and without hot walls; flow visualization studies in a transparent 1/15-scale vessel.
RESULTS: (1) Complete the fabrication and construction of a 2/15-scale vessel and attendant facility. 92) Extend the 1/15-scale transparent vessel studies to provide flow visualization movies of the various regions in which steam-water interactions occur. (3) Carry out penetration and entrainment studies in the 2/15-scale model to determine effect of system size, transient (steam flow) effects an hot wall effects.
PROJECT MILESTONES: (1) Complete the design and construction of 2/15-scale facility 1/7/77. (2) Complete 1/15-scale testing 12/7/76. (3) Complete shakedown testing of 2/15-scale facility 2/25/77. 94) Report results of 1/15-scale testing 6/22/77. (5) First round of 2/15-scale data 8/18/77.
KEYWORDS: DOWNCOMER PENETRATION;PWR TYPE REACTORS;REACTOR SAFETY;LOSS OF COOLANT;ECCS;PERFORMANCE;HYDRAULICS;LIQUID FLOW;MOCKUP;TESTING

<150050>
TITLE: Semiscale
PROJECT NUMBER: A6038
PRINCIPAL INVESTIGATOR: Olson, D.J.
ADDRESS: 550 Second Street, Idaho Falls, ID 83401
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Bixby, Willis W.
TELEPHONE: F427-4260
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Commission
77 FUNDING: Nuclear Regulatory Commission FY77:$5,350,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: DEVELOPMENT/Pilot plant (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Provide separate and integral effects experimental data for developing and/or verifying LOCA computational methods. (2) Provide data for (a) optimizing selection of LOFT test parameters, (b) assessing reliability of LOFT instrumentation, (c) evaluating LOFT test results and (d) addressing LOFT design compromises.
APPROACH: Perform the following series of loss of coolant accident experiments in a scaled non nuclear facility to generate system effects data for code verification. Group 1 Tests: To provide a data base for comparing isothermal blowdown performance of the Semiscale System and the LOFT system. Group 1 consisted of 6 tests. Group 2 Tests: To investigate the blowdown heat transfer characteristics of the Mod 1 core. Group 2 consisted of 9 tests. Group 3 Tests: To provide information on the reflood heat transfer characteristics of the Mod 1 system. Group 3 consisted of 12 tests. Group 4 Tests: To establish a data base for subsequent investigation of alternate ECC concepts. Group 4 consisted of 9 tests. Group 5 Tests: To establish the benefit of alternate ECCS injection locations. Group 5 consists of 9 tests. Group 6 Tests: To provide a data base for comparing integral test performance of the Semiscale Mod 1 system, with LOFT nuclear tests. Group 6 consists of 5 tests. Group 28 Tests: Special tests to investigate steam generator tube rupture and core power control. Group 28 consists of 4 tests.
RESULTS: (1) Group 4 Baseline ECC Test Series: (A) Complete Experimental Data Report (EDR) within 3 months after each test; and (B) Complete preparation of Test Results Report (TRR) within 6 months after completion of test group. (2) Group 5 Alternate ECC Test Series: (A) Complete Experimental Data Report (EDR) within 3 months after each test; and (B) Complete preparation of Test Results Report (TRR) within 6 months after completion of test group. (3) Group 6 LOFT Nuclear Supportive and Counterpart Tests: (A) Conduct 5 tests; and (B) Prepare: (a) Test predictions and quick look for each test, (b) Experimental Data Report (EDR) within 3 months after each test, and (c) Test Results Report (TRR) within 6 months after completion of test group of the LOFT supportive tests. (4) Group 28 Special Tests: (A) Conduct 9 tests; and (B) Prepare: (a) Test predictions and quick look report for each test, (b) Experimental Data Report within 3 months after each test, and (c) Test Results Report (TRR) within 6 months after completion of test group. (5) Complete Design, Fabrication and Assembly of: (A) Broken loop pump; and (B) Broken loop steam generator. (6) Initiate System Mods for 2-Loop Operation. (7) Initiate design procurement and fabrication of a 12' core with a typical PWR upper plenum to simulate and investigate the upper head injection concept of Westinghouse (Vessel and loop to be designated as MOD-3).
PROJECT MILESTONES: (1) Complete conversion to Mod 3 2/1/78. (2) Complete Baseline Test Series with Mod 3 8/1/78. (3) Complete UHI Test Series with Mod 3 2/1/79. (4) Complete Alternate EUS Test Series with Mod-2 (non UHI Upper Plenum) 4/8/80.
KEYWORDS: REFLOOD;PWR TYPE REACTORS;BWR TYPE REACTORS;LOSS OF COOLANT;BLOWDOWN;REACTOR SAFETY;HYDRAULICS;HEAT TRANSFER;TESTING;MOCKUP;ECCS

<150051>
TITLE: Class I Equipment Qualification Test Study
PROJECT NUMBER: A1051
PRINCIPAL INVESTIGATOR: Bonzon, L.
ADDRESS: Sandia Laboratories, P.O. Box 5800, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Feit, Ronald
TELEPHONE: F427-4272
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Commission
77 FUNDING: Nuclear Regulatory Commission FY77:$853,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory (50%);DEVELOPMENT/Laboratory scale (50%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) To develop a model that can be used to simulate the natural aging process by accelerated aging methods. (2) To determine the current qualification test environment based on RG 1.89. (3) To determine the sensitivity to changes in qualification test parameters including synergisms. (4) To determine adequate criteria to certify qualification tests.
APPROACH: (1) Based on recommendations made in a FY 76 state-of-the-art report, specific component aging models and test methods are being developed. (2) Currently utilized radiation source simulators are being evaluated as to their suitability to duplicate the required radiation source. Dose rate studies will be conducted and refinements made on source term calculations. (3) Qualification test facilities will be fabricated and validated and a determination made on the comparison of sequential and combined testing.
RESULTS: Mathematical models, test procedures, test equipment and test data.
PROJECT MILESTONES: (1) FY 76 Assessment of the state-of-the-art of aging models and identification of future research; completed definition of nuclear source term based on RG 1.89; preliminary test procedures and specimen test chamber for synergistic testing developed. (2) FY 77 Preliminary data to verify the adequacy of the aging models under development; nuclear source simulator evaluation completed and preliminary data on dose-rate and dose-depth studies; synergistic effects determined.
KEYWORDS: REACTOR COMPONENTS;SPECIFICATIONS;PERFORMANCE TESTING;WEATHERING;SIMULATORS;AGE DEPENDENCE;REACTOR SAFETY

<150052>
TITLE: Two-Phase Interactions in Countercurrent Flow
PROJECT NUMBER: B5804
PRINCIPAL INVESTIGATOR: Dukler, A.E.
ADDRESS: University of Houston, Houston, TX 77004
AFFILIATION: Houston Univ., Tex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Zuber, Novak
TELEPHONE: F427-4275
TYPE OF FUNDING: Contract No. AT(49-24)-0194
77 FUNDING: Nuclear Regulatory Commission FY77:$61,200
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Construct equipment suitable for determining the true mechanism for flooding and for evaluating the wave structure and interfacial interactions during upflow. (2) Measure wave structure and pressure characteristics during the flooding process. Determine definitive criteria for the onset of flooding. Evolve information on the flooding mechanism. Model the flooding process and develop suitable correlations based on the observed physical mechanism. (3) Measure the wave structure, interfacial shear and wave form drag during upflow conditions. Model the interfacial interactions between gas and liquid based on the physical mechanisms revealed by the experiments.
APPROACH: Develop experimental facility and measure wave structure and interfacial interactions during flooding and upflow.
RESULTS: (1) Flooding measurements have been completed and two mechanisms of flooding have been determined. (2) Film flow measurements over the flooding range have been completed.
PROJECT MILESTONES: (1) Equipment: (A) Assemble and test laser system for measurements of lateral motion of large drops 6/15/77; and (B) Various methods for penetrating liquid film at will will be explored in order to prevent distortion of laser beam. (2) Film Flow and Flooding: (A) Complete film for measurements 4/1/77; (B) Develop model for momentum interaction at interface; (C) Develop model for flooding 9/1/77; and (D) Issue report 9/30/77. (3) Lateral Motion of Droplets: Obtain preliminary measurements on the lateral motion of large drops in concurrent and countercurrent flow 9/1/77.
KEYWORDS: FLOODING;UPFLOW;WAVE STRUCTURE;BWR TYPE REACTORS;PWR TYPE REACTORS;ECCS;LIQUID FLOW;REACTOR SAFETY;LOSS OF COOLANT;TWO-PHASE FLOW

<150056>
TITLE: Steam-Water Mixing and System Hydrodynamics Program
PROJECT NUMBER: A4048
PRINCIPAL INVESTIGATOR: Carbiener, W.A.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Serkiz, Aleck W.
TELEPHONE: F427-4370
TYPE OF FUNDING: Contract No.-AT(49-24)-0293
77 FUNDING: Nuclear Regulatory Commission FY77:$710,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Freshwater;GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To conduct experimental studies which investigate the steam-water interactions, including ECC penetration and sweepout, in 1/15 and 2/15-scale models of typical PWR's.
APPROACH: Experimental studies of penetration and entrainment will be carried out in the 2/15-scale model to provide data and information on the effect of system size on penetration to evaluate whether the parametric behavior observed in the 1/15-scale model carries over to the 2/15-scale model, to determine whether steady-state penetration and entrainment data can be used to predict the behavior under transient (ramped steam) conditions, and to evaluate the effects of hot walls in a larger size system.
RESULTS: The data and results of these studies will be used in the development of correlations for use in best estimate model development. FY-76T and -77 plans include the following: (1) obtain correlations of penetration and entrainment data for 1/15- and 2/15-scale models of four-loop PWR's for use in model development; (2) investigate the scale-up of these small-scale data; (3) investigate the applicability of steady-state penetration and entrainment data to transient (ramped steam flow) conditions; (4) provide lead-in information to experiments planned in larger size systems; and (5) develop correlation-based models of penetration and entrainment behavior, incorporate these and other similar existing models into the RELAP code, and test the ability of the models to predict the penetration and entrainment behavior in the existing 1/15- and 2/15-scale model systems.
PROJECT MILESTONES: (1) Report results of initial 60 psig tests 5/15/76. (2) Complete 1'' annulus tests 7/15/76. (3) Extend ECC-penetration test results 11/30/76.
KEYWORDS: PWR TYPE REACTORS;ECCS;PERFORMANCE;REACTOR SAFETY;CONFIGURATION;HYDRAULICS;TWO-PHASE FLOW;MOCKUP;ENTRAINMENT;FUNCTIONAL MODELS

<150058>
TITLE: Containment Analysis Development (BWR Pool Dynamics)
PROJECT NUMBER: A0116
PRINCIPAL INVESTIGATOR: Edward, L.E.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Slegers, Leonard
TELEPHONE: F427-4275
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$400,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)

RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop the best estimate code for PWR and BWR Containment Analysis.
APPROACH: Adapt existing computer codes to model the pool dynamics in the containment system of a boiling water reactor.
RESULTS: (1) To explore the applicability of existing computer programs to the problem of air/steam venting in BWR suppression pools. (2) To obtain a 2-dimensional numerical solution for the discharge of a single relief valve vent in a BWR suppression pool. (3) Extend the relief valve vent solution to account for flexible (finite modulus) pool walls.
PROJECT MILESTONES: (1) Adapt configuration and multiphase models to CHAMP-II 3/30/77. (2) Document CHAMP-II 9/30/77.
KEYWORDS: POOL DYNAMICS;VENTING;BWR TYPE REACTORS;CONTAINMENT SYSTEMS;PRESSURE SUPPRESSION;COMPUTER CODES;REACTOR SAFETY

<150059>
TITLE: Pressure Suppressing Test and Analysis
PROJECT NUMBER: A0118
PRINCIPAL INVESTIGATOR: Karpenko, V.N.
ADDRESS: P.O. Box 808, Livermore, CA 94550
AFFILIATION: California Univ., Livermore (USA). Lawrence Livermore Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Slegers, Leonard
TELEPHONE: F427-4275
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$940,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To obtain experimental data on the BWR MARK-1 Torus Suppression Chamber for model verification and licensing.
APPROACH: Build a partial section of a torus of a boiling water reactor (BWR) and perform air and steam tests to determine extent of pressure suppression loading.
RESULTS: Complete facility construction, procure instrumentation and components and conduct tests to improve understanding of BWR torus suppression chamber under LOCA conditions.
PROJECT MILESTONES: (1) Complete air tests 1/13/77. (2) Complete steam tests 4/14/77. (3) Prepare and issue final report 5/13/77.
KEYWORDS: BWR TYPE REACTORS;CONTAINMENT SHELLS;LOSS OF COOLANT;STRESSES;PRESSURE SUPPRESSION;REACTOR SAFETY

<150061>
TITLE: Full Length Emergency Cooling Heat Transfer: Systems Effects Test (FLECHT-SET)
PROJECT NUMBER: A4071
PRINCIPAL INVESTIGATOR: Suda, A.
ADDRESS: Westinghouse Electric Corp., P.O. Box 555, Pittsburgh, PA 15230
AFFILIATION: Westinghouse Electric Corp., Pittsburgh, Pa. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Davidson, E.H.
TELEPHONE: F427-4260
TYPE OF FUNDING: Contract No.-AT(49-24)-0178
77 FUNDING: Nuclear Regulatory Commission FY77:$360,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To provide experimental data on ECC behavior during the reflood phase of a LOCA, for use in the improvement and development of PWR reflood models. Objectives of the forced flooding experiments are to provide heat transfer coefficients and entrainment data at low flooding rates.
APPROACH: Conduct reflood tests on an electrically heated mockup of a portion of a pressurized water reactor fuel bundle.
RESULTS: Complete testing with axial cosine bundle. Consolidate results of cosine bundle tests and associated analysis and prepare reports. Perform forced flooding rate tests with top skewed bundle.
PROJECT MILESTONES: Complete top skew testing 2/23/77.
KEYWORDS: PWR TYPE REACTORS;ECCS;PERFORMANCE TESTING;PERFORMANCE;LOSS OF COOLANT;SIMULATION;HEAT TRANSFER;FLOODS

<150062>
TITLE: INEL Technical Support to NRC for Industry Cooperative Programs
PROJECT NUMBER: A6039
PRINCIPAL INVESTIGATOR: Rice, R.E.
ADDRESS: 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: Aerojet Nuclear Co., Idaho Falls, Idaho (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Davidson, E.H.
TELEPHONE: F427-4260
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Commission (NRC)
77 FUNDING: Nuclear Regulatory Commission FY77:$450,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The primary role of Idaho Nuclear Engineering Lab. (INEL) as technical advisor to the NRC Industry Cooperative Programs is to ensure that the data from these programs are adequate for verification of analytical models for predicting reactor system response to a LOCA. In this role, INEL will provide support for the BWR-BDHT and reflood separate effects test programs. In addition, INEL will assist in defining experimental requirements for future test programs as they are conceived.
APPROACH: Independent analysis of information produced by industry under contract to NRC, including technical audits of plans, designs, data and reports.

RESULTS: (1) Will complete reviews of PWR-BDHT, FLECHT-SET, BWR-BD/ECC program documentation, models and test data. (2) Will begin analyses of BWR LOCA response and relate to performance of TLTA to assess typicality and scaling adequacy. (3) Will complete predictions of selected BWR-BD/ECC and PWR-BDHT experiments. (4) Will conduct comparisons of RELAP4 calculations with selected data from PWR-BDHT, BWR-BD/ECC, FLECHT-SET and other test programs. (5) Will perform various code application tasks as specified by NRC.
PROJECT MILESTONES: (1) Complete RELAP-4 BWR-6 model, issue letter report 8/8/77. (2) Issue letter report on FLECHT Data Comparisons with MOD 6 12/8/77. (3) Issue letter report on selected TLTA 848 BD/ECC predictions 12/31/77.
KEYWORDS: BWR TYPE REACTORS;LOSS OF COOLANT;BLOWDOWN;HEAT TRANSFER;HYDRAULICS;MATHEMATICAL MODELS;COMPUTER CODES;REACTOR SAFETY;COMPARATIVE EVALUATIONS;RELIABILITY

<150063>
TITLE: Pressurized Water Reactor Blowdown Heat Transfer Program
PROJECT NUMBER: B0125
PRINCIPAL INVESTIGATOR: Thomas, D.G.
ADDRESS: P.O. Box Y, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Davidson, E.H.
TELEPHONE: F427-4260
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$3,500,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To determine time to CHF and heat transfer rates during pre- and post-CHF phases of blowdown as influenced by variation in power, system pressure, coolant flow, and break location.
APPROACH: Conduct blowdown tests in a non-nuclear facility using an electrically heated bundle of rods designed to simulate a portion of a pressurized water reactor (PWR) fuel bundle.
RESULTS: Complete operations with first 49-rod bundle in THTF. Begin procurement for the 64 rod bundle. Make pretest predictions for selected THTF blowdowns using RELAP4. Refine means for obtaining dispersed flow in THTF spool pieces. Examine extrapolation of low pressure two-phase flow calibrations to high pressure conditions. Develop alternate methods for two-phase flow measurement. Continue single rod BDHT tests to assess heaters and instrumentation. Complete second phase of error analysis of THTF instrumentation.
PROJECT MILESTONES: (1) Complete second test series (inactive rod and separate effect studies) 10/30/77. (2) Complete third test series (power decay studies) 7/30/78.
KEYWORDS: PWR TYPE REACTORS;BLOWDOWN;HEAT TRANSFER;CRITICAL HEAT FLUX;RESEARCH PROGRAMS;HYDRAULICS;FUEL ELEMENT CLUSTERS;FUEL-COOLANT INTERACTIONS;LOSS OF COOLANT;REACTOR SAFETY;AFTER-HEAT REMOVAL

<150064>
TITLE: Boiling Water Reactor (BWR), Blowdown Heat Transfer (BD) and Emergency Core Cooling Studies (ECC)
PROJECT NUMBER: B3014
PRINCIPAL INVESTIGATOR: Burnette, G.
ADDRESS: General Electric Co., 175 Curtner Ave., San Jose, CA 95125
AFFILIATION: General Electric Co., San Jose, Calif. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Davidson, E.H.
TELEPHONE: F427-4260
TYPE OF FUNDING: Contract No.-AT(49-24)-0215
77 FUNDING: Nuclear Regulatory Commission FY77:$731,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To study LOCA in the area of heat transfer from nuclear fuel to fluid during blowdown and ECC injection. These are non-nuclear tests using electrically heated fuel simulators. Investigations will be extended into blowdown/ECC integral testing with the objective of providing data to characterize interaction of ECC with the blowdown phenomena. These are scaled systems tests in which separate effects are studied. The purposes of the RPRI/NRC/GE integral Blowdown/Emergency Core Cooling, BD/ECC, test program are: (1) Obtain and evaluate basic BD/ECC data from test system configurations which have calculated performance characteristics similar to a BWR with 8 x 8 fuel bundles during a hypothetical LOCA. (2) Determine the degree to which models for BWR system and fuel bundles describe the observed phenomena, and as necessary, develop improved models which are generally useful in improved LOCA analysis methods.
APPROACH: Perform non-nuclear experiments on phenomena related to a postulated boiling water reactor loss-of-coolant accident.
RESULTS: Test Series Designations A: 8 x 8 BDHT without ECC Interaction; B: Early BD/ECC Spray Interaction; C: Intermediate Pressure BD/ECC, with Spray and Flooding; D: Early BD/ECC Spray Interaction, Skewed Axial Power; E: Early BD/ECC Spray Interaction, Alternate BD Configuration.
PROJECT MILESTONES: (1) Issue topical report on Test Series A 12/20/77. (2) Issue topical report on Test Series B 11/30/78. (3) Issue topical report on Test Series C 2/25/80. (4) Issue topical report on Test Series D 8/31/80. (5) Issue topical report on Test Series E 2/28/81.
KEYWORDS: BWR TYPE REACTORS;BLOWDOWN;HEAT TRANSFER;ECCS;PERFORMANCE;SIMULATION;LOSS OF COOLANT

<150065>
TITLE: Loss of Fluid Test (LOFT)
PROJECT NUMBER: A6048
PRINCIPAL INVESTIGATOR: Burge, L.F.
ADDRESS: 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: Aerojet Nuclear Co., Idaho Falls, Idaho (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: McPherson, G.D.
TELEPHONE: F427-4260
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm.
77 FUNDING: Nuclear Regulatory Commission FY77:$11,956,000; Energy Research and Development Administration

FY77:$19,200,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To model PWR features, to simulate reactor system transient responses to Loss of Coolant Accidents (DBA), to develop measurements to validate and improve analytical predictive codes, used for engineered safety features performance.
APPROACH: Conduct a series of nonnuclear loss-of-coolant experiments in a scaled pressurized water reactor (PWR) facility then load a nuclear core and conduct a series of nuclear loss-of-coolant experiments to provide complete systems effects tests of the hypothetical loss-of-coolant accident and operation of the emergency core cooling systems.
RESULTS: Data to verify and develop LOCA codes. Understanding of PWR behavior during wide variety of postulated accidents.
PROJECT MILESTONES: (1) 1977 Conduct fifth non-nuclear LOCE (LI-4, on May 3). Begin to load core, Sept. (2) 1978 Precriticality tests. Criticality and zero power tests. Conduct final non-nuclear test, LI-5. Requalify core. Conduct power range tests.
KEYWORDS: PWR TYPE REACTORS;LOFT REACTOR;LOSS OF COOLANT;SIMULATION;REACTOR OPERATION;ECCS

<150066>
TITLE: LOCA Analysis Verification
PROJECT NUMBER: A6047
PRINCIPAL INVESTIGATOR: Rice, R.E.
ADDRESS: 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: SEE CODE- 9502158 EG and G Idaho, Inc., Idaho Falls (USA). Idaho National Engineering Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Solberg, Donald E.
TELEPHONE: F427-4275
TYPE OF FUNDING: Interagency agreement-U.S. Nuclear Regulatory Comm. (NRC)
77 FUNDING: Nuclear Regulatory Commission FY77:$745,500
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The purpose of this activity is to provide verified analytical models for predicting the system response of BWR and PWR power plants to a Loss-of-Coolant Accident (LOCA). This is accomplished by establishing the requirements for analytical model development and supporting experiments, and by comparing model predictions with data in order to assess the uncertainty bands of the model predictions. Experiments of concern are: the LOFT Program, Semiscale Program, Plenum Filling Experiment, Industrial Cooperative Programs, and other domestic or foreign programs furnishing data related to analyses of the LOCA.
APPROACH: Verify computer models through comparison with experiments.
RESULTS: (A) Developmental Verification: (1) RELAP4 Mod 6 analysis results were compared with the following data: (a) FLECHT run 0085, (b) FLECHT-SET run 3105B, (c) Semiscale runs S-03-2, S-03-6 and S-02-9; (2) Checkout runs made for RELAP4 Mod 6 were: (a) PWR reflood response, (b) metal/water reaction study, and (c) oscillation study; and (3) RELAP4 Mod 7 analysis results were compared with the following data: (a) BWR-FLECHT runs with top, bottom, and combined top and bottom ECC injection, (b) GE proprietary hot and cold bundle tests, and (c) a TLTA test. (B) Independent Verification: (1) RELAP4 Mod 6 analysis results were compared with the following data: (a) pressurizer blowdown data from Semiscale and LOFT isothermal tests, (b) steam generator blowdown data from LOFT and Semiscale isothermal tests, (c) LOFT system blowdown test L1-4 as best estimate analysis of NRC Standard Problem 7 (also performed with RELAP4 Mod 5), and (d) PKL reflood tests K-5A and K-7A; and (2) RELAP4 Mod 6 analyses for comparison with data in progress are: (a) core responses in Semiscale and ONRL PWR-BDHT data, (b) system blowdown and reflood response in a Semiscale integral test, (c) core reflood response in Semiscale and FLECHT, for both forced feed and gravity feed ECC, and (d) isothermal system blowdown response in Semiscale and LOFT.
PROJECT MILESTONES: Project milestones under reevaluation.
KEYWORDS: VERIFICATION;BWR TYPE REACTORS;PWR TYPE REACTORS;LOSS OF COOLANT;MATHEMATICAL MODELS;COMPUTER CODES;R CODES;REACTOR SAFETY

<150068>
TITLE: Seismotectonics of New Madrid Area
PROJECT NUMBER: B5969
PRINCIPAL INVESTIGATOR: Kolata, D.
ADDRESS: Illinois State Geological Survey, 121 Natural Resources Building, Urbana, IL 61801
AFFILIATION: Illinois State Geological Survey, Urbana (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Safeguards, Fuel Cycle and Environmental Research
MONITOR: Steuer, Neil B.
TELEPHONE: F427-4376
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$24,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Licensees, the NRC and the public differ in their assessment of the locations of the boundary of the New Madrid earthquake zone. New Madrid, Missouri, is the approximate location of the epicenters of the most severe earthquakes in recorded U.S. history. This earthquake potential affects parts of Illinois, Indiana, Kentucky, Tennessee, Missouri and Arkansas. The potential earthquake effects have significant impact on the design, siting and construction of nuclear power facilities in the region. Consequently, the issues are: (1) should the earthquake zone be confined to an area within about 100 miles of New Madrid, Missouri, or (2) does it cover an area within about 200 miles of New Madrid.
APPROACH: (1) Develop a detailed map of the vertical component of the earth's magnetic field in the Johnson County Area, Illinois. (2) Develop detailed profiles of the vertical component of the earth's magnetic field across known and suspected faults in the Johnson County Area, Illinois. (3) Develop a catalog of magnetic susceptibilities of rock types in and around the study area.
RESULTS: A detailed study of the structural framework of the Mississippi embayment of Southern Illinois. The

purpose of this relatively rapid and inexpensive study is to provide much-needed information concerning the structural fabric, depth to basement, and lithologic changes in the basement of this structural transition area. It is hoped that this type of high resolution survey will also provide a means of delineating possible igneous intrusives and faulting in the sedimentary rocks.
KEYWORDS: EARTHQUAKES;MISSOURI;SEISMOLOGY;TECTONICS;MAGNETIC FIELDS;ILLINOIS;INDIANA;KENTUCKY;TENNESSEE;ARKANSAS;NUCLEAR POWER PLANTS;SITE SELECTION;DESIGN;SEISMIC EFFECTS;ROCKS;GEOLOGY;SEDIMENTARY ROCKS;MAGNETIC SURVEYS;GEOLOGIC FAULTS

<150069>
TITLE: Seismotectonics of New Madrid Area
PROJECT NUMBER: B5971
PRINCIPAL INVESTIGATOR: Hinze, W.J.
ADDRESS: Purdue University, Prof. of Geophysics, W. Lafayette, IN 47907
AFFILIATION: Purdue Univ., Lafayette, Ind. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Safeguards, Fuel Cycle and Environmental Research
MONITOR: Steuer, Neil B.
TELEPHONE: P427-4376
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$100,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Licensees, the NRC and the public differ in their assessment of the location of the boundary of the New Madrid earthquake zone. New Madrid, Missouri, is the approximate location of the epicenters of the most severe earthquakes in recorded U.S. history. This earthquake potential affects parts of Illinois, Indiana, Kentucky, Tennessee, Missouri and Arkansas. The potential earthquake effects have significant impact on the design, siting and construction of nuclear power facilities in the region. Consequently, the issues are: (1) should the earthquake zone be confined to an area within 100 miles of New Madrid, Missouri, or (2) does it cover an area within about 200 miles of New Madrid.
APPROACH: A study area bounded by 85 degress West and 90 degrees West longitude and 36.5 degrees North and 39 degrees North latitude is proposed for which gravity and aeromagnetic data will be compiled, filled in with new observations where necessary, and interpreted. Also, a series of seismic refraction profiles will be recorded in order to delineate crustal structure variations associated with the 38th Parallel Lineament and the NMFZ. Basement geology and geochronology will also be investigated along with surficial and sedimentary geological relationships.
RESULTS: The scope of the proposed project to accomplish an integrated geological and geophysical study of the 38th Parallel Lineament and its intersection with the New Madrid Fault Zone (NMFZ) and to deduce the subsurface structural relationships and tectonic evolution of the region. We propose to concentrate our efforts in Phase One to preparation of a total magnetic intensity map of a portion of southeastern Illinois and an interpretation of this map with the available magnetic data in adjacent Indiana.
KEYWORDS: SEISMOLOGY;TECTONICS;EARTHQUAKES;MISSOURI;ILLINOIS;KENTUCKY;TENNESSEE;ARKANSAS;NUCLEAR POWER PLANTS;GEOLOGY;SITE SELECTION;DESIGN;SEISMIC EFFECTS;GEOLOGIC FAULTS

<150070>
TITLE: Seismotectonics of the Nemaha Uplift Area
PROJECT NUMBER: B5967
PRINCIPAL INVESTIGATOR: Luza, K.
ADDRESS: Oklahoma Geological Survey, 830 Van Vleet Oval Rm. 163, Norman, OK 73069
AFFILIATION: Oklahoma Geological Survey, Norman (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Safeguards, Fuel Cycle and Environmental Research
MONITOR: Steuer, Neil B.
TELEPHONE: P427-4376
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$78,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Two operating and four proposed nuclear power plants are located in Nebraska, Kansas, and Oklahoma. Three more are planned. All are within or adjacent to seismic risk zones having had earthquakes resulting in moderate damage. The historical record of seismicity is inadequate in areas of the Midcontinent. Thus delineation of tectonic provinces based regional geologic structure and associated seismicity is required. Delineation of tectonic provinces which accurately reflect the potential magnitude of seismic events is an important cost and risk factor in assigning design criteria for nuclear power plants. Earthquakes ascribed to crustal adjustment have occurred along the Nemaha Uplift. Little is known about the relationships of the Nemaha structure to the earthquakes. This project will be part of a larger study effort to investigate their possible relation.
APPROACH: (1) Delineate the Nemaha Uplift and associated structures. (2) Investigate the relationships between the Nemaha Uplift and the Keweenawan Mafic Belt. (3) Assign realistic values for maximum seismic magnitude in the region. Final results will be a series of maps, tables and explanatory text. These will outline the relative seismicity in the study area and attempt to correlate it with tectonic features known from surficial and subsurface geological and geophysical evidence.
RESULTS: The Oklahoma, Kansas and Nebraska Geological Surveys will study the regional tectonic framework and establish seismicity levels for the area of the Nemaha Uplift and its related structures. The principal goal is to provide fundamental data for design of nuclear installations and risk evaluation in nuclear power plant siting. A determination will be made as to whether this area can be separated from other tectonic components in the midcontinent region on the basis of its seismicity and geologic structure. A seismic network will be established in the area of the Nemaha Uplift. More detailed (limited) gravity and aeromagnetic studies will be performed, concentrating on Nemaha Uplift, to either augment existing information or fill in critical areas where information is lacking. In addition to the geophysical and seismological data, geologic and structural data will be compiled by the Kansas and Nebraska Geological

Surveys and forwarded to the Oklahoma Geological Survey where it will be correlated with that collected in Oklahcma. Current data will be added to that presently available and historic records, and all will be compiled on final maps. Interim results of the project will be maps to be produced by each State Survey on a scale of 1:500,000. The final maps will be on a scale of 1:1,000,000. They will be accompanied by explanatory text and a description of the data collection process. The
KEYWORDS: NUCLEAR POWER PLANTS;SITE SELECTION;NEBRASKA;KANSAS;OKLAHOMA;GEOLOGICAL SURVEYS;SEISMOLOGY;EARTHQUAKES;GEOLOGIC STRUCTURES;REGIONAL ANALYSIS

<150071>
TITLE: Seismotectonics of New Madrid Area, St. Louis University
PROJECT NUMBER: B5964
PRINCIPAL INVESTIGATOR: Herrmann, R.
ADDRESS: St. Louis University, Department of Earth and Atmospheric Sciences, P.O. Box 8099, Laclede Station, St Louis, MO 63156
AFFILIATION: Saint Louis Univ., Mo. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Safeguards, Fuel Cycle and Environmental Research
MONITOR: Steuer, Neil B.
TELEPHONE: P427-4376
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$90,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Licensees, the NRC and the public differ in their assessment of the location of the boundary of the New Madrid earthquake zone. New Madrid, Missouri, is the approximate location of the epicenters of the most severe earthquakes in recorded U.S. history. This earthquake potential affects parts of Illinois, Indiana, Kentucky, Tennessee, Missouri and Arkansas. The potential earthquake effects have significant impact on the design, siting and construction of nuclear power facilities in the region. Consequently, the issues are: (1) should the earthquake zone be confined to an area within about 100 miles of New Madrid, Missouri, or (2) does it cover an area within about 200 miles of New Madrid.
APPROACH: Undertake seismic studies to provide data which will help to accurately delineate the boundary of the New Madrid earthquake zone and contiguous tectonic provinces; and to study and identify the structure and tectonics of the New Madrid area.
RESULTS: Install and operate a 16 station seismic network between Cairo, IL and Vincennes, IN will result in a seismological program that will contribute information directly bearing on past, current and future seismic conditions of the area within a 200 mile circle around New Madrid, Missouri.
KEYWORDS: EARTHQUAKES;MISSOURI;SITE SELECTION;SEISMIC EFFECTS;NUCLEAR POWER PLANTS;DATA;SEISMOLOGY;TECTONICS;GEOLOGIC FAULTS

<150072>
TITLE: Seismotectonics of the Nemaha Uplift, Nebraska
PROJECT NUMBER: B5774
PRINCIPAL INVESTIGATOR: Burchett, R.
ADDRESS: Conservation and Survey Division, University of Nebraska, Lincoln, NB 68508
AFFILIATION: Nebraska Univ., Lincoln (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Safeguards, Fuel Cycle and Environmental Research
MONITOR: Steuer, N.B.
TELEPHONE: P427-4376
TYPE OF FUNDING: Contract No.;Interagency agreement-NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$85,000
TECHNOLOGY: NUCLEAR/General (80%);GENERAL SCIENCE (20%)
ENERGY CYCLE: STORAGE (30%);ELECTRICITY GENERATION (40%);WASTE MANAGEMENT (30%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: At present there are two operating and four proposed nuclear power plants in Nebraska, Kansas, and Oklahoma. More are considered for this area. All existing and proposed plants are within or adjacent to an area having had earthquakes with resulting moderate damage. Existing historical record of seismicity is inadequate in the midcontinent. This has made it necessary to rely on the delineation of major tectonic and associated seismicity. The delineation of tectonic provinces which accurately reflect the potential magnitude of seismic events is an important cost and risk factor in assigning appropriate design criteria for nuclear power plants. Many earthquakes have occurred along the Nemaha Uplift. This project will be a part of a larger study to delineate tectonic provinces, identify earthquake mechanisms and relate them to structures.
APPROACH: Synthesize existing data and complete current studies for the east-central and southeastern portion of Nebraska during the initial year. Proposed products include the following maps at a scale of 1:500,000; (1) precambrian configuration; (2) aeromagnetic; (3) Bouguer gravity; (4) surface lineations; (5) bedrock geolcgy; (6) earthquake epicenter and intensity; (7) precambrian rock type; and (8) structural contour-base Kansas City (Pennsylvanian). All of these maps and possibly other maps and other areas will be reccmpiled and coordinated with adjoining areas at the completion of the total period of study.
RESULTS: During the initial year, sites for detailed investigation will be identified. Portions of these studies will be carried out in cooperation with adjoining states. These site studies will include detailed geophysical studies, laboratory analysis, age-dating of recent rock movement and core programs.
KEYWORDS: SEISMOLOGY;SEISMIC EFFECTS;EARTHQUAKES;NEBRASKA;KANSAS;OKLAHOMA;NUCLEAR POWER PLANTS;SITE SELECTION;TECTONICS;DATA;GEOPHYSICS;GEOLOGY

<150075>
TITLE: Seismotectonics of New Madrid Area
PROJECT NUMBER: B5960
PRINCIPAL INVESTIGATOR: Stearns, R.G.
ADDRESS: Vanderbilt University, Geology Dept., Nashville, TN 37235
AFFILIATION: Vanderbilt Univ., Nashville, Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Safeguards, Fuel Cycle and Environmental Research
MONITOR: Steuer, Neil B.
TELEPHONE: F427-4376
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$70,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory;RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Midwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Licensees, the NRC and the public differ in their assessment of the location of the boundary of the New Madrid earthquake zone. New Madrid, Missouri, is the approximate location of the epicenters of the most severe earthquakes in recorded U.S. history. This earthquake potential affects parts of Illinois, Indiana, Kentucky, Tennessee, Missouri, and Arkansas. The potential earthquake effects have significant impact on the design, siting and construction of nuclear power facilities in the region. Consequently, the issues are: (1) should the earthquake zone be confined to an area within about 100 miles of New Madrid, Missouri; (2) does it cover an area within about 200 miles of New Madrid; and (3) can the earthquakes be related to specific structures.
APPROACH: Undertake geologic studies to accurately locate capable faults in the New Madrid earthquake zone and contiguous tectonic provinces; and to study and identify the structure and tectonics of the New Madrid area.
RESULTS: Conduct geological examination of pre-selected sites that will contribute information directly bearing on past, current and future seismic conditions of the area with a 200 mile circle around New Madrid, Missouri.
KEYWORDS: EARTHQUAKES;SEISMOLOGY;TECTONICS;MISSOURI;ILLINOIS;INDIANA;KENTUCKY;TENNESSEE;ARKANSAS;NUCLEAR POWER PLANTS;SEISMIC EFFECTS;GEOLOGY;SITE SELECTION;DESIGN;GEOLOGIC FAULTS

<150076>
TITLE: Soil Dynamic Behavior
PROJECT NUMBER: B3015
PRINCIPAL INVESTIGATOR: Miller, R.
ADDRESS: Seattle, WA
AFFILIATION: Shannon and Wilson, Inc., Seattle, Wash. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry
TELEPHONE: F427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$625,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING
PROJECT DESCRIPTION: (1) Continue investigations to develop in situ shear modulus method. (2) Conduct field tests to determine materials properties at sites of strong-motion accelerographs. (3) Prepare guideline document for investigation of soil response to earthquake motions at power plant sites (completed). (4) Prepare summary of liquefaction experiments (completed).
KEYWORDS: SOILS;SHEAR PROPERTIES;EARTHQUAKES;NUCLEAR POWER PLANTS;GROUND MOTION;SITE SELECTION;SOILS;SOIL MECHANICS

<150078>
TITLE: Cost/Benefit Analysis of Underground Reactor Siting
PROJECT NUMBER: A1027
PRINCIPAL INVESTIGATOR: Milloy, J.
ADDRESS: P.O. Box 5800, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry
TELEPHONE: F427-4370
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Nuclear Regulatory Commission FY77:$75,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To evaluate advantages and disadvantages of underground siting in terms of safety benefits and safety and economic costs.
APPROACH: (1) Complete characterization of siting concepts. (2) Extend calculations of seismic response to include analysis of conditions without a pressure-resistant liner. (3) Evaluate effectiveness of gravity feed and convective circulation for emergency cooling conditions. (4) Complete characterization of potential benefits of USG. (5) Initiate subcontract for groundwater contamination calculations. (6) Initiate subcontract to assist in quantification of benefits and penalties. (7) Complete characterization of potential penalties of USG. (8) Prepare final report on items above with analysis of optimal and reference siting concepts (completes project).
KEYWORDS: COST BENEFIT ANALYSIS;SITE SELECTION;UNDERGROUND NUCLEAR STATIONS;SAFETY;ECONOMICS;COOLING;GROUND WATER;CONTAMINATION;REACTOR SAFETY

<150079>
TITLE: Earthquake Prediction
PROJECT NUMBER: B3017
PRINCIPAL INVESTIGATOR: Whitcomb, J.
ADDRESS: Pasadena, CA 91106
AFFILIATION: California Inst. of Tech., Pasadena (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry
TELEPHONE: P427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$39,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) Perform research to observe, monitor, and interpret geophysical phenomena, the changes in value of which may be premonitory to the occurrence of earthquakes. (2) Establish and maintain a communications link between the San Onofre station and Pasadena, California, to provide recording of signals from the station at the California Institute of Technology. (3) Provide the necessary professional and technical support for collecting, recording, analyzing, and interpreting the data acquired, in conjunction with data from other network stations, and in accordance with the purposes of Item 1 above.
RESULTS: A collection of analyzed data on geophysical phenomena, amenable to relate to earthquake occurrences.
KEYWORDS: EARTHQUAKES;GEOPHYSICS;MONITORING;CALIFORNIA;DATA ACQUISITION;DATA ANALYSIS;SEISMOLOGY;REACTORS

<150081>
TITLE: Design Criteria for Piping and Nozzles
PROJECT NUMBER: B0123
PRINCIPAL INVESTIGATOR: Moore, S.E.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Lynn, E.K.
TELEPHONE: P427-4262
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Nuclear Regulatory Commission FY77:$35,000
TECHNOLOGY: NUCLEAR/Fission (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To conduct integrated experimental and analytical studies for the development and verification of structural analysis methods for single and multiple nozzle-to-pressure vessel attachments, and for piping systems. To develop design rules and data for codes and standards use.
APPROACH: Experimental pressure tests of vessels and nozzle attachments, as well as pipe sections, including cyclic tests and an analytic parameter study.
RESULTS: Design rules, flexibility factors, and backup information for isolated and closely-spaced nozzles in pressure vessels and for piping system components will continue to be developed for use in codes and standards, and for use in specifying dimensional controls. Eight backup data and interpretive reports including a dimensional study of piping components drafted in prior years will be completed and published. Operational status and checkout of existing finite-element computer program the analysis of isolated nozzles attached to cylindrical shells and for piping tees and branch connections will be completed, and a limited parameter study of approximately 20 isolated nozzle models loaded with internal pressure will be conducted. Finite-element analyses will also be conducted for two cylindrical pressure vessel models, each with two closely-spaced nozzles under internal pressure loading. Planning will be started for the study of three closely-spaced nozzles in cylindrical pressure vessels. A report will be prepared summarizing available information and data obtained through the PVRC on limit loads for branch connections and nozzles attached to cylindrical shells. An analytical parameter study on the effect of end restraint on piping elbows will be completed, and stress indices and flexibility factors to account for these end effects will be developed. A cyclic internal pressure
PROJECT MILESTONES: RPV = Reactor Pressure Vessel. (1) Document computer code for two closely-spaced RPV nozzles-internal pressure 9/15/77. (2) Document computer code for three closely-spaced RPV nozzles-internal pressure 12/31/77. (3) Complete parameter study and design rules for closely-spaced RPV nozzles 6/30/78.
KEYWORDS: PIPES;NOZZLES;PRESSURE VESSELS;DESIGN;TESTING;STANDARDS

<150082>
TITLE: Halden Fuel Irradiation Program
PROJECT NUMBER: B5531
PRINCIPAL INVESTIGATOR: Vik, T.
ADDRESS: P.O. Box 173, N-1751, Halden, NO
AFFILIATION: Institutt for Atomenergi, Halden (Norway). OECD Halden Reaktor Prosjekt
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Johnston, William V.
TELEPHONE: P427-4266
TYPE OF FUNDING: Contract No.-AT(49-24)-1001
77 FUNDING: Nuclear Regulatory Commission FY77:$300,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To obtain data on reactor fuel rod performance under normal reactor conditions and mild power transients.

APPROACH: Place instrumented assemblies of fuel rods in the Halden (Norway) reactor.
RESULTS: Information on gap conductance, stored energy, gas release, fuel behavior, and fuel/cladding interactions.
KEYWORDS: HBWR REACTOR;REACTOR OPERATION;FUEL ELEMENTS;PERFORMANCE TESTING;IRRADIATION;IRRADIATION CAPSULES;HEAT TRANSFER;FISSION PRODUCT RELEASE;FUEL-CLADDING INTERACTIONS;NUCLEAR FUELS

<150084>
TITLE: Crack Arrest Study
PROJECT NUMBER: A4046
PRINCIPAL INVESTIGATOR. Hahn, G.T.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Lynn, E.K.
TELEPHONE: F427-4262
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To establish a crack arrest methodology for heavy-walled pressure vessels fabricated from nuclear grades of steel.
APPROACH: Development of dynamic analysis for test specimens and carry out experimental measurements to validate the analysis.
RESULTS: (1) Complete development of two-dimensional dynamic analysis for the specimen geometries used in the program including the beginning of a dynamic analysis for a model of a pressure vessel. To be included are the effects of load-system inertia and compliance, toughness gradients, and transient thermal stresses. (2) Perform testing required to distinguish among the arrest theories and verify the dynamic analyses. Experiment results will be coordinated with similar tests performed at the other facilities in the combined NRC/EPRI Program. Important highlights are the effects of loading and specimen compliance, specimen geometry, propagation history, and thermal stress. (3) Determine optimum specimen geometry and size, testing procedures for arrest toughness measure. Coordinate with the HSST Program at ORNL in the development of specimen design using an insert of irradiation material at the crack tip and in the crack line. (4) Initiate the development of a data base of the crack arrest toughness of A533-B1 and A508-2 steels. Recommend procedures for expeditiously determining statistically significant data.
PROJECT MILESTONES: (1) Dynamic analysis of pressurized cylinders under thermal stress 9/30/77. (2) Measurement of K/sub ID/ on 4 additional pressure vessel stress 9/30/77. (3) Measurement of K/sub ID/ on irradiated steels 9/30/77. (4) RIL to RES on unirradiated crack arrest toughness 9/1/77. (5) RIL-RES on unirradiated crack arrest to NRR 9/30/77. (6) Background report on ASTM Standard 12/31/77. (7) Weld procedures for weldments 9/30/78. (8) Numerical programming and program checkout for side wedge loading 9/30/77. (9) Analyze ORNL experiments 3/31/78.
KEYWORDS: PRESSURE VESSELS;CRACKS;TESTING;TWO-DIMENSIONAL CALCULATIONS

<150085>
TITLE: Development of High-Sensitivity Ultrasonic Techniques for In-Service Inspection of Nuclear Reactors
PROJECT NUMBER: B5680
PRINCIPAL INVESTIGATOR: Linzer, M.
ADDRESS: Gaithersberg, MD 20760
AFFILIATION: National Bureau of Standards, Gaithersburg, Md. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Muscara, J.
TELEPHONE: F427-4262
TYPE OF FUNDING: Interagency agreement
77 FUNDING: Nuclear Regulatory Commission FY77:$53,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Develop techniques to enhance the sensitivity of ultrasonic inspection of nuclear reactor components.
APPROACH: (1) Develop preliminary versions of instrumentation to increase the signal-to-random noise ratio of ultrasonic signals. This will be accomplished primarily through signal-averaging techniques. (2) Develop flaw-discrimination techniques based on spectral analysis of the ultrasonic signals. FY 76 efforts will emphasize development of two-frequency ultrasonic system, Fourier-transform techniques, and wideband contactless electromagnetic transducer. (3) Apply the improved techniques to detect flaws in nuclear reactor materials and components. Efforts in FY 76 will emphasize inspection of 4 in. diam. piping.
RESULTS: Improved methods having greater sensitivity for ultrasonic inspection of nuclear reactor components.
PROJECT MILESTONES: (1) Apply signal averaging and pulse comparison to detection of flaws in reactor pressure vessel and piping materials 9/30/77. (2) Field application of signal average and pulse compression and development of ultrasensitive UT system 9/30/78. (3) Complete Phase III of technique development and application program 9/30/78.
KEYWORDS: REACTOR COMPONENTS;INSPECTION;ULTRASONIC TESTING;EQUIPMENT;MATERIALS TESTING;SENSITIVITY

<150086>
TITLE: Dynamic Photoelastic Study of Crack Arrest
PROJECT NUMBER: A9026
PRINCIPAL INVESTIGATOR: Kobayashi, T.
ADDRESS: College Park, MD 20740
AFFILIATION: Maryland Univ., College Park (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Lynn, E.K.
TELEPHONE: F427-4262
TYPE OF FUNDING: Contract No.-AT(49-24)-0172

77 FUNDING: Nuclear Regulatory Commission
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: The overall objective of the research program is to determine appropriate characterization methods for crack arrest in terms of a measurable physical property of the material, development of test methods and specimens for standardized crack arrest toughness measurements, and adoption by ASME Code and Regulatory authorities for design and operation of pressurized water, primary system components.
APPROACH: (1) Select model materials. (2) Develop hardware. (3) Perform measurements of K and crack velocity. (4) Develop variable toughness specimens.
RESULTS: Achieve objective stated above.
PROJECT MILESTONES: (1) Comparison between steel and plastic specimen 8/31/77. (2) Weld evaluations 9/30/77. (3) Coatings analysis of steel specimens 3/31/78.
KEYWORDS: PRESSURE VESSELS;CRACKS;TESTING;STANDARDS;WELDED JOINTS;PHOTOELASTICITY;STRESS ANALYSIS;COATINGS

<150087>
TITLE: Structural Integrity of Water Reactor Pressure Boundary Components - NRL
PROJECT NUMBER: B5528
PRINCIPAL INVESTIGATOR: Loss, F.J.
ADDRESS: Washington, D.C. 20375
AFFILIATION: Naval Research Lab., Washington, D.C. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Lynn, E.K.
TELEPHONE: F427-4262
TYPE OF FUNDING: Contract No.-AT(49-24)1003
77 FUNDING: Nuclear Regulatory Commission FY77:$834,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Assess materials behavior in relation to structural safety and reliability for pressure boundary components of light water reactors. Develop an understanding of fast fracture and low cycle fatigue phenomena in terms of continuum mechanics and metallurgical factors. Identify metallurgical factors and evolve guidelines for radiation resistant steels. Investigate procedures for periodic reduction of radiation induced property changes. Evolve engineering criteria for reliable structural performance and long term operation.
APPROACH: Task A: Develop techniques for experimental determination of dynamic K/sub ID/ for a three-point bend specimen; complete required modifications to testing apparatus. Define the K/sub ID/ vs temperature trends for A533-B, A508-2 and A302-B steels, the latter plate having a low upper shelf energy and being produced to simulate steel-making practices used for early reactor vessels. Characterize the K/sub ID/ behavior in terms of small size specimens (precracked Charpy-V and 1-in. bend specimens) as well as large specimens (4 and 6-in. thick) that provide plane strain constraint in the transition temperature regime. Investigate techniques for measuring dynamic J/sub ID/ in the elastic plastic regime. Develop an analytical model to predict the hammer force vs time behavior during impact and verify experimentally. Task B: Perfect test techniques and debug new testing systems for fatigue crack growth rate determinations in A533-B plate and A508-2 forging and weld metal. Define fatigue crack propagation rates at 550 degrees F in a reactor water environment for a specific loading pattern on unirradiated material. Obtain a new 4T autoclave system and suitably modify it to maintain water chemistry that is characteristic of both PWR and BWR environments. Task C: Undertake exploratory 550 degrees F irradiation - 650 degrees F anneal experiment on effect of impurity element content on upper shelf and transition temperature recovery; perform initial qualification of radiation embrittlement resistance of extra low copper content A533-B plate and weld heat affected zone from NRC-CE NRL
RESULTS: Accomplish objective stated above.
PROJECT MILESTONES: (1) Complete testing of NRC prelim matrix 12/31/77. (2) Complete main test program on CCGR 9/30/78. (3) RIL to RES on warm prestressing 9/23/77. (4) Recommend code revision to NRC 9/30/78. (5) RES-RIL to NRR on warming prestressing 9/30/77.
KEYWORDS: MATERIALS TESTING;RADIATION EFFECTS;STEELS;FATIGUE;FRACTURES;PRESSURE VESSELS;PERFORMANCE TESTING;REACTOR MATERIALS;PWR TYPE REACTORS;BWR TYPE REACTORS;REACTOR SAFETY;WATER

<150123>
TITLE: Atmospheric Effects of Cooling Systems
PROJECT NUMBER: A2032
PRINCIPAL INVESTIGATOR: Gustafson, P.F.
ADDRESS: 9700 South Cass Avenue, Argonne, IL 60439
AFFILIATION: Argonne National Lab., Ill. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Safeguards, Fuel Cycle, and Environmental Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4350
TYPE OF FUNDING: Contract No.-A2032
77 FUNDING: Nuclear Regulatory Commission FY77:$135,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Southwest
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: To perform a critical review, evaluation and validation of mathematical models used to estimate the atmospheric effects of wet and dry cooling towers, cooling ponds and spray canals. Evaluate the Sauna-S numerical model of Motor Columbus Consulting Engineers, Inc., Switzerland for predicting cooling tower plume dispersion and drift transport.
APPROACH: (1) Collect, summarize and evaluate existing data on plume measurements at cooling towers, ponds and spray canals; (2) Compare mathematical plume models as to generic applications and prediction abilities; (3) Compare and evaluate drift prediction models as data permits; (4) Describe the components of the Sauna-S model used to make the India point calculations and the methods and procedures for its use

and for its application to specific sites. Sauna-S model verification experiments and results are to be described.
RESULTS: Validation of mathematical models and qualitative observations being used to make quantitative estimates of the effect on the atmosphere of evaporative cooling systems.
KEYWORDS: COOLING TOWERS;COOLING SYSTEMS;MATHEMATICAL MODELS;COOLING PONDS;PLUMES;DATA;FORECASTING;ENVIRONMENTAL EFFECTS;AIR;AIR POLLUTION

<150140>
TITLE: Distribution of Tornadoes
PROJECT NUMBER: A4059
PRINCIPAL INVESTIGATOR: Fujita, T.T.
ADDRESS: 5734 South Ellis Avenue, Chicago, IL 60637
AFFILIATION: Chicago Univ., Ill. (USA). Dept. of Geophysical Sciences
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: F427-4373
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Determine tornado probability of occurrence geographically in terms of intensity and damage path. (2) Determine geographic distribution of maximum translational and rotational wind speeds. (3) Analyze the nature of pressure drop, rate of pressure drop (both across the tornado core and along the tornado path), and suction vortices.
APPROACH: (1) FPP assessment of tornadoes which occurred from 1930 to 1974 inclusive. (2) Prepare a detailed map of past tornado tracks taking into account F-scale intensity. (3) Describe the variation of tornado frequency and severity as a function of: (a) altitude and surface roughness; (b) real paths (damage widths versus diameter of maximum winds); (c) touch-down frequency 1930 to now; (d) total area of tornadoes per one degree square; (e) total path length within each one degree square; and (f) weighted path length.
RESULTS: Establish distribution probability of tornadoes.
KEYWORDS: METEOROLOGY;TORNADOES;TURBULENCE;WIND;VELOCITY;USA;MAPS;FORECASTING;WEATHER

<150142>
TITLE: Wind Tunnel Measurements of Building Wakes
PROJECT NUMBER: B5829
PRINCIPAL INVESTIGATOR: Meroney, R.N.;Peterka, J.A.
ADDRESS: Department of Civil Engineering, Fort Collins, CO 80523
AFFILIATION: Colorado State Univ., Fort Collins (USA). Dept. of Civil Engineering
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Perform wind tunnel measurements of building wakes.
APPROACH: (1) Determine quantitatively the character and persistence of the wake and wind tunnel laboratory model of well documented prototype reactor complexes. (2) Develop appropriate empirical formulation of building wake diffusion, generalizing the results of the experimental analysis where possible. (3) STET (4) Determine the relationship between instantaneous (peak) and average concentration measurements in the vicinity of and downwind from buildings. (5) Characterize and attempt to quantify building wakes as they are affected or determined by (a) building size, shape, orientation; (b) atmospheric stability; (c) wind speed; (d) terrain roughness, both upwind and downwind of structures; and (e) source release point. (6) Compare wind tunnel test results with field results and reconcile differences.
RESULTS: Characterization of building wakes.
KEYWORDS: WAKES;AIR POLLUTION;DIFFUSION;BUILDINGS;WIND TUNNELS;REACTOR SITES;FORECASTING;STABILITY;WIND;VELOCITY;METEOROLOGY;WEATHER

<150143>
TITLE: Engineering Analysis of Near-Ground Windfields in Tornadoes
PROJECT NUMBER: B5998
PRINCIPAL INVESTIGATOR: McDonald, J.R.;Minor, J.E.
ADDRESS: Department of Civil Engineering, Lubbock, TX 79409
AFFILIATION: Texas Tech Univ., Lubbock (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Assess tornado risk for nuclear power facilities. (2) Determine the near-ground windfield in tornadoes.
APPROACH: (A) Assemble a consistent set of tornado records from available sources. (B) Perform a critical evaluation of current approaches to tornado risk analysis. (C) Develop new set of regional tornado criteria based on the technical advances derived from I.B. (D) Describe the variation of tornado frequency and severity as a function of identifiable variables such as altitude, surface roughness, population distribution, etc.

RESULTS: (A) Assess critically the existing literature which addresses near-ground tornado windfields. (B) Review and synthesise published storm damage documentations for windspeed and windfield data. (C) If feasible, extend data on ground level windfield by examining existing high-quality motion picture films and determine a correlation between damaged structures and the motion picture record. (D) Conduct field investigations after significant tornado events and record systematically damage and debris patterns which indicate maximum windspeed and windfield patterns.
KEYWORDS: TORNADOES;WIND;DATA ACQUISITION;HAZARDS;ENVIRONMENTAL EFFECTS;VELOCITY;METEOROLOGY;WEATHER;REACTOR SAFETY

<150144>
TITLE: U. S. Tornado Statistics
PROJECT NUMBER: B5977
PRINCIPAL INVESTIGATOR: Pearson, A.D.;Shaefer, J.T.
ADDRESS: 601 East 12th Street, Room 1728, Federal Building, Kansas City, MO 64106
AFFILIATION: National Oceanic and Atmospheric Administration, Kansas City, Mo. (USA). National Severe Storms Forecast Center
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Interagency agreement-USNRC
77 FUNDING: Nuclear Regulatory Commission FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Determine accurately the location, intensity time, path length and path width of all reported U.S. tornadoes, 1950-1976. (2) Examine spatial and temporal distribution of significant tornado features. (3) Evaluate the effects of topography and ordoraphy on tornado occurrence and severity.
APPROACH: Paper study.
RESULTS: Summary of tornado history in US (1950-1976).
KEYWORDS: METEOROLOGY;TORNADOES;STATISTICS;USA;WEATHER

<150145>
TITLE: Lidar Velocity Measurements
PROJECT NUMBER: B5691
PRINCIPAL INVESTIGATOR: Schwiesow, R.L.
ADDRESS: Wave Propagation Laboratory, Boulder, CO 80302
AFFILIATION: National Oceanic and Atmospheric Administration, Boulder, Colo. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Interagency agreement-USNRC
77 FUNDING: Nuclear Regulatory Commission FY77:$50,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Measure waterspout velocity components. (2) Analyze and interpret waterspout lidar data. (3) Assess feasibility of determining 3-D wind profiles by Doppler Lidar.
APPROACH: Piled measurement program.
RESULTS: Improved characterization of waterspouts.
KEYWORDS: WATERSPOUT;METEOROLOGY;WIND;VELOCITY;CLOUDS;STORMS;DATA;LASERS;INFRARED SPECTRA;WATER;RADAR;WEATHER

<150146>
TITLE: Tornado Characteristics
PROJECT NUMBER: B5534
PRINCIPAL INVESTIGATOR: Kessler, E.
ADDRESS: 1313 Halley Circle, Norman, OK 73069
AFFILIATION: National Oceanic and Atmospheric Administration, Norman, Okla. (USA). National Severe Storms Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Interagency agreement-USNRC
77 FUNDING: Nuclear Regulatory Commission FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Obtain measurements of meteorological parameters in vicinity of tornados. (2) Obtain definitive windspeed estimates from tornado damage analysis and engineering estimates. (3) Supply coordination and analysis support to waterspout probing efforts. (4) Conduct theoretical and numerical modeling studies to support observational efforts and to analyze maximum tornado parameters.
APPROACH: (1) Field measurements. (2) Numerical modeling.
RESULTS: Improved characterization of tornados.
KEYWORDS: TORNADOES;WEATHER;METEOROLOGY;MATHEMATICAL MODELS;WIND;VELOCITY

<150147>
TITLE: Transport and Diffusion of Airborne Effluents
PROJECT NUMBER: B5690
INCIPAL INVESTIGATOR: Dickson, C.R.;Vander Hoven, I.
ADDRESS: 550 Second Street, Idaho Falls, ID 83401
AFFILIATION: National Oceanic and Atmospheric Administration, Idaho Falls, Idaho (USA). Air Resources Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$175,000
TECHNOLOGY. GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) Perform building wake field experiments at EOCR and Rancho Seco Nuclear Facilities. (2) Analyze results of building wake test series.
APPROACH: Experimental Field Program.
RESULTS: Determined building wake field.
KEYWORDS: WAKE;AIR POLLUTION;DIFFUSION;METEOROLOGY;RANCHO SECO-1 REACTOR;ENVIRONMENTAL EFFECTS;REACTOR SITES;BUILDINGS;RADIOACTIVE EFFLUENTS;PWR TYPE REACTORS;FISSION PRODUCTS;ENVIRONMENTAL TRANSPORT;WEATHER

<150148>
TITLE: Modeling Tornado Dynamics
PROJECT NUMBER: B5795
PRINCIPAL INVESTIGATOR: Lewellen, W.S.
ADDRESS: 50 Washington Road, Princeton, NJ 08540
AFFILIATION: Aeronautical Research Associates of Princeton, Inc., N.J. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$60,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: (1) Perform a thorough and critical review of available theoretical models of geophysical vortices to assess the current state of knowledge regarding tornado vortex modeling. (2) Apply ARAP's second-order closure model of turbulence to an axisymmetric vortex driven by buoyancy in the presence of the ground boundary. (a) Define the upper bounds on the three-dimensional velocities and pressures which may exist in a tornado or waterspout, considered both separately and in combination. (b) Describe the radial (horizontal) and vertical profiles of meteorological parameters in tornadoes, such as windspeeds, pressures, densities and temperatures. (3) Perform a sensitivity study of the influence of such factors as atmospheric stability, terrain roughness, and ambient cloud circulation on the velocity and pressure distribution in a tornado.
APPROACH: Numerical modeling.
RESULTS: Evaluated tornado models.
KEYWORDS: TORNADOES;MATHEMATICAL MODELS;METEOROLOGY;WIND;VELOCITY;SIMULATION;DENSITY;WEATHER

<150149>
TITLE: Fault Dating Methodology
PROJECT NUMBER: A9027
PRINCIPAL INVESTIGATOR: Glover, L.
ADDRESS: Virginia Polytechnic Institute, Blacksburg, VA
AFFILIATION: Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry D.
TELEPHONE: C(301)427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$69,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determine patterns and ages of post metamorphism faults in part of the Northern Piedmont.
APPROACH: (1) Conduct field investigations to determine location and geometry of faults; collect samples to isotopically determine the ages of rocks adjacent to the faults and of granulated materials within the zones of faults movement. (2) Conduct field investigations to determine the depth and local extent of saprolite zones. (3) Conduct mass spectrometric analyses and other laboratory analyses on appropriately prepared samples for the purpose of determining isotopic-ratio dates and discordancies of samples collected during field investigations. (4) Compile maps and photomaps of the study area to show pertinent geological features such as faults, lineations, and other geologic structures and contacts. (5) Conduct a strip-transverse for geologic study of rock exposures along the James River between Richmond and Columbia, Virginia.
RESULTS: A determination of patterns and ages of past metamorphism faults in part of the Northern Piedmont.
KEYWORDS: POST METAMORPHISM;FAULTS;GEOPHYSICAL;GEOLOGIC FAULTS;AGE ESTIMATION;MEASURING METHODS;GEOLOGICAL SURVEYS;GEOPHYSICAL SURVEYS;VIRGINIA;REGIONAL ANALYSIS

<150151>
TITLE: Central New England Seismicity
PROJECT NUMBER: A4058
PRINCIPAL INVESTIGATOR: Toksoz, N.
ADDRESS: Cambridge, MA 02114
AFFILIATION: Massachusetts Inst. of Tech., Cambridge (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry D.
TELEPHONE: C(301)427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$87,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Study New England seismicity with emphasis on Massachusetts and New Hampshire.
APPROACH: (1) Acquire, record, process, and interpret data from the central New England seismic stations (Mass., N.H., Vt.). (2) Conduct research to determine the velocity structure of the crust and upper mantle in central New England in order to locate hypocenters more accurately and to understand better the structure and tectonic history of this region. (3) Conduct other studies, as appropriate, of the significance of small earthquakes to the interpretation of tectonic stress and patterns of seismicity.
RESULTS: An improved characterization of the seismicity of the New England area.
KEYWORDS: NEW ENGLAND;SEISMIC SURVEYS;MASSACHUSETTS;NEW HAMPSHIRE;REGIONAL ANALYSIS;TECTONICS

<150152>
TITLE: Study of Seismicity and Tectonics in New England
PROJECT NUMBER: A4056
PRINCIPAL INVESTIGATOR: Skehan, J.
ADDRESS: Commonwealth Avenue, Boston, MA 02215
AFFILIATION: Boston Univ., Mass. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry D.
TELEPHONE: C(301)427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Site specific New England
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Study seismicity and tectonics of northern New England.
APPROACH: (1) Acquire, record, process, and interpret data from the northern New England seismic stations. (2) Conduct research to determine the velocity structure of the crust and upper mantle in northern New England in order to locate hypocenters more accurately and to understand better the structure and tectonic history of this region. (3) Conduct other studies, as appropriate, of the significance of small earthquakes to the interpretation of tectonic stress and patterns of seismicity.
RESULTS: An improved characterization of the seismicity and tectonics of the northern New England area.
KEYWORDS: SEISMIC SURVEYS;EARTHQUAKES;REGIONAL ANALYSIS;TECTONICS

<150153>
TITLE: Anna, Ohio Seismic Study
PROJECT NUMBER: B5545
PRINCIPAL INVESTIGATOR: Pollack, H.;Mauk, F.
ADDRESS: University of Michigan, Ann Arbor, MI 48104
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry D.
TELEPHONE: C(301)427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$75,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Midwest;GEOGRAPHIC AREAS/Site specific Anna, Ohio
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Geophysical investigations of the Anna, Ohio, earthquake zone.
APPROACH: (1) Install in the Anna, Ohio, seismic area a short-period seismic network which will continuously telemeter data to Ann Arbor. (2) From the processed records of earthquakes: (a) establish the ambient seismicity level and a frequency-versus-magnitude relationship for the Anna region, (b) locate local hypocenters and interpret their distribution with respect to hypothetical tectonic relationships, (c) deduce focal mechanisms for earthquakes in the Anna region, and (d) in the event of a sizeable earthquake, collect strong motion data and after-shock data to be employed with the seismicity data in evaluating seismic risk. (3) Make observations of the physical processes in the region to investigate possible secular variations in the ambient tectonic stress or strain field through: (a) monitoring of variations in water levels in observation wells, and (b) conducting repeated precise gravity surveys.
KEYWORDS: OHIO;SEISMIC SURVEYS;GEOPHYSICAL SURVEYS;EARTHQUAKES;DATA ACQUISITION SYSTEMS;MONITORING

<150155>
TITLE: In Situ Stress Measurement
PROJECT NUMBER: B5615
PRINCIPAL INVESTIGATOR: Baxter, C.;Sbar, M.
ADDRESS: New York, NY
AFFILIATION: Energy Research and Development Administration, New York (USA). Health and Safety Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry D.

TELEPHONE: C(301)427-4370
77 FUNDING: Nuclear Regulatory Commission FY77:$74,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Northeast;GEOGRAPHIC AREAS/Site specific NY State
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ECOLOGICAL PROCESSES AND EFFECTS
PROJECT DESCRIPTION: Determination of the regional stress field in New York State and adjacent areas.
APPROACH: (1) Continue investigations of the regional distribution of stress in near-surface rocks of New York State and adjacent areas. (2) Perform detailed laboratory investigations of overcored specimens. Analyses will include petrographic examinations of microfractures and cements, and rock loading variations and their influence on crack behavior, and the influence of biaxial stress fields on elastic and mechanical properties of rocks.
RESULTS: A determined regional stress field for New York State and adjacent areas.
KEYWORDS: NEW YORK;TECTONICS;STRESSES;REGIONAL ANALYSIS;ROCKS

<150162>
TITLE: Heavy Section Steel Technology Program
PROJECT NUMBER: B0119
PRINCIPAL INVESTIGATOR: Whitman, G.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Lynn, E.K.
TELEPHONE: C(301)427-4262
TYPE OF FUNDING: Interagency agreement-NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$2,160,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To develop and evaluate methods of fracture analysis of heavy section steel light water reactor pressure vessels for inclusion in codes and standards. The HSST program is organized under six major areas which are individually covered.
APPROACH: Methods of elastic-plastic fracture analyses will continue to be evaluated, developed and validated using experimental data obtained from small-scale models and the intermediate vessel tests. The fatigue crack growth rate studies to evaluate lower frequency, lower delta k, higher 'R' ratios and load follow tests will be continued. Additional material types will be screened to examine their susceptibility to corrosion fatigue and stress corrosion cracking. The testing of small irradiated specimens will be completed and additional irradiation experiments will be planned to validate irradiation effects on code rules. Intermediate test vessel summary reports will be written. Design of the thermal shock experiment will be completed and two small experiments performed. The effect of system energy content on fracture modes will be studied and an experimental program will be initiated. Metallographic examinations of re-heat cracking in heat affected zones will be performed.
RESULTS: Improved methods for the fracture analysis of heavy section steel light water reactor pressure vessels.
PROJECT MILESTONES: ITV = Intermediate Test Vessel, TSE = Thermal Shock Equipment, HAZ = Heat Effected Zone. (1) Issue report on ITV-7A 10-28-77. (2) Issue report ITV-7B 12-15-77. (3) Issue report TSE-3 and 4 10-30-77. (4) Issue report ITV-8 8-31-78. (5) Test ITV-10 7-1-78. (6) Issue ITV-10 11-1-78. (7) Issue significance report on nozzle corner flaws 2-1-79.
KEYWORDS: STEELS;PRESSURE VESSELS;REACTOR VESSELS;FRACTURES;NONDESTRUCTIVE TESTING

<150163>
TITLE: Improved Ultrasonic Non-Destructive Testing of Pressure Vessels (Category II)
PROJECT NUMBER: A4047
PRINCIPAL INVESTIGATOR: Frederick, J.
ADDRESS: University of Michigan, Ann Arbor, MI 48104
AFFILIATION: Michigan Univ., Ann Arbor (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Muscara, J.
TELEPHONE: C(301)427-4262
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$29,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: A system is to be developed for reliably determining the size of flaw indications to within the limits set by the new ASME Boiler and Pressure Vessel Code requirements as published in the Summer 1973 Addenda. This is to be done by computer-processing of ultrasonic pulse-echo data from a phase-sensitive synthetic array of transducers. Feasibility of this concept is expected to be demonstrated within the first six months of the contract period using test specimens having machined discontinuities, which have been made from materials used in reactor pressure vessels. To be demonstrated is that the phase-sensitive array is superior to the conventional pulse-echo systems in determining the size, shape, and orientation of a discontinuity.
APPROACH: Perform preliminary work on establishing minimum detectable discontinuity sizes using machined discontinuities in both wrought and cast stainless steel test blocks. Evaluate proposed techniques for reducing noise caused by high attenuation and microstructure scattering. Extend current techniques to the evaluation of stainless steel pipe sections in an immersion system. Acquire RPV materials with natural discontinuities and cladded surfaces for evaluation of system capabilities. Design and construct two axes scanning immersion system to facilitate C-scan evaluation utilizing improved lateral resolution through synthetic array processing. Design and construct gray-scale display for real-time presentation of B-scan or C-scan data with improved longitudinal and lateral resolution.
RESULTS: A developed system for reliably determining flaw sizes within the limits set by the new ASME Boiler and Pressure Vessel Code requirements as published in the Summer 1973 Addenda.

PROJECT MILESTONES: Continue the evaluation of the test samples supplied by the reactor pressure vessel manufacturers. Compare the results with alternative testing methods. Section the test specimen and evaluate test results with respect to the requirements of Section XI of the ASME Code 9/30/77.
KEYWORDS: PRESSURE VESSELS;REACTOR VESSELS;TESTING;DEFECTS;NONDESTRUCTIVE TESTING;CRACKS;ULTRASONIC TESTING;SAFETY

<150165>
TITLE: Inspection of Nuclear Reactor Welding by Acoustic Emission
PROJECT NUMBER: A4052
PRINCIPAL INVESTIGATOR: Prine, D.W.
ADDRESS: General American Research Division, 7749 N. Natchez Avenue, Niles, IL 60648
AFFILIATION: General American Transportation Corp., Niles, Ill. General American Research Div.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Muscara, J.
TELEPHONE: C(301)427-4262
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$42,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: A system is to be developed for in-process weld inspection for nuclear reactor components using acoustic emission for detection and location of weld microcracking.
APPROACH: The first phase of this research, to be conducted in the first year, will entail assembly of the appropriate equipment and its use in acoustic emission monitoring of several different welding techniques in use for nuclear power plant piping construction. Defects found will be cross-validated with other NDT techniques and metallograph analyses to determine the applicability of acoustic emission to find rejectable defects associated with nuclear welding. The feasibility of the system developed will be evaluated by (1) establishing the acoustic emission detection sensitivity, and (2) applicability to on-line inspection. Work in the second phase (year) of the contract will center upon completion of fabrication of the prototype pipe weld monitor and beginning of field evaluation aimed at gathering sufficient data to satisfy requirements for acceptance into the ASME Boiler and Pressure Vessel Code. Evaluations will also begin for in-process pressure vessel welding, employing the same procedures as used to validate the piping weld monitoring. Completion of the field testing of both the piping and pressure vessel monitoring will be accomplished in the third phase (year) of this study. Also, the prototype vessel weld monitor will also be constructed and proven under shop conditions. The primary effort in the last part of this phase will be the analysis of data and accumulated evidence to present to
RESULTS: The system is expected to produce more reliable (safer) welds and yet to lower costs by finding defects at the time of fabrication rather than at a later inspection period.
PROJECT MILESTONES: (1) Vessel weld monitor field trials, ''hands-off'' complete 9/1/77. (2) Complete data analysis and preparation of data for standards-report issued to RES 10/1/77.
KEYWORDS: WELDED JOINTS;ACOUSTIC EMISSION TESTING;PRESSURE VESSELS;POWER REACTORS;REACTOR VESSELS;SAFETY

<150175>
TITLE: Revision of Nuclear Safety Guide (TID 7016)
PROJECT NUMBER: B0163
PRINCIPAL INVESTIGATOR: Thomas, J.T.
ADDRESS: Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, TN 37830
AFFILIATION: Oak Ridge National Lab., Tenn. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Schamberger, Robert D.
TELEPHONE: C(301)427-4323
TYPE OF FUNDING: Interagency agreement-NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$14,000
TECHNOLOGY: NUCLEAR/Fission (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Laboratory;RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: Update TID 7016 to reflect current technology.
APPROACH: (1) Revise data and discussion of Part I, ''The Nuclear Safety Problem,'' to reflect current standards, practices and understandings. (2) Expand Part II, ''Recommended Nuclear Safety Limits,'' to include available information on mixed oxide, typical fuel compounds, reflector materials, and complex geometries. Redo sections on arrays of units and on transportation. (3) Revise Part III, ''Examples of Plant Application,'' to include several methods for evaluating neutron interactions in addition to the solid angle method. (4) Submit draft revision for review by ANS-8 and ANSI N14. Revise draft to reflect reviewers' comments.
RESULTS: An updated TID 7016, reflecting current technology.
KEYWORDS: UPDATE;NUCLEAR ENERGY;SAFETY;RADIATION PROTECTION;FUEL PARTICLES;NEUTRON REFLECTORS;TRANSPORT;MANUALS;CRITICALITY

<150176>
TITLE: Seismotectonics of New England
PROJECT NUMBER: B5961
PRINCIPAL INVESTIGATOR: Barosh, P.
ADDRESS: Weston Observatory of Boston College, Boston, MA 02167
AFFILIATION: Boston Coll., Weston, Mass. (USA). Weston Observatory
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Steuer, Neil B.
TELEPHONE: C(301)427-4376
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$280,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: STORAGE (40%);ELECTRICITY GENERATION (30%);WASTE MANAGEMENT (30%)
CHARACTER OF STUDY: RESEARCH/Theoretical;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine;BIOMES/Marine;GEOGRAPHIC AREAS/Northeast

RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Determine if New England and adjacent areas can be subdivided into smaller tectonic provinces; define the province boundaries and define the relationship of the geologic structure to earthquakes in the region.
APPROACH: Conduct reasonable geological, geophysical, or seismological programs that will contribute information directly bearing on past, current and future seismic conditions of the area. In accordance with this work, the contractor is to contact participating agencies and determine individual participants and anticipated levels of participation, collect literature maps and geophysical records from all sources, study samples and well records.
RESULTS: Prepare maps showing best interpretation of the configuration of the various horizons in the stratigraphic section and serve as a liaison between the participating agencies and commission personnel.
KEYWORDS: NEW ENGLAND;GEOLOGIC STRUCTURES;USA;EARTHQUAKES;TECTONICS;SEISMOLOGY;STRATIGRAPHY;CONSTRUCTION;MAPS;SAFETY

<150177>
TITLE: Seismotectonics of the Midcontinent Gravity Anomaly
PROJECT NUMBER: B5952
PRINCIPAL INVESTIGATOR: Walton, M.
ADDRESS: 1633 Eustis St., St. Paul, MN 55108
AFFILIATION: Minnesota Geological Survey, St. Paul (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Steuer, Neil
TELEPHONE: C(301)427-4376
TYPE OF FUNDING: Interagency agreement-NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$56,000
TECHNOLOGY: FOSSIL FUEL/Oil and Gas (5%);NUCLEAR/General (15%);GENERAL SCIENCE (80%)
ENERGY CYCLE: STORAGE (25%);ELECTRICITY GENERATION (25%);ELECTRICAL TRANSMISSION (25%);WASTE MANAGEMENT (25%)
CHARACTER OF STUDY: RESEARCH/General;RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Midwest;HYDROGRAPHIC AREAS/Great Lakes
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) Divide the central stable region of the mid-continent gravity anomaly into smaller tectonic provinces. (2) Delineate the midcontinent gravity anomaly. (3) Identify earthquake mechanisms in the region.
APPROACH: Undertake geologic and seismic studies to accurately delineate the boundary of the midcontinent gravity anomaly and contiguous tectonic provinces; and to study and identify the structure and tectonics of the upper Great Lakes Precambrian Shield Province.
RESULTS: (1) A map showing best interpretation of the configuration of Precambrian basements rocks. (2) Establishment of a seismic network to monitor seismicity of the midcontinent gravity anomaly to provide basic seismic data for risk evaluation in nuclear power plant siting.
KEYWORDS: RISK ASSESSMENT;USA;TECTONICS;SEISMOLOGY;EARTHQUAKES;NUCLEAR POWER PLANTS;SITE SELECTION;OIL SPILLS;CONSTRUCTION;GEOLOGY

<150189>
TITLE: Thermal Performance Experiments on Ultimate Heat Sinks
PROJECT NUMBER: B2081
PRINCIPAL INVESTIGATOR: Hadlock, R.K.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Energy Research and Development Administration FY77:$150,000
TECHNOLOGY: GENERAL SCIENCE (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (50%);ELECTRICITY GENERATION (50%)
POLLUTANTS: HEAT, THERMAL (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: Perform thermal performance experiments on heat sinks.
APPROACH: (1) Conduct a site survey of candidate hot ponds for field experiments. (2) Design field experiments for both spray ponds and cooling ponds. (3) Prepare integrated instrument system from proven hardware. (4) Conduct a proof test of entire system on BNW spray ponds. (5) Analyze data from proof test. (6) Review experimental design and measurement program.
RESULTS: Establish thermal characteristics of heat sinks, in the form of cooling ponds and spray ponds.
KEYWORDS: COOLING PONDS;PERFORMANCE;SITE SELECTION;SPRAYS;METEOROLOGY;WEATHER

<150190>
TITLE: Evaluation of Atmospheric Dispersion Data
PROJECT NUMBER: B2086
PRINCIPAL INVESTIGATOR: Wendell, L.L.
ADDRESS: P.O. Box 999, Richland, WA 99352
AFFILIATION: Battelle Pacific Northwest Labs., Richland, Wash. (USA)
MONITORING AGENCY: Energy Research and Development Administration, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Abbey, Robert F., Jr.
TELEPHONE: C(301)427-4373
TYPE OF FUNDING: Interagency agreement-US NRC
77 FUNDING: Nuclear Regulatory Commission FY77:$80,000
TECHNOLOGY: GENERAL SCIENCE (100%)
POLLUTANTS: NOXIOUS GAS (50%);PARTICULATES (50%)
CHARACTER OF STUDY: RESEARCH/Laboratory (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;GEOGRAPHIC AREAS/Continental
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT

PROJECT DESCRIPTION: (1) Identify potential sources of atmospheric diffusion data for neutrally-buoyant sources located in homogeneous terrain. (2) Evaluate data with respect to information content on surface roughness, wind speed, atmospheric stability, release time, and sampling time.
APPROACH: Analysis of experimental field dispersion data utilizing actual concentration measurements. Correlate measured concentration values with concurrently measured atmospheric variables, such as wind speed, stability, and terrain roughness.
RESULTS: Method for characterizing atmospheric dispersion utilizing known (measured) meteorological variables.
KEYWORDS: EARTH ATMOSPHERE;DIFFUSION;WIND;METEOROLOGY;SAMPLING;WEATHER

<150191>
TITLE: Southern Piedmont Seismology
PROJECT NUMBER: A9028
PRINCIPAL INVESTIGATOR: Long, L.T.
ADDRESS: Georgia Tech. University, Atlanta, GA 30332
AFFILIATION: Georgia Inst. of Tech., Atlanta (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry D.
TELEPHONE: C(301)427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$35,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Clark Hill, GA
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: A geophysical investigation of the seismicity in the Clark Hill Reservoir vicinity.
APPROACH: (1) Perform research to acquire instrumentally recorded data on local earthquakes and man-caused shocks in the Clark Hill Reservoir area and relate the physical parameters of these events to the structure of the earth's crust in the area. (2) Perform detailed geophysical surveys to delineate significant crustal units in the area and to determine crustal velocity structure of the region. (3) Install, operate, and maintain a short-period siesmograph network with a telemetry system for recording at a central location. (4) Investigate and report the relationships between earthquake activity, geology, and tectonic environment of the area. (5) Investigate the possible relationship between local seismicity and the history of water-level variations in the Clark Hill Reservoir.
RESULTS: Maps illustrating seismic character of the region and correlations to earthquake activity.
KEYWORDS: GEORGIA;WATER RESERVOIRS;EARTHQUAKES;SEISMIC SURVEYS;TECTONICS

<150192>
TITLE: Geology and Seismology Siting Studies
PROJECT NUMBER: B5535
PRINCIPAL INVESTIGATOR: Houser, F.;Wentworth, C.
ADDRESS: State of Virginia, VA
AFFILIATION: Geological Survey, Reston, Va. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry D.
TELEPHONE: C(301)427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$1,255,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific California, South Carolina
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) Coastal California fault mapping (onshore and offshore). (2) Eastern Mojave Desert (geology, geophysics, seismology). (3) Charleston, SC, regional geology and seismology. (4) Activity on multiple fault strands. (5) Fault dating in continental interior.
RESULTS: Maps illustrating the seismic character of the area and correlations with earthquake activity.
KEYWORDS: GEOLOGICAL SURVEYS;SEISMIC SURVEYS;LAND POLLUTION ABATEMENT;CALIFORNIA;SOUTH CAROLINA;AGE ESTIMATION;REGIONAL ANALYSIS;EARTHQUAKES;SITE SELECTION;NUCLEAR ENERGY;GEOLOGIC FAULTS

<150193>
TITLE: Connecticut Seismic Network Studies
PROJECT NUMBER: A4057
PRINCIPAL INVESTIGATOR: Chiburis, E.
ADDRESS: University of Connecticut, Storrs, CT 06268
AFFILIATION: Connecticut Univ., Storrs (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Harbour, Jerry D.
TELEPHONE: C(301)427-4370
TYPE OF FUNDING: Contract No.
77 FUNDING: Nuclear Regulatory Commission FY77:$39,000
TECHNOLOGY: GENERAL SCIENCE (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;GEOGRAPHIC AREAS/Site specific Connecticut
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT
PROJECT DESCRIPTION: (1) Establish the seismicity of Connecticut and southern New England in terms of epicentral location, focal depth, magnitude, frequency of occurrence, and recurrence relationships of earthquakes. (2) Continue to provide quantitative data on New England earthquakes to State, Federal, and local authorities, and to other research institutions engaged in similar research. (3) Determine the litholcgy and velocity structure of the earth's crust and upper mantle in the New England region. (4) Examine the correlation between seismicity and structural geology in Connecticut in particular and in New England in general. (5) Upgrade the capability of the Connecticut seismic network.
RESULTS: (1) Maps illustrating the seismic character of the region. (2) Correlations with earthquake activity.
KEYWORDS: CONNECTICUT;SEISMIC SURVEYS;EARTHQUAKES;EARTH CRUST;EARTH MANTLE;LITHOLOGY

<150205>
TITLE: Effect of Liquid Pathways on RSS Consequence Calculations
PROJECT NUMBER: A1200
PRINCIPAL INVESTIGATOR: Wayland, J.R.
ADDRESS: Sandia Laboratories, Albuquerque, NM 87115
AFFILIATION: Sandia Labs., Albuquerque, N.Mex. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Murphy, Joseph A.
TELEPHONE: C(301)443-6947
TYPE OF FUNDING: Contract No.-A1200
77 FUNDING: Nuclear Regulatory Commission FY77:$77,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: SPECIFIED OTHER POLLUTANTS/Miscellaneous (100%)
CHARACTER OF STUDY: RESEARCH/Theoretical (100%)
REGIONS OF INTEREST: BIOMES/Terrestrial;BIOMES/Freshwater;BIOMES/Estuarine
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: Establish the degree of potential radiation exposure to the population from hypothetical accident sequences in which some, or all, of the LWR core has melted through the floor of the containment vessel.
APPROACH: Characterize radioactive sources for liquid pathways and develop and implement liquid pathway models for the hydrosphere and biosphere to calculate the movement and distribution of radionuclides in the environment and man.
RESULTS: A more realistic liquid pathway model for the assessment of accident risks in the U.S. commercial nuclear power reactors.
PROJECT MILESTONES: Provide monthly reports.
KEYWORDS: WATER COOLED REACTORS;MELTDOWN;MAXIMUM CREDIBLE ACCIDENT;RADIOACTIVE EFFLUENTS;ENVIRONMENTAL TRANSPORT;RADIONUCLIDE MIGRATION;SURFACE WATERS;SOILS;LIQUID WASTES;FOOD CHAINS;MAN;ENVIRONMENT;RADIATION DOSES;RADIATION HAZARDS;HUMAN POPULATIONS;BIOLOGICAL MODELS;MATHEMATICAL MODELS;TERRESTRIAL ECOSYSTEMS;AQUATIC ECOSYSTEMS

<150206>
TITLE: Methodology Development for a Potential Risk Assessment of Fuel Reprocessing
PROJECT NUMBER: B4147
PRINCIPAL INVESTIGATOR: Buckner, J.T.
ADDRESS: Savannah River Laboratory, Aiken, SC 29801
AFFILIATION: Du Pont de Nemours (E.I.) and Co., Aiken, S.C. (USA). Savannah River Lab.
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Cullingford, Michael C.
TELEPHONE: C(301)443-6947
TYPE OF FUNDING: Contract No.-B4147
77 FUNDING: Nuclear Regulatory Commission FY77:$226,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: PROCESSING, CONVERSION (100%)
POLLUTANTS: PARTICULATES (10%);RADIATION (50%);HEAT, THERMAL (5%);SPECIFIED OTHER POLLUTANTS/Miscellaneous (35%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
REGIONS OF INTEREST: BIOMES/Atmospheric;BIOMES/Terrestrial;BIOMES/Freshwater
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:CHARACTERIZATION, MEASUREMENT, AND MONITORING;ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: Develop a methodology applicable to the assessment of risk to the public from fuel reprocessing.
APPROACH: WASH-1400 methodology where applicable. Definition of a reference repository (to be used for the purposes of analysis only). Collection and analysis of reliability data presently existing in the US. Systems analysis and appropriate quantification techniques to develop a risk assessment methodology.
RESULTS: (1) Methodology appropriate to risk assessment of Fuel Reprocessing. (2) Definition of Fuel Reprocessing. (3) Insights into these systems, components or test and maintenance procedures which contribute significantly to the risk. (4) Areas where data is needed.
PROJECT MILESTONES: Phase I: Definition of Reference System 12/77. Phase II: Risk Assessment Methodology Development 12/79.
KEYWORDS: FUEL REPROCESSING PLANTS;NUCLEAR FACILITIES;HEALTH HAZARDS;HUMAN POPULATIONS;DATA COMPILATION;SAFETY;PLUTONIUM ISOTOPES;GAMMA SOURCES;IODINE ISOTOPES;COMPUTER CALCULATIONS;ENVIRONMENTAL TRANSPORT;RADIATION MONITORS;INFORMATION RETRIEVAL;COST BENEFIT ANALYSIS;SYSTEMS ANALYSIS

<150209>
TITLE: Light Water Reactor Risk Assessment
PROJECT NUMBER: A3057
PRINCIPAL INVESTIGATOR: Hall, R.E.
ADDRESS: Brookhaven National Laboratories, Upton, NY 11973
AFFILIATION: Brookhaven National Lab., Upton, N.Y. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Murphy, Joseph A.
TELEPHONE: C(301)443-6947
TYPE OF FUNDING: Contract No.-A3057
77 FUNDING: Nuclear Regulatory Commission FY77:$250,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: PARTICULATES (50%);RADIATION (50%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: BIOMEDICAL AND ENVIRONMENTAL RESEARCH:ENVIRONMENTAL TRANSPORT;ECT;OS
PROJECT DESCRIPTION: Provide risk assessment for commercial nuclear reactor accidents (Class 3-8).
APPROACH: Use methodology similar to that used in WASH-1400. Use actual plant operating data where possible. Generate logic diagrams to identify accident sequences and use fault tree methodology to quantify the

results.
RESULTS: Provide techniques and data base to begin risk assessment for Surry and Peachbottom II Class 3-8 accidents.
PROJECT MILESTONES: Monthly letter reports plus final report.
KEYWORDS: WATER COOLED REACTORS;REACTOR ACCIDENTS;FAULT TREE ANALYSIS;DATA ANALYSIS;PROBABILITY

<150210>
TITLE: Effect of Scale on Two-Phase Countercurrent Flow Flooding in Vertical Tubes
PROJECT NUMBER: B5816
PRINCIPAL INVESTIGATOR: Richter, H.J.
ADDRESS: Thayer School of Engineering, Dartmouth College, Hanover, NH 03755
AFFILIATION: Dartmouth Coll., Hanover, N.H. (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Division of Reactor Safety Research
MONITOR: Serkiz, Aleck W.
TELEPHONE: F427-4370
TYPE OF FUNDING: Contract No.-AT(49-24)-0329
77 FUNDING: Nuclear Regulatory Commission FY77:$41,000
TECHNOLOGY: NUCLEAR/Fission Converters (100%)
CHARACTER OF STUDY: RESEARCH/Applied (100%)
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: A series of air-water flooding experiments with countercurrent flow will be conducted in vertical tubes of various diameters to determine the scale effects and to investigate competing scaling theories. The tests will use water introduced into the top of the tube, followed by water injection into the side of the tube and then side injection into an annulus.
APPROACH: Perform flooding experiments in a series of vertical tubes with countercurrent air-water flow and different water injection points.
RESULTS: Experiments are designed to test the validity of competing scaling theories.
PROJECT MILESTONES: (1) Complete test loop design and construction 10-31-76. (2) Complete loop shakedown 11-30-70. (3) Complete testing with top water injection 5-15-77. (4) Report on top water injection 5-31-76. (5) Complete modification of test loop for side injection 9-1-77.
KEYWORDS: RADIATION PROTECTION;REACTOR SAFETY;DECONTAMINATION;RADIOACTIVE WASTE DISPOSAL;TUBES;REACTOR COOLING SYSTEMS;WATER;CORE FLOODING SYSTEMS;AIR POLLUTION;AIR;CONSTRUCTION;SCALING

<150211>
TITLE: Core Meltdown Sensitivity Studies
PROJECT NUMBER: A4067
PRINCIPAL INVESTIGATOR: Denning, R.S.
ADDRESS: 505 King Avenue, Columbus, OH 43201
AFFILIATION: Battelle Columbus Labs., Ohio (USA)
MONITORING AGENCY: Nuclear Regulatory Commission, Washington, D.C. (USA)
DIVISION: Office of Nuclear Regulatory Research
MONITOR: Cunningham, Mark A.
TELEPHONE: C(301)443-6947
TYPE OF FUNDING: Contract No.-A4067
77 FUNDING: Nuclear Regulatory Commission FY77:$164,000
TECHNOLOGY: NUCLEAR/General (100%)
ENERGY CYCLE: ELECTRICITY GENERATION (100%)
POLLUTANTS: RADIATION (100%)
CHARACTER OF STUDY: ANALYTICAL (100%)
REGIONS OF INTEREST: GEOGRAPHIC AREAS/Global
RESEARCH CATEGORY: OPERATIONAL SAFETY
PROJECT DESCRIPTION: To determine the sensitivity of LWR risk to uncertainties in the physical phenomena associated with a postulated core meltdown accident.
APPROACH: Response surface modeling of important postulated LWR core meltdown accident sequences (as assessed in Reactor Safety Study).
RESULTS: Ranking of relative sensitivities of LWR risk to uncertainties in various physical phenomena.
PROJECT MILESTONES: Estimated completion date 12/77.
KEYWORDS: RESPONSE SURFACE;WATER COOLED REACTORS;MELTDOWN;PROBABILITY;MATHEMATICAL MODELS;ACCURACY;SAFETY;REACTOR SAFETY

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