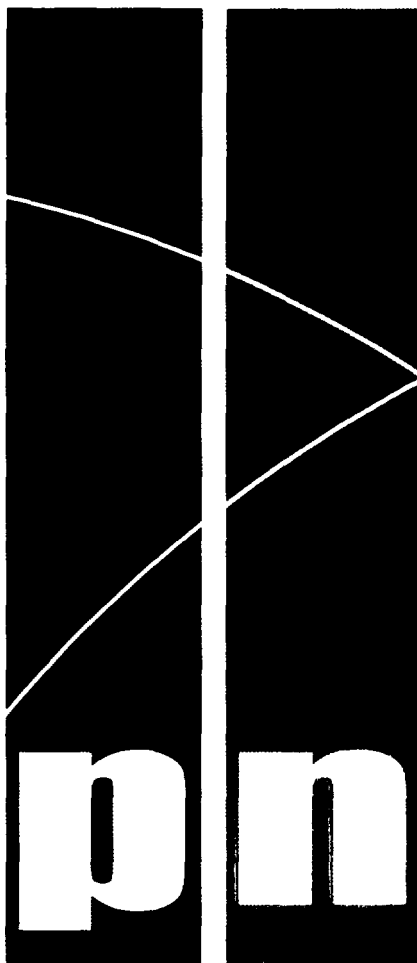




# '96

## ANNUAL REPORT



**PHILIPPINE NUC**




**RESEARCH INSTITUTE**

**VOL 28 No 22**

**We regret that  
some of the pages  
in this report may  
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# **1996 HIGHLIGHTS OF ACCOMPLISHMENTS**





*PNNL's mission is geared towards the effective and efficient delivery of peaceful nuclear energy applications through research and development, specialized nuclear services, technology transfer programs and the firm and fair implementation of nuclear regulatory policies.*

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# MESSAGE

*The year 1996 marked the centennial of the discovery of radioactivity by the French physicist Henri Becquerel. This discovery started a chain of scientific marvels that led to the present day modern applications of nuclear techniques. The centennial celebration culminated in the 2<sup>nd</sup> Philippine Nuclear Congress in which Dr. Hans Blix, Director General of the International Atomic Energy Agency (IAEA), was the keynote speaker. The multisectoral Nuclear Congress participants issued a resolution (printed elsewhere in this report) which identified actions that need to be addressed in improving public acceptance of nuclear energy.*

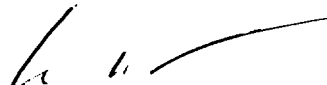
*The PNRI continued to upgrade and repair its facilities including the tripling of the capacity of the multipurpose gamma irradiation facility. The Institute's link to the information highway was enhanced via a local area network.*

*In the international scene, the PNRI supported efforts to establish a Southeast Asia Nuclear Weapons Free Zone (SEANWFZ) and called for the Philippine ratification of the Convention on Nuclear Safety which took effect in October 1996. For the third time since IAEA's existence, the Philippines, through DOST Secretary William G. Padolina, presided the 40<sup>th</sup> IAEA General Conference in Vienna, Austria. The PNRI also sustained its participation in international and regional fora.*

*PNRI co-hosted seven regional and national training events involving participants from Regional Cooperative Agreement (RCA) member states in the Asia-Pacific region. PNRI's participation in the Nuclear Power Steering Committee (NPSC) continued in three main responsibility areas: radioactive waste management, nuclear safety and nuclear fuel cycle as well as in nuclear education, a priority goal of the Committee.*

*During the year, PNRI supported a bill filed in the house of Congress regarding the establishment of a radiation technology center at PNRI. Implementation of the activities under the memorandum of understanding with the Atomic Energy Canada, Limited (AECL) was begun with a visit of the Director to AECL's facilities and a three-month assignment of a PNRI personnel to the latter's radioactive waste management research laboratory.*

*The support of the PNRI personnel, the DOST hierarchy and the PNRI's cooperators and collaborators in the nuclear field are much appreciated.*

  
**CARLITO R. ALETA, PH.D.**  
DIRECTOR



# Nuclear & Allied Services

*PNRI ensures the accelerated and efficient delivery of nuclear and allied services to its various clients in industry, business, health sector, government and the academe.*

## **GAMMA IRRADIATION**

The PNRI continued to provide gamma irradiation services to industry, the academe and other research institutions using the cobalt-60 multipurpose gamma irradiation facility and the Gammacell-220. In May 1996, PNRI upgraded its cobalt-60 (source of gamma radiation) from 120,000 curies to 150,000 curies. This was done to meet the increased demand of the medical/pharmaceutical industry for sterilization and decontamination of their products by gamma radiation. This year, 6,147 samples were irradiated in the pilot-scale irradiation facility, an increase of 127% compared to last year's 2,705 samples.

The Gammacell-220 was used for smaller volume of irradiation. A total of 2,484 samples were irradiated in this facility.

## **RADIOISOTOPE SUPPLY**

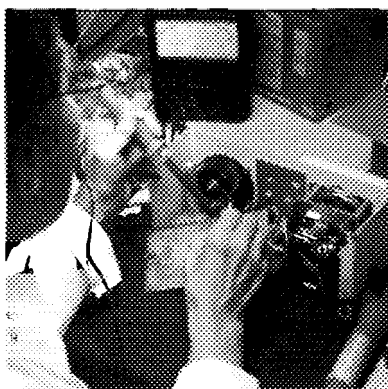
The Institute dispensed and supplied 361 orders of Iodine-131 (amounting to 193,897 MBq) to ten nuclear medicine centers and hospitals in the country. Iodine-131, a radioisotope used in the diagnosis and treatment of thyroid disorders, is being purchased by PNRI in bulk. The PNRI supplied I-131 to the hospitals at a lower cost than those purchased directly by end-users.

## **ENGINEERING SERVICES**

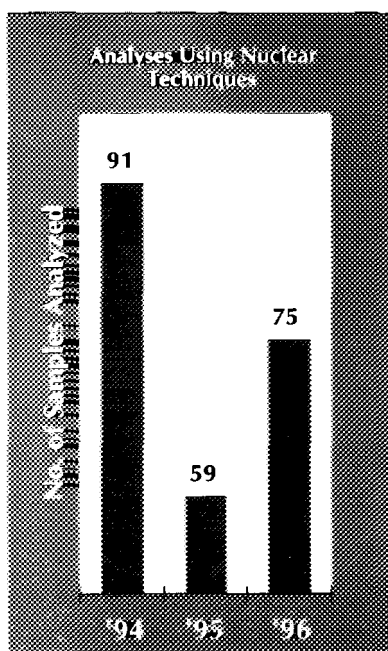
Design, fabrication, repair and other engineering services were done, not only for PNRI but for external clients as well. The engineering group designed and fabricated bench-type high and low voltage power supplies and a research



Loading of additional cobalt-60 radioactive source at the multipurpose irradiation facility.



A PNRI technician repairs a nuclear instrument.



pulser; repaired 215 instruments for PNRI and 10 non-PNRI institutions; fabricated 30 drop-out relays to protect instruments from transients arising from power outages; and completed the plans and specifications for the power conditioning of the Cobalt-60 multipurpose irradiation facility.

PNRI also provided mechanical engineering services through the following; completion of 39 major jobs and 466 minor jobs for the fabrication of electro-mechanical devices such as catalytic converter, rubber latex mixer, handling tongs and fumehoods; repair and maintenance of electro-mechanical equipment such as refrigeration and air-conditioning units and vacuum pumps; and preparation of the conceptual design and general specifications of the spent fuel storage and high-level source handling facility.

### NUCLEAR-RELATED ANALYTICAL SERVICES

Seventy-five samples from 20 external clients were analyzed at PNRI for radioactivity levels using nuclear-related techniques. The samples consisted mostly of export products such as cocoa, desiccated coconut, fertilizers, meat, coconut oil, tobacco and tuna. None of the samples analyzed exceeded the appropriate standards for radioactivity. In addition, a total of 73 samples were analyzed for PNRI groups.

### COMPUTER SERVICES

The computer group installed the PNRI Local Area Network (LAN) to allow networking among the various computers in the Institute. The group also developed four new application software packages. These were the radiation instrument calibration system, the library statistics data base, accounts receivable subsidiary ledger and the PNRI personnel information system for Windows®. Twenty-nine existing application modules and routines were modified and 236 job requests and consultations were addressed throughout the year.

A wireless LAN connection with the Advanced Science and Technology Institute (ASTI) was set-up, enabling the PNRI to have a direct INTERNET connection without going through a telephone line. A PNRI web site at the ASTI Web server was also set-up and a PNRI Home page is now available as well.

### RADIATION PROTECTION SERVICES

The PNRI continued to provide different radiation protection services to workers occupationally exposed to radiation and to users of radioactive materials and nuclear instruments. The services ensure that the workers, as



well as the general public, are not unnecessarily exposed to ionizing radiation. This year, the radiation exposures of 2,719 workers from 315 institutions were monitored through a national film badge service at PNRI. The Institute calibrated 420 nuclear instruments from 72 institutions to ensure reliable measurements. A total of 350 radioactive sources were leak-tested. The PNRI also collected 20 units of spent sealed radioactive sources and 9.28 cubic meters solid and 261.6 liters of radioactive wastes. Special calibration services were also provided to radiotherapy facilities and nuclear medicine centers.

### HEPATITIS B DETECTION

The Institute has successfully completed its experiments on the labelling of monoclonal antibodies (anti-HBs) with the radioisotope Iodine-125. Hence, bulk reagents for the determination of Hepatitis-B surface antigen (HBsAg) may now be supplied for free to government agencies upon request.

PNRI also pursues collaborative efforts with the Research Institute for Tropical Medicine for the source of monoclonal anti-HBs and with the Philippine National Red Cross for the supply of human serum which will be used for Hepatitis B detection.

### CYTOGENETIC ANALYSIS

The cytogenetics group provided the following services to various clients: cytogenetic analysis for 34 clients to track down the occurrence of genetic defects such as multiple congenital anomalies and Downs Syndrome; monitoring occupational exposures of radiation workers; and production/rearing of laboratory mice for research.

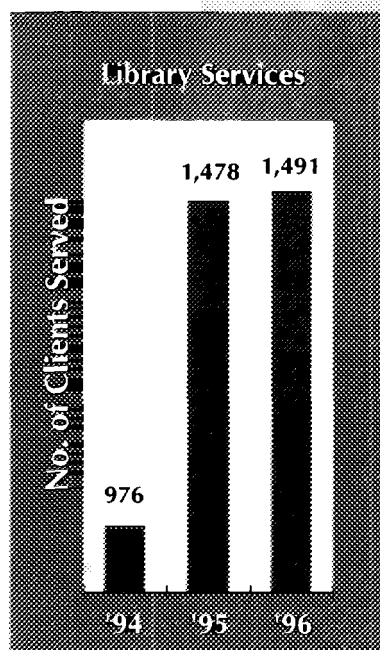
### LIBRARY AND DOCUMENTATION SERVICES

A total of 1,491 researchers from the academe, government institutions and industry sector used PNRI reference materials and library facilities. To better serve PNRI and non- PNRI clients, 1,670 books, periodicals, journals and other reference materials were acquired, bringing the PNRI library holdings to 18,256 as of December 1996.

PNRI continued its participation to the International Nuclear Information System (INIS) by sending 64 title entries of nuclear documents to the INIS database in Vienna, Austria. INIS, a bibliographic database covering 90% of the world's nuclear literature, may be accessed at PNRI by researchers via the local area network (LAN) and via Internet. As participation to the SCINET, PNRI inputted and classified 150 titles of books for On-line Public Access Catalog (OPAC).



A PNRI radiation protection personnel measures optical density of film badges used by persons occupationally exposed to radiation.





**PNRI Director Carlito R. Aleta, assisted by PNRI's nuclear training head, hands certificate to one of the participants of the nuclear science education training course.**

## **NUCLEAR TRAINING**

The PNRI conducted 31 nuclear training courses with 400 participants from 217 institutions. These courses were in the fields of nuclear science and technology, radiation safety and non-destructive testing techniques (NDT). Five of the courses were for faculty/educators in the secondary and tertiary levels. These were conducted in Central Luzon Polytechnic College in Cabanatuan, Nueva Ecija and the Benguet State University in La Trinidad, Benguet. The NDT training courses were conducted in cooperation with the Philippine Society for Nondestructive Testing.

As part of the Institute's manpower development program in the field of nuclear technology, 53 high school and college students from Metro Manila and nearby provinces were given on-the-job training in the different research laboratories within PNRI. Twenty-three seminars/lectures were conducted at PNRI, as well as in different secondary schools, as part of PNRI's nuclear education program.

## **INFORMATION SERVICES**

The promotion of the beneficial uses of nuclear energy has been carried out through the following information dissemination activities: For 1996, 38,312 nuclear information materials dissemination were distributed/loaned-out to 11,241 clients. A total of 6,839 visitors from 132 schools/agencies came to PNRI for an educational tour of its laboratories and facilities. PNRI also provided assistance to 200 walk-in visitors. Twenty-seven nuclear information and promotional materials consisting of publications, exhibits and postcards were developed. PNRI also participated in special events such as in technology fairs. Tri-media linkages were pursued through the following: 19 radio interviews/radio plugs; preparation/monitoring of news releases and radio spots; conduct of four press conferences in cooperation with the Science and Technology Information Institute and the Philippine Information Agency; and coordinated 39 television coverages/interviews. The information services group also conducted seven nuclear awareness seminars in schools in Metro Manila and in one province.



**These students comprise the thousands of visitors who go to PNRI for their educational tour.**

# Research & Development

*The Institute's nuclear research and development programs are directed to contribute in the improvement of the country's agricultural productivity, industrial efficiency, health care services and environmental management.*

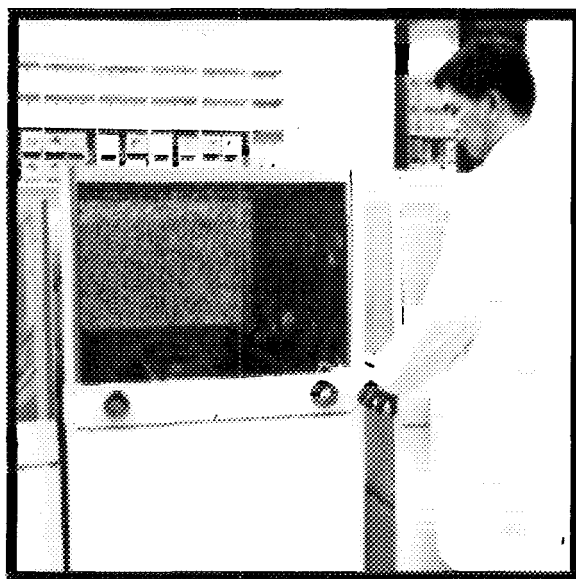
## EXPORT WINNERS

### FRUIT FLY CONTROL

In collaboration with the National Mango Research and Development Center-Bureau of Plant Industry, PNRI continued its preparations for the island-wide annihilation of Oriental fruit flies in Guimaras province using the sterile insect technique (SIT). For 1996, fruit flies from Guimaras were mass-reared at PNRI's entomology laboratory. The fruit fly's life history traits through several generations (such as fecundity, egg hatchability and sex ratio) were established. About 340,000 pieces of fiberboard squares, which will be used as absorbent material for methyl eugenol (an insect attractant), were processed. The SIT information campaign at Guimaras was likewise conducted in cooperation with the local government.

### GENETIC SEXING OF FRUIT FLY

In the sterile insect technique (SIT) of controlling fruit fly population, it would be best to be able to transport to the area of operation an all-male batch of fruit flies to mate with female fruit flies in the target area. Hence, a new project on the genetic sexing of *B. philippinensis* was started in 1996. It aims to develop genetic sexing markers in the fruit fly to enable the selection of male fruit flies during the production stage, thus cutting the cost of mass production by about one-half.



Mass rearing of fruit flies at the PNRI's entomology laboratory.



The Parrot variety of Heliconia is one of the ornamental plants being studied at PNRI.

## QUARANTINE TREATMENT OF ORNAMENTALS

Studies on the use of radiation as an alternative quarantine treatment for ornamentals intended for export continued. As part of this study, the life cycle and radiosensitivity of the different stages of orchid weevil to radiation were established. With respect to studies on vase life of ornamental plants, *Oncidium* was found to be the most sensitive to radiation among *Anthurium*, *Dendrobium* and *Heliconia*. PNRI also found that the Parrot variety of *Heliconia* was more tolerant to radiation than the other varieties, namely, Parakeet, Sase and *Andromeda*.

## BIOLOGICAL MARKER

PNRI has devised a simple chromogenic test for tyrosinase present at different stages of development of the fruit fly starting from three-day old larvae. It was found that gamma radiation destroys a radiosensitive gene locus in *B. philippinensis* responsible for producing the Gs-protein. This protein has tyrosinase enzyme activity. Using homogenate material from fruit fly, the test produces a positive dark brown to black coloration on a test spot mounted on acetate film containing the substrate 2-methyl DOPA. Since the irradiated fruit fly does not have the Gs-protein, it gives a negative reaction to this test. This test is being developed as a quarantine diagnostic kit.

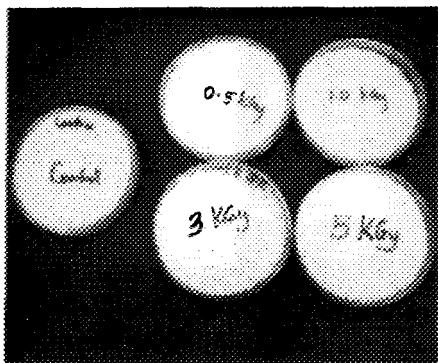
## APPLICATION OF X-RAY ANALYSES

PNRI's applied physics researchers determined the thickness coating of gold in fashion jewelry and the accurate composition of gold in fine jewelry using the radioisotopes excited x-ray fluorescence (XRF) spectrometer and the total reflection x-ray fluorescence (TXRF) spectrometer. These facilities were also used to determine major to trace element composition of samples from PNRI and non-PNRI clients such as sediments, minerals, environmental samples (water, forage, soil) and biological samples (milk, molasses).

## BASIC DOMESTIC NEEDS

### FOOD IRRADIATION

PNRI started a collaborative study with the National Food Authority and the Philippine Rice Research Institute to determine the efficacy of gamma radiation in extending the shelf-life of rice and corn as well as in decreasing post-harvest losses by reducing microbial growth and insect disinfestation.



PNRI studies the effects of different doses of radiation in rice.

Results showed that microbial growth and insect infestation were significantly reduced in irradiated rice as compared to non-irradiated rice after ten months storage under simulated commercial conditions. There was also a significant reduction in insect infestation in corn after four months of storage.

## DAIRY CATTLE PRODUCTION

PNRI used the progesterone radioimmunoassay (RIA) technology in assessing the fertility and reproductive status, as well as the effects of strategic nutritional supplementation of 30 dairy cattle in a project site in Laguna. The cattle were being managed at a smallholder level. The strategic feed supplementation of BCmM feed mix given to the pregnant cows resulted in a significant decrease in calving-to-conception interval (from 245 days to 134 days) among 53% of the cows. The feed supplementation also resulted in a significant increase in milk yield among 42% of the cows. This was given to the cows two months prior to calving till three months postpartum. Only 1.7% of the cows were found to be subestrus/with poor ovarian function.



A nuclear technique is used to improve dairy cattle production.

## MUTATION BREEDING

*Rice.* Stable mutants from Malagkit Sungsong and Perurutong were obtained and were yield tested. M Sungsong and Perurutong are two traditional rice varieties which were irradiated to improve their standability and yield. The yield testing confirmed that the short mutants in M. Sungsong yielded higher than the original variety. Mutants from Perurutong also yielded higher than the original variety although they mature in 135 days. These mutants were crossed with other varieties to incorporate their short stature and their characteristics.

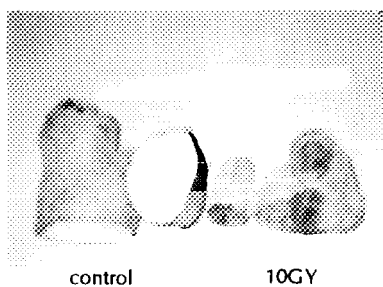
*Pineapple.* A very desirable mutant was obtained from the Queen variety pineapple. The fruit of this mutant has a very sweet taste, has a high density and has a shelf-life of about ten days instead of the usual five.

*Ubi.* Recurrent irradiations of the storage roots of the ubi (yam) variety from Zambales and the Kinamay variety from Bohol resulted in a 100% increase in purple coloration of the yam's flesh. There is a greater market preference for ubi with more purple coloration.

*Ornamentals.* PNRI started a new project on improving the characteristics of ornamentals through mutation breeding. Propagules of chrysanthemum (London Gold and Malaysian Red v. varieties) and gladiolus (Red variety) were gamma irradiated. Results of the first generation planting showed that seedling height, length of roots, and number of roots of gladiolus decreased



Mutation breeding helps in improving the pineapple Queen variety.



Irradiation resulted in a more purple Kinamay ubi variety.

with increasing radiation dose. At 40 Gy, gladiolus plants produced/bore flower buds 17 days earlier than the non-irradiated ones. Stimulation of plant height was observed in chrysanthemum irradiated at lower doses. Stem bifurcation was observed with the greatest frequency at 10 Gy.



Application of phosphorus fertilizer to mungbean plants in Guimaras.

#### **BIOLOGICAL NITROGEN FIXATION UNDER STRESS CONDITION**

As part of this project, PNRI researchers conducted field experiments in acid soil in Guimaras to study the response of the M79-106-25, PAEC-3 mutant and Taiwan Green mungbean varieties to phosphorus applications. Results showed a high bean yield of 466 kilos of M79-106-25 per hectare when the soil was applied with 180 kilos of phosphorus per hectare. Mungbean planted in soils that were not treated with phosphorus and lime did not thrive.

#### **DEVELOPMENT OF A Tc-99m GENERATOR**

This year's research activities focused on the preparation of a larger-size technetium-99m (Tc-99m) generator. The development of a local supply of the generator can provide low-cost Tc-99m radionuclide which is useful for imaging of various organs such as the brain, kidney, lung, liver, heart, bone and thyroid and for diagnosing some metabolic disorders.

#### **URBAN WASTE MANAGEMENT**

In previous years, PNRI conducted studies using radioactive tracer techniques to help the Metro Manila Development Authority (MMDA) in improving the operation and management of the San Mateo landfill facility. As a result of these studies, the MMDA installed aerators in May 1996 in one of the landfill treatment ponds. These aerators have corrected the stagnant zones and have improved the flow of garbage leachate in the ponds.



Samples are taken from the San Mateo landfill leachate pond for migration of leachate studies.

#### **POLLUTION-RELATED STUDIES**

As part of the air pollution project, PNRI established air monitoring stations at the Ateneo de Manila University observatory grounds and at the La Mesa Dam water treatment facility. Each station is equipped with a Gent-type dichotomous sampler for collection of air particulates and a meteorological tower for continuous monitoring of wind speed and direction.

Analytical procedures for the analysis of low-level concentrations of toxic and other elements in water samples by total reflection x-ray spectrometry are being developed. Preliminary results of the analysis of water samples from Metropolitan Waterworks and Sewerage System and well water samples from Metro Manila indicate varying concentrations of some elements.

## **RADIATION STERILIZATION OF MEDICAL PRODUCTS, TISSUE GRAFTS AND PHARMACEUTICALS**

PNRI studies showed that ten kinds of medical and pharmaceutical products produced by four companies are feasible for radiation sterilization by gamma radiation at a dose of 25 kGy. These products are bandage strips, tamper-proof caps, plastic plugs, empty vials of plastic eye droppers, antibiotic bid-mold makers and orthopedic implants such as acetabular cup, femoral stem, femoral canal brush, acetabular brush and femoral cement plug. PNRI conducted microbiological tests such as bioburden and sterility tests on these products as requested by the four medical and pharmaceutical companies.

## **ENVIRONMENTAL RADIOACTIVITY MEASUREMENTS**

Radioactivity in the environment was monitored through air, soil, water and diet samples collected in areas surrounding the Philippine Research Reactor (PRR) and in other parts of the country. The average gamma radiation dose rate observed in these areas was still below the  $55 \text{ nGy h}^{-1}$  worldwide average.

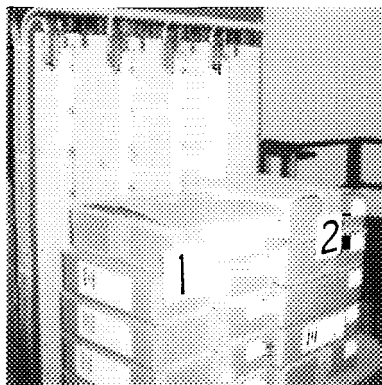
PNRI also monitored the radioactivity concentrations of cesium-137 in seawater and fish samples collected off the coasts of Surigao City, Batanes Island and Borongan, Samar as part of the Institute's radioactivity surveillance on the French nuclear tests in the Pacific. The concentrations of cesium-137 in these samples were within the reported allowable level of  $5 \text{ Bqm}^{-3}$ .

## **RADON MONITORING**

PNRI measured the levels of radon in the storage room of a clinic in Iloilo City where radium needles used for brachytherapy are stored. The radon levels observed ranged from  $36$  to  $192 \text{ Bqm}^{-3}$  indicating some leakage of radon from the needles. These levels, however, are still within the limits set by the International Commission on Radiological Protection which is  $200 \text{ Bqm}^{-3}$  for the general public and  $1000 \text{ Bqm}^{-3}$  for radiation workers. PNRI recommended to the clinic owner to bring the radium needles, which are no longer used, to the Institute for proper disposal.

## **BIOLOGICAL MONITORING OF ENVIRONMENTAL POLLUTION**

The HGPRT (hypoxanthine-guanine phosphoribosyl transferase) mutation assay in human blood samples was used by PNRI as an indicator of exposure to environmental pollution of persons residing and working in Valenzuela and in Las Piñas. Based on the data from the Environmental Baseline Mutation Databank (EBMD) for Valenzuela and Las Piñas, 59% of the Las



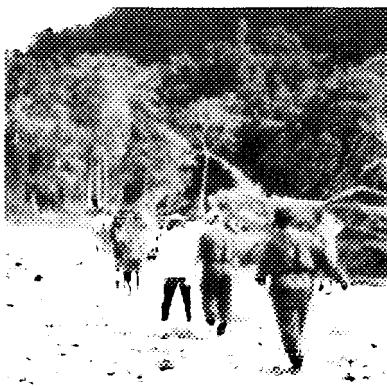
Gamma radiation from cobalt-60 can sterilize the medical products inside the carton boxes.



Monitoring of environmental radioactivity near the Philippine Research Reactor.



HGPRT mutation assay in blood samples is being used as an indicator of exposure to environmental pollution.



A geochemical stream sediment sampling team passes through a dry river bed in Roxas, Palawan.



Drying of radiation vulcanized natural rubber latex films prior to tensile strength determination.

Piñas residents have a mean mutation index (MI) of 0.3209 while 67% of Valenzuela residents have a mean MI of 0.4829. These values show that Valenzuela residents are exposed to higher levels of environmental pollutants than those from Las Piñas.

## SUPPORT INDUSTRY

### SURVEY FOR NUCLEAR AND OTHER INDUSTRIAL MINERALS

Results of the geological and geochemical verification surveys for nuclear minerals and rare earth elements (REE) conducted in Palawan confirmed the postulated presence of a large domal structure which could be the harbinger of mineralization in northern Palawan.

The reconnaissance geochemical and radiometric surveys in the southern half of Palawan was started. The 375 samples taken from southern Palawan are being processed prior to analysis.

A foot-borne gamma ray spectrometric survey was likewise conducted at Rapu-rapu island in Albay. Results of the 680 measurements done in 136 sampling stations covering an area of 0.28 sq km showed that the system may be a useful exploration tool in outlining volcanogenic massive sulfide deposits, silver and gold mineralization in Rapu-rapu.

## COCONUT INDUSTRY

### RADIATION POLYMERIZATION

*Cocochemicals.* Radiation products have been obtained from the polymerization of coconut oil and lauryl alcohol with methyl methacrylate (MMA). These can be separated from the starting materials by their different solubility properties in creating solvents. The viscosity and consistency of these products can be varied depending on the radiation dose and the amount of MMA added to the reaction. A whole range of applications from lubricants to plastilizers and polymeric materials, is therefore, possible.

## OTHER PRIORITY AREAS

### RADIATION VULCANIZATION OF NATURAL RUBBER LATEX

PNRI completed the laboratory scale irradiation of natural rubber latex (NRL), and established the specifications of Philippine irradiated NRL. On



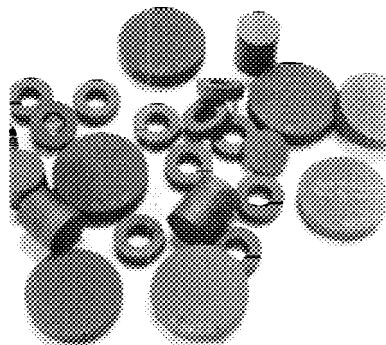
the pilot-scale stage, 100 liters of NRL were gamma irradiated, and distributed to three local manufacturers of dipped natural rubber products. Test production of rubber gloves, balloons and other dipped products using irradiated NRL is presently being performed by these manufacturers.

### **HIGH TECHNOLOGY MATERIALS DEVELOPMENT**

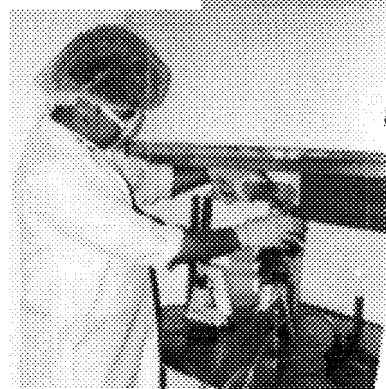
In collaboration with the Indonesian Atomic Energy Agency (BATAN), PNRI synthesized and characterized Potassium Beta Ferrite with composition,  $5.33\text{Fe}_2\text{O}_3\cdot\text{K}_2\text{O}$ , a superionic conductor or solid electrolyte of the beta alumina type using neutron scattering, x-ray diffraction, Fourier Transform Infrared and thermal analysis. This activity is being undertaken in connection with PNRI's participation in the national effort to develop high technology materials and electronic devices of importance to current and future industries.

### **PROTECTORS FOR RADIATION THERAPY**

The PNRI has started a new project on anti-cancer drugs which can regulate the mechanisms of sensitivity of normal and tumor cells to radiation and chemotherapy. Preliminary tests have been performed with the use of herbal drugs such as ginseng and garlic as radioprotectors using mouse intestinal crypts (in vivo) and thymocytes (in vitro) as models. Extracts from garlic radioprotected the highly radiosensitive crypt cells and the epithelia of the villi at 15-20 Gy. Ginseng extracts only protected the villi cells. The radioprotectors were found to induce apoptosis or programmed cell death. Both extracts radioprotected the mouse thymocytes.



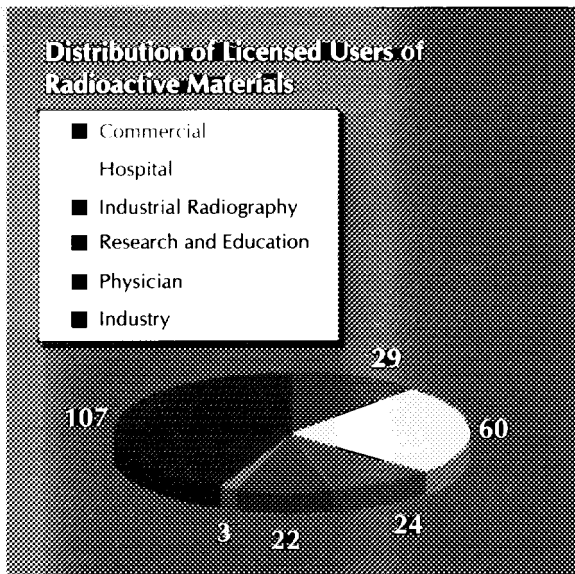
Ferrites are developed at PNRI's applied physics research laboratory.



Culture media for thymocyte cells from mouse being prepared as part of the study on protectors for radiation therapy.

# Nuclear Safety & Regulations

*The PNRI enforces nuclear safety and regulations to ensure that the uses of radioactive materials are carried out safely and would not pose unnecessary risk to radiation workers and the general public.*



## LICENSING, REVIEW AND EVALUATION

PNRI is the country's regulatory body on the use of nuclear radiation technology. Thus, the Institute continued to review, evaluate and assess the license applications of industrial, medical and other institutions for the authority to use, possess, sell and import radioactive materials.

For this year, 245 government and private institutions have been issued a total of 264 licenses. This number represents an increase of 33% as compared to the previous year's 199 licenses. Of the newly licensed institutions, 12 are industrial firms, 5 are hospitals, one is a research laboratory and one is a commercial firm.

## INSPECTION AND ENFORCEMENT

PNRI nuclear regulators inspected 204, or 88%, of the 232 scheduled inspections and audits of licensed facilities using radioactive materials. Corrective actions were implemented by licensees on PNRI's findings on non-compliance to nuclear safety rules and regulations. For non-compliance, enforcement action in a form of a Cease and Desist Order for the temporary closure of operations was issued until the required corrective actions have been satisfactorily completed.

## **RADIOLOGICAL IMPACT ASSESSMENT**

An initial assessment of the projected atmospheric release of radioactivity at the PNRI radwaste facilities was completed. Results of dose projections did not exceed the annual limit for members of the general public.

As part of the activities of the Nuclear Power Program Sub-Committee on Nuclear Safety, PNRI started the project on the comparative safety assessment of nuclear plants and other electricity generating plants. Sample comparative analyses of the plants were made using an environmental assessment computer code.

## **RADIOLOGICAL EMERGENCY PREPAREDNESS**

The Institute, as the lead agency in the development and update of the national radiological emergency preparedness and response plan (RADPLAN), organized and conducted two seminars this year. Representatives from 20 RADPLAN member-agencies participated in these seminars. RADPLAN aims to respond promptly to any related emergency which may affect the country in the light of nuclear developments all over the world.

The Committee on Radiological Emergency (CORE) was also reorganized and was formally proposed to be a working committee of the National Disaster Coordinating Council (NDCC). The members of the CORE are the Office of the Civil Defense as chairperson, PNRI as co-chairperson with the Radiation Health Office/Department of Health, Department of Agriculture, Department of Environment and Natural Resources, Department of Interior and Local Government, PAGASA and the Department of Labor and Employment as members.

## **STANDARDS**

The Institute, as authorized by Law, promulgates rules and regulations, establishes standards, and issues orders and bulletins on the possession and use of radioactive materials. These rules and regulations are codified in the Code of PNRI Regulations (CPR). For this year, PNRI completed two specific rules that are awaiting approval for publication in the Official Gazette. These are CPR Part 16, "License for the Use of Sealed Sources Contained in Industrial Devices"; and CPR Part 17, "License for the Commercial Sale and Distribution of Radioactive Materials and Devices/Equipment Containing Radioactive Materials". On its final stage of development is CPR Part 18, "Licenses for Use of Radioactive Materials in Research and Education". CPR Part 3, "Standards for the Protection Against Radiation" and CPR Part 4,



**A PNRI resource speaker enlightens RADPLAN seminar participants about radiation.**



**Standards unit head briefs representatives of licensed industrial firms during the nuclear regulatory conference at PNRI.**

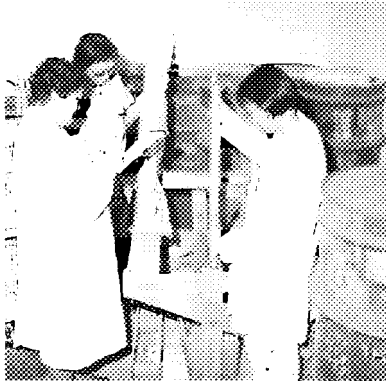
"Regulations for the Safe Transport of Radioactive Materials" are being revised to incorporate current developments and provisions in these areas.

PNRI also completed four regulatory guides and eight bulletins to improve understanding of regulatory requirements and the effectiveness of regulatory enforcement.

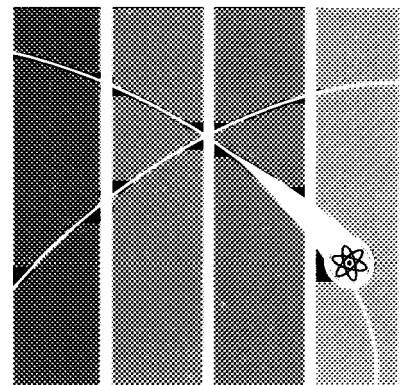
### **SAFEGUARDS**

The PNRI continued to implement the Philippine system of accounting for, and control of, nuclear materials stored in the Philippine Research Reactor in Diliman, Quezon City and in the Bataan Nuclear Power Plant. As part of this activity, the International Atomic Energy Agency (IAEA) safeguards inspectors team conducted an annual physical inventory/verification inspections of these facilities with the assistance of the PNRI safeguards team. Reports on these inspections were submitted to the IAEA.

A technical manual, which will improve the sealed radiation sources registry system in the Philippines, was also developed.



The PNRI safeguards team inspects the uranium fuel stored at the research reactor.



# General Administration & Linkages

## ADMINISTRATIVE SERVICES

The Finance and Administrative Division (FAD) facilitated the participation of 137 PNRI employees to local trainings, seminars/workshops, symposia and conferences (see lists on pages 34-37). The FAD also facilitated PNRI's request for exemption of seven positions from Attrition Law which prohibits the hiring of new employees. The Civil Service Commission approved all the positions that PNRI requested for exemption.

FAD also attended to the upgrading of PNRI facilities. For 1996, 13 repair projects were contracted out, 12 have been completed and one is on-going. The construction of the PNRI Administrative Building (Phase 2) was also continued. As of 1996, about 60% of the whole building had been completed. Five repair works on the Philippine Research Reactor were also contracted out.

## LINKAGES

### LOCAL LINKAGES

The PNRI continued to chair the four-year old Quezon City Science Community which is presently composed of 41 member agencies. It also actively participated in the Nuclear Power Steering Committee which was created in 1995 by President Fidel V. Ramos to "provide policies, direction and monitoring, evaluation and other functions necessary and appropriate to attain the objectives of the overall nuclear power program of the country."

Tie-ups with other government agencies, the private sector and the academe were likewise strengthened and new ones were forged through PNRI's research and development activities, nuclear regulatory functions, technical extension services and through the Institute's grants-in-aid program (see list on page 29).

## MANPOWER PROFILE

### Statistics by Activity

R&D	6
Regulatory	37
S&T Services	70
S&T Education	10
Administrative	70
Total	286

### Statistics by Education

Ph.D.	6
MS-MA	6
BS	160
Below BS	7
Total	286

## FOREIGN LINKAGES

The PNRI, as the Philippine focal agency in the world's nuclear authority - the International Atomic Energy Agency (IAEA) - has always drawn support from the IAEA. The Institute has also cooperative programs on nuclear S&T with the following institutes: Australian Nuclear Science and Technology Organization (ANSTO), Atomic Energy Canada Limited (AECL), Indonesian National Atomic Energy Agency (BATAN), Korea Atomic Energy Research Institute (KAERI), Science and Technology Agency (STA) in Japan, Japan Atomic Energy Research Institute (JAERI), Japan Atomic Industrial Forum (JAIF), Japan International Cooperation Agency (JICA) and the Power Reactor and Nuclear Fuel Development Corporation (PNC) in Japan.

Through these foreign links, the Institute was able to avail of 24 research contracts; 15 technical cooperation projects; 16 expert services; and 99 fellowships for PNRI staff and non-PNRI researchers.

Participants from nine Asia-Pacific countries pose with guests at the opening session of the 6th Seminar on Public Acceptance (PA) of Nuclear Energy and PA Contact Persons' Meeting at Holiday Inn Manila Pavilion. Guests include Press Undersecretary Honesto M. Isleta (standing, in barong Tagalog), DOST Undersecretary Dr. Estrella F. Alabastro and PNRI Deputy Director Aida D. Eugenio (seated, 6th and 7th from left). Also in photo is Mr. Edilberto A. Cabalfin, PNRI-NSTD Chief, who is the Philippine PA Contact Person and National Coordinator for the seminar.



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## LINKAGES

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Through these foreign links, the Institute was able to avail of 24 research projects; 15 technical cooperation projects; 16 expert services; and 99 projects for PNRI staff and non-PNRI researchers.



# Special S&T Events

*The Institute actively participated in national S&T events in cooperation with various agencies.*

## EVENTS

- Annual Science and Technology Fair, 17–22 July 1996; Philtrade, Roxas Boulevard, Manila. Theme: "Towards a Technologically Competitive Philippines"
- Quezon City Science Community's Celebration of the National Science and Technology Week ; 18 July 1996 at the Social Science Building of the Ateneo de Manila University, Quezon City
- 24<sup>th</sup> Atomic Energy Week; 9-13 December 1996, PNRI. Theme "Challenges of Nuclear Technology in the 21<sup>st</sup> Century"
  - Voluntary Blood Donation, conducted by the National Kidney Institute. Sponsor: Quezon City Science Community
  - Seminar on Radiation and Health. Speaker: Dr. Richard V. Osborne, Atomic Energy of Canada, Limited
  - Technical Poster Contest
  - Exhibits, guided tours of PNRI facilities, film showings, "Tiangge sa PNRI"
- Celebration of the 100<sup>th</sup> Year of the Discovery of Radioactivity (1896–1996)
  - Conventions, nuclear regulatory conferences, seminars/workshops/fora on nuclear technology applications. Sponsors: PNRI, Department of Science and Technology (DOST), Philippine Heart Center, Radiation Health Service/Department of Health and scientific societies such as the Philippine Society for Nuclear Medicine (PSNM), Philippine Association for Radiation Protection (PARP), Philippine Association of Medical Physicists (POMP), Philippine Society for Nondestructive Testing (PSNT), Radioisotope Society of the Philippines (RSP) and Philippine Radiation Oncology Society
  - Poster Contest on the theme "Health Care Delivery Through Radioactivity". Sponsor: Philippine Society for Nuclear Medicine
  - Second Philippine Nuclear Congress, 10-12 December 1996, Manila Midtown Hotel. Organizing Committees: (Honorary Chair) Hon. Domingo L. Siazon, Jr., Secretary, DFA; (Chair) Hon. William G. Padolina, Secretary, DOST; (Co-Chair) Dr. Carlito R. Aleta, Director, PNRI; (Members) Various government agencies and scientific societies.

**A:** DOST Secretary William G. Padolina (right), Quezon City Administrator Manuel S. Alba and DOST Undersecretary Estrella F. Alabastro formally open the Quezon City Science Community (QCSC) exhibit in Ateneo de Manila University. The PNRI serves as the QCSC secretariat.

(A)



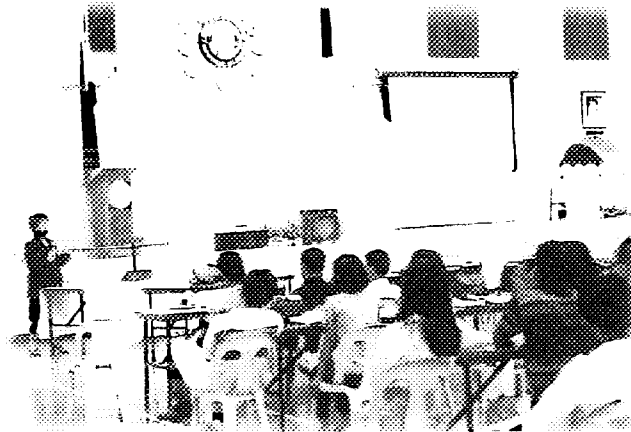
**B:** The PNRI was the third place winner in the Most Original exhibit during the 7th S&T Fair at Philtrade.

(B)



**C:** Mrs. Eulinia M. Valdezco, head, PNRI Radiation Protection group, lectures to participants of the Nuclear Medicine forum at the Department of Health as part of the centennial celebration of the discovery of radioactivity.

(C)



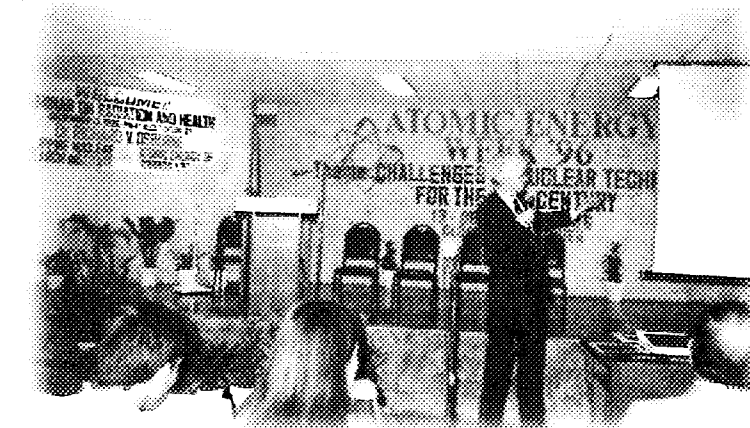
(D)



**D:** Senator Gloria Macapagal-Arroyo (second from left), Atomic Energy Week (AEW) keynote speaker, views the exhibit on the different uses of nuclear technology with (from left to right) Atomic Research Division Chief Alumanda M. dela Rosa, PNRI Director Carlito R. Aleta, Dr. Isabel R. Aleta and DOST Undersecretary Lydia Tansinsin.

**E:** Dr. Richard V. Osborne of Atomic Energy Canada, Ltd. stresses a point during the AEW seminar on Radiation and Health.

(E)



(F)



**F:** AEW exhibit visitors learn about the benefits of nuclear technology in agriculture.

**G:** Stamps and First Day Cover in commemoration of the 100th Year of the Discovery of Radioactivity were issued on April 30, 1996.

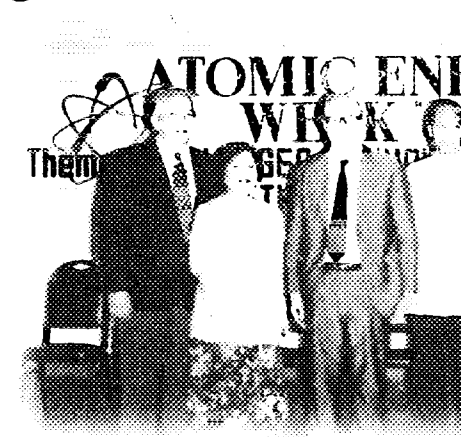
**H:** AEW visitors view the technical poster entries in the contest sponsored by the Philippine Society for Nuclear Medicine.

**I:** IAEA Director General Hans Blix (center) visits PNRI during the AEW celebration. Also in photo are (L to R) Mr Ramon Sytangco (Atomic Energy Canada, Limited), PNRI Deputy Director Aida D. Eugenio, Dr. Carlito R. Aleta and Dr. Richard V. Osborne.

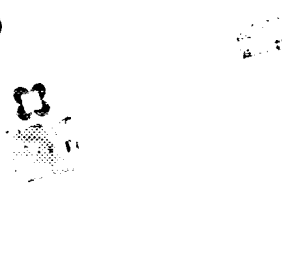
(H)



(I)



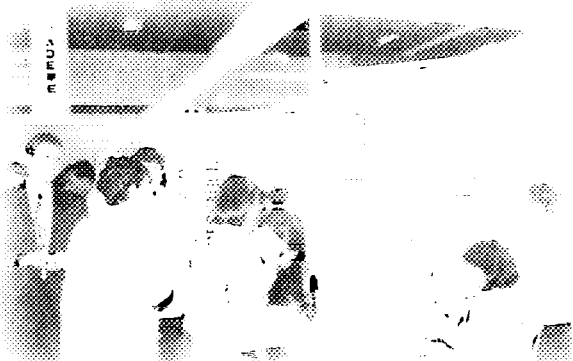
(G)







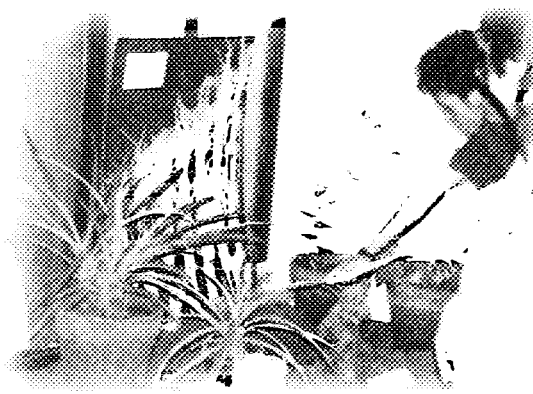
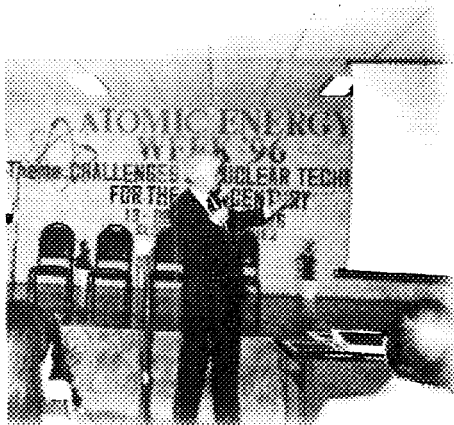
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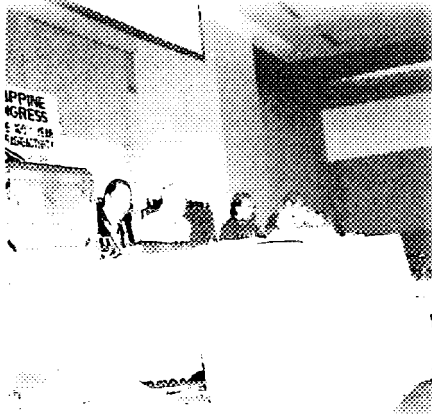


(K)

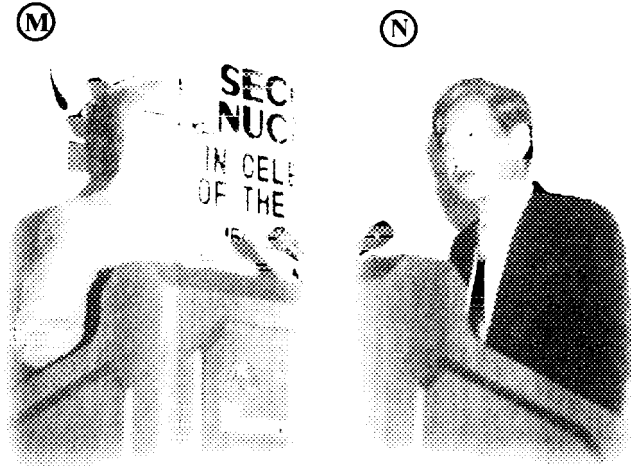


J: Dr. Ma. Cristina D. Padolina and Dr. Isabel R. Aleta (holding ribbons) exchange pleasantries at the opening of the exhibits and posters. Looking on are (from left to right) Dr. Carlito R. Aleta, DOST Secretary William G. Padolina (partly hidden), Foreign Affairs Secretary Domingo L. Siazon, Jr., Prof. Joneho Tabata (Commissioner of Japan's Atomic Commission) and Dr. Hans Blix.

K: Nuclear Congress participants visit the PNRI exhibit booth.



(M)



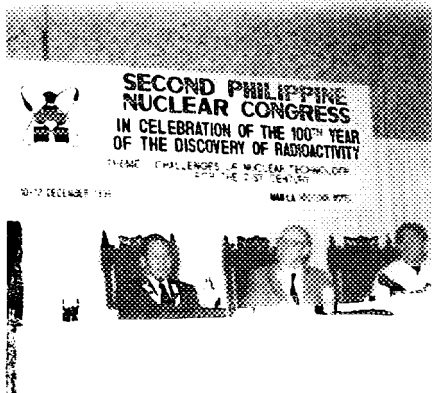
(N)

L: DOST Secretary William G. Padolina welcomes the Congress participants and gives the opening remarks.

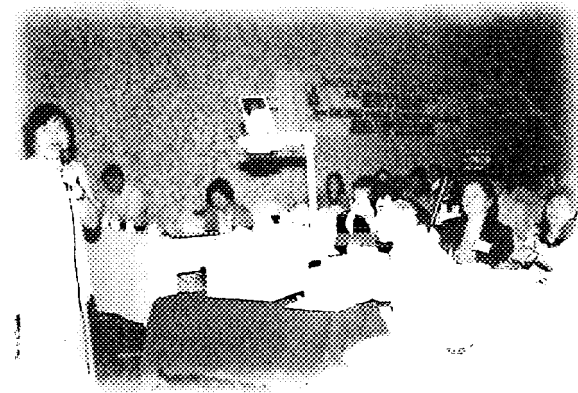
M: Dr. Hans Blix is the keynote speaker at the opening ceremonies.

N: Prof. Joneho Tabata speaks on the experiences of Japan in Nuclear Energy Research and Development at the plenary session.

O: Foreign Affairs Secretary Domingo L. Siazon delivers his message as Dr. Aleta, Dr. Hans Blix and Secretary Padolina listen attentively.



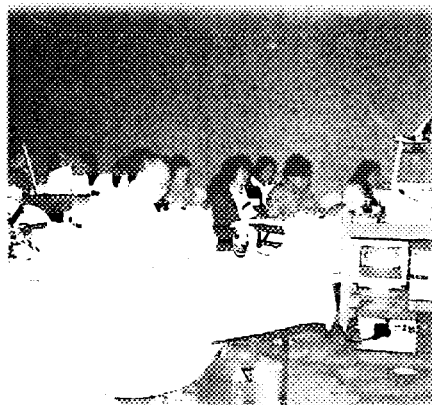
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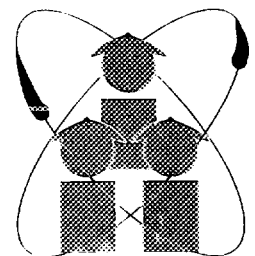
P: Ms. Avelina Lapade, OIC, PNRI Agricultural Research Group, presents Mutation Breeding at the PNRI during the technical session on food and agriculture.

Q: Media is represented by People's Tonight copy editor Mitos Garcia and Manila Bulletin columnist Thor Orig at the technical session on nuclear education and public awareness.

R: Department of Energy Secretary Francisco L. Viray, guest speaker during the nuclear congress closing ceremonies, visits the congress exhibit booths.



(R)



## The 2nd Philippine Nuclear Congress

The DOST, PNRI and other cooperating agencies convened the Second Philippine Nuclear Congress on December 10-12, 1996 as a culminating activity of the year-long celebration of the centennial of the discovery of radioactivity. The event provided stakeholders a forum to assess the national and international issues on nuclear energy and to recommend the directions of nuclear S&T in the next millennium.

### The Resolution Issued by the Multisectoral Participants of the 2nd Philippine Nuclear Congress:

Whereas, the country's and the Asia-Pacific region's demand for energy is expected to accelerate further in the next century to meet the needs of rapid industrialization and an expanding population base;

Whereas, a major portion of output and employment will be accounted for by industry and services and industries will mainly be technologically-based to ensure high productivity, significant value-added and competitiveness;

Whereas, the new millenium shall increasingly call for change in the course of economic development to become less ecologically destructive and society will be highly environment conscious so that citizens and firms demand and patronize environment-friendly technologies and products;

Whereas, food security and health and other basic services are of utmost concern for the growing population;

Now, therefore, be it resolved that:

- The government shall adopt policies that ensure that the nation is prepared to consider and decide on all technological options with particular attention to nuclear science and technology, relative to the needs of sectors other than energy;
- The government shall ensure that the necessary systems, institutions and resources are put in place, mobilized, and given the necessary support;
- The Philippine Nuclear Research Institute (PNRI), the agency best prepared to implement nuclear science and technology programs, shall be given a stronger mandate and support to address the different areas of concern to implement the above-mentioned policy.
- The government shall provide the policy environment and the necessary resources for strengthening science in all educational levels, to include environmental science, nuclear science and energy, with the Department of Education, Culture and Sports and the Commission on Higher Education as lead agencies;
- Priority shall be given to Human Resource Development along the lines of nuclear science and technology and given appropriate support;
- The government shall support a responsive and proactive Information, Education, and Communication (IEC) program to prepare the people to make critical decisions and useful feedback as necessary;
- The Office of the Press Secretary-Philippine Information Agency shall formulate and implement a nuclear energy communication and public acceptance program which would be anchored on a culture of proactive and balanced dissemination of its benefits, risks, and safeguards as well as promote a philosophy of transparency and open lines of communication;
- Research and development efforts in all aspects of nuclear science and its peaceful application shall be strengthened, supported and nurtured.
- Safety shall be a paramount consideration in all activities/processes involving nuclear energy.

(This resolution was strongly endorsed to the Nuclear Power Steering Committee through its Chairman, the Honorable Secretary of Energy Francisco L. Viray, at Manila Midtown Hotel, Ermita, Manila, on the 12th day of December 1996.)

## Financial Resources

### STATEMENT OF REVENUES AND EXPENDITURES

JANUARY TO DECEMBER 1996

#### GENERAL ADMINISTRATION SERVICES

#### GENERAL ADMINISTRATION AND SUPPORT SERVICES

General Administration and Support Services

Sub-Total

#### SUPPORT TO OPERATIONS

Repair and maintenance of nuclear reactor and auxiliary system

Assistance to government institutions

Contribution to the International Atomic Energy Agency and other national and international technological organizations including membership dues

Nuclear training and fellowship grant for trainees of the member countries of the IAEA

Atomic Energy Week Celebration

Sub-Total

#### OPERATIONS

Nuclear research and development including activities for environmental surveillance

Research reactor (TRIGA) utilization

Nuclear services and training including nuclear engineering and facility operations

Purchase of radioisotope materials and instruments

Nuclear regulations, licensing and safeguards

Sub-Total

#### PROJECTS

Locally-Funded Projects

Buildings and structure outlay

Unprogrammed Fund - General Fund Adjustments

Compensation Adjustment Fund

Payment of Productivity

Miscellaneous Personnel Benefits Fund

Custom Duties and Taxes for Importation

Grand Total

\* Continuing Appropriation

Set 7

# Financial Resources

STATEMENT OF FINANCIAL OPERATIONS			
JANUARY TO DECEMBER 1996			
GENERAL ADMINISTRATION SERVICES	ALLOTMENT	OBLIGATIONS	SAVINGS (OVERDRAFT)
GENERAL ADMINISTRATION AND SUPPORT			
General Administration and Support Services	19,592,700.00	17,092,932.00	2,499,768.00
<b>Sub-Total</b>	<b>19,592,700.00</b>		
SUPPORT TO OPERATIONS			
Repair and maintenance of nuclear reactor and auxiliary system	900,000.00	909,888.00	(9,888.00)
Assistance to government institutions	404,500.00	366,500.00	38,000.00
Contribution to the International Atomic Energy Agency and other national and international technological organizations including membership dues	450,000.00	446,450.00	3,550.00
Nuclear training and fellowship grant for trainees of the member countries of the IAEA	134,500.00	0.00	134,500.00
Atomic Energy Week Celebration	134,500.00	95,853.50	38,646.50
<b>Sub-Total</b>	<b>2,023,500.00</b>		
OPERATIONS			
Nuclear research and development including activities for environmental surveillance	21,221,700.00	19,643,545.58	1,578,154.42
Research reactor (TRIGA) utilization	720,000.00	571,130.00	148,870.00
Nuclear services and training including nuclear engineering and facility operations	16,095,600.00	13,375,260.09	2,720,339.91
Purchase of radioisotope materials and instruments	630,000.00	418,250.00	211,750.00
Nuclear regulations, licensing and safeguards	9,698,550.00	8,248,415.61	1,450,134.39
<b>Sub-Total</b>	<b>48,365,850.00</b>		
PROJECTS			
Locally-Funded Projects			
Buildings and structure outlay	28,500,000.00	5,707,597.13	22,792,402.87
Unprogrammed Fund - General Fund Adjustments	1,274,000.00	0.00	1,274,000.00
Compensation Adjustment Fund	5,621,343.00	5,663,487.00	(42,144.00)
Payment of Productivity	572,000.00	572,000.00	0.00
Miscellaneous Personnel Benefits Fund	688,324.00	584,564.89	103,759.11
Custom Duties and Taxes for Importation	493,480.00	493,480.00	0.00
<b>Grand Total</b>	<b>107,131,197.00</b>	<b>74,189,354.39</b>	<b>32,941,842.61*</b>

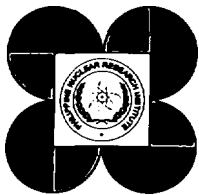
\* Continuing Appropriation

**STATEMENT OF ACTUAL INCOME**

JANUARY TO DECEMBER 1996

OPERATING AND SERVICE INCOME	AMOUNT
GOVERNMENT SERVICE	
Licensing fees, etc.	683,983.00
<b>Sub-Total</b>	<b>683,983.00</b>
GOVERNMENT BUSINESS OPERATIONS	
Sale of radioisotopes	589,846.00
Sale of experimental samples	1,380.00
<b>Sub-Total</b>	<b>591,226.00</b>
OTHERS - SERVICES FEES FOR -	
Calibration	146,320.00
Cytogenetic analysis	41,430.00
Gammametric analysis	79,015.50
Radioactivity analysis	1,500.00
Leak Test	127,595.00
Gross beta-alpha analysis	19,140.00
Radwaste storage/disposal	191,742.50
Smear sample analysis	13,680.00
Monitoring films and cassettes	1,293,667.00
Use of Co-60 facility	314,645.40
Radiological hazard survey	2,645.00
Microscopy	1,165.00
Qualitative x-ray fluorescence analysis	190.00
FT-IR Analysis	4,250.00
Bioburden testing	76,500.00
Sterility test	16,950.00
XRF sample	430.00
Microbiological analysis	1,150.00
<b>Sub-Total</b>	<b>2,332,015.40</b>
FINES AND PENALTIES	
Surcharge	11,411.00
<b>Sub-Total</b>	<b>11,411.00</b>
MISCELLANEOUS INCOME	
Lost calculator	2,480.00
Over-deposit	0.33
<b>Sub-Total</b>	<b>2,480.33</b>
<b>Grand Total</b>	<b>3,620,995.73</b>

# Organization & Key Officials



## OFFICE OF THE DIRECTOR

### OFFICE OF THE DEPUTY DIRECTOR

- ◆ TECHNICAL ASSISTANCE
- ◆ PLANNING
- ◆ INTERNAL CONTROL

## ATOMIC RESEARCH DIVISION

- ◆ AGRICULTURAL RESEARCH
- ◆ BIOMEDICAL RESEARCH
- ◆ HEALTH PHYSICS RESEARCH
- ◆ APPLIED PHYSICS RESEARCH
- ◆ CHEMISTRY RESEARCH
- ◆ ANALYTICAL MEASUREMENTS RESEARCH
- ◆ ISOTOPES TECHNIQUES RESEARCH
- ◆ NUCLEAR MATERIALS RESEARCH

## NUCLEAR SERVICES AND TRAINING DIVISION

- ◆ NUCLEAR REACTOR OPERATIONS
- ◆ ENGINEERING SERVICES
- ◆ IRRADIATION SERVICES
- ◆ NUCLEAR TRAINING
- ◆ COMPUTER SERVICES
- ◆ INFORMATION SERVICES
- ◆ LIBRARY SERVICES

- ◆ STANDARDS DEVELOPMENT
- ◆ INSPECTION AND ENFORCEMENT
- ◆ LICENSING, REVIEW AND EVALUATION
- ◆ SAFEGUARDS
- ◆ RADIATION PROTECTION
- ◆ RADIOLOGICAL IMPACT ASSESSMENT

- ◇ FINANCE AND PROPERTY SECTION
- ◆ BUDGET UNIT
- ◆ ACCOUNTING UNIT
- ◆ CASH UNIT
- ◆ PROPERTY AND PROCUREMENT UNIT
- ◇ PERSONNEL SERVICES SECTION
- ◆ PERSONNEL UNIT
- ◆ RECORDS AND COMMUNICATION UNIT
- ◆ MEDICAL UNIT
- ◇ GENERAL SERVICES SECTION
- ◆ PLANT SERVICES UNIT
- ◆ MOTORPOOL UNIT



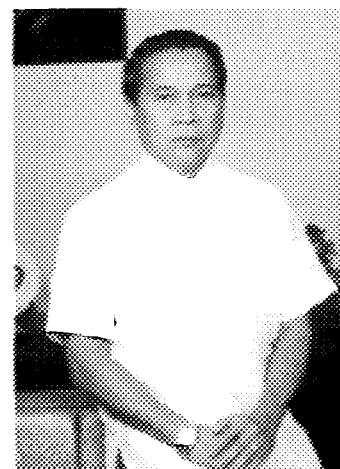
Carlito R. Aleta, Ph.D.  
Director



Alumanda M. dela Rosa, Ph.D.  
Chief, Atomic Research Division



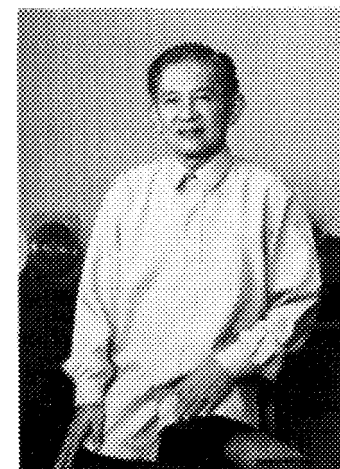
Aida D. Eugenio, M.Sc.  
Deputy Director



Edilberto A. Cabalfin, M.Sc.  
Chief, Nuclear Services & Training Division



Graceta D. Cuevas, DPA  
Chief, Administrative & Finance  
Division



Domingo B. Domondon, M.Sc.  
Chief, Nuclear Regulations, Licensing &  
Safeguards Division



**TABLE 1. LIST OF 1996 IAEA<sup>1</sup> RESEARCH CONTRACTS<sup>2</sup>**

RESEARCH PROJECT	CHIEF INVESTIGATOR	AGENCY
• Improving Dairy Cattle Production at Farm Level in Southern Luzon, Philippines	Adoracion L. Alejandrino	PNRI Biomedical Research Section
• Irradiation as a Quarantine Treatment for Ornamentals	Eugenia C. Manoto	PNRI Agricultural Research Section
• Genetic Sexing of <i>Bactrocera philippinensis</i> in the Philippines	Florencio I. S. Medina III	PNRI Biomedical Research Section
• Multielement Characterization of Air Particulates from Selected Urban Centers of the Philippines	Flora L. Santos	PNRI Analytical Measurements Research Section
• Development of Process Control for Irradiation of Fresh Mangoes	Estelita G. Cabalfin	PNRI Irradiation Services Section
• Options for Cost-Effective Treatment of Low-level Radioactive Wastes Containing C-14, H-8 and Radioiodine	Eulinia M. Valdezco	PNRI Radiation Protection Section
• Iron and Zinc Absorption from Weaning Foods Prepared from Germinated* Cereals and Legumes using Isotope Tracers	Divinagracia G. Valdez	Food and Nutrition Research Institute
• The Use of Stable Isotopes in Studies of Vitamin A Nutrition in the Philippines	Florentino Solon	Nutrition Center of the Philippines
• Consumer Acceptance and Market Testing of Irradiated Onions, Garlic and Other Spices	Alicia O. Lustre	Food Development Center
• Herbicide Performance on Grasses and Sedges as Affected by Application Techniques, Surfactant Type and Concentration in the Tropics	Mary Jean V. Barredo-Medina	National Crop Protection Center
• Behaviour and Effects of Pesticides in Manila Bay and in Model Systems Using Radiolabelled Tracers	Cristina M. Bajet	National Crop Protection Center
• Impact of Continued Use of Monocrotophos on Soil as a Consequence of Cotton Crop Protection	Amelia W. Tejada	National Crop Protection Center
• Immunoassay for Pesticide Residue Analysis of Vegetables	Narceo A. Bajet	University of the Philippines, Los Baños (UPLB)
• The Use of Deoxyribonucleic Acid (DNA) Probes to Follow the Establishment and Ecology of an Introduced Asymbiotic Nitrogen-Fixing Bacteria to an Acid Clay Type Soil	Juanita C. Mamaril	National Institute of Biotechnology and Applied Microbiology/UPLB
• PCR-Based Fingerprinting of Bananas and Other Musa Species in the Philippines for Breeding and In-Vitro Culture Applications	Desiree Menancio-Hautea	Institute of Plant Breeding/UPLB
• Export Trials of Irradiated Mango and Papaya from the Philippines	Concepcion I. Lizada	Postharvest Horticulture Training and Research Center (UPLB)
• Improving Soil Fertility and Optimizing Crop Production Through Biofertilization with Sewage Sludge	Ireneo J. Manguiat	Southeast Asian Regional Center for Graduate Study and Research in Agriculture, College, Laguna
• The Establishment and Use of ELISA-Based Technologies for the Diagnosis, Monitoring and Investigation of Foot and Mouth Disease	Blesilda C. Verin	Philippine Animal Health Center
• A Study on I <sup>131</sup> Treatment for Hyperthyroidism in the Philippines	Juan F. Torres	University of Sto. Tomas Hospital
• Innovative Clinical Techniques for Brachytherapy of Head and Neck Tumors	Lilian V. Rodriguez	St. Luke's Medical Center
	Miriam Joy C. Calaguas	
• Detection of Hepatitis-B Virus DNA In Human Serum Samples: Use of <sup>32</sup> P Labelled Probes for the Polymerase Chain Reaction	Florencio C. Dizon	Research Institute for Tropical Medicine/Department of Health
• Determination of Peak Bone Mass Density and Composition in Low Income Urban Residents of Metro Manila Using Isotope Techniques	Mary Anne Lim-Abrahan	UP-PGH Medical Center
• Investigation on the Use of <sup>34</sup> S and <sup>18</sup> O in Sulfates in Geothermometry and in Determining the Origin and Distribution of Acidic Fluids in High-Temperature Philippine Geology Systems	Hermes P. Ferrer	Energy Development Corporation Philippine National Oil Company
• Validation of a Mathematical Model for Shallow Reinjection of Geothermal Wastewater	Mario C. Berbano	Energy Research and Development Center Philippine National Oil Company

<sup>1</sup> International Atomic Energy Agency

<sup>2</sup> Research Contracts are grants under the IAEA Research Contract Programme whose funding is sourced from the IAEA regular budget and also from extrabudgetary contributions to the IAEA. Through this program, minor equipment and miscellaneous local purchases are provided. The grant to a project is of the average of \$5,000.00 per year.

**TABLE 2. LIST OF 1996 IAEA TECHNICAL COOPERATION PROJECTS<sup>3</sup>**

RESEARCH PROJECT	COUNTERPART	AGENCY
• Manpower Development and Nuclear Technology Support	Carlito R. Aleta	PNRI
• Gamma Ray Spectrometric Survey	Gabriel P. Santos	PNRI
• Radioimmunoassay for Improving Animal Production	Adoracion L. Alejandrino	PNRI
• Upgrading of Gamma Irradiation Facility	Alumanda M. Dela Rosa	PNRI
• Applications of X-Ray Analysis	Virginia S. Calix	PNRI
• Training Center for Non-Destructive Testing (Phase II)	Corazon C. Bemido	PNRI
• Low-Level Radioactive Waste Management (completed 6 Sept '96)	Eulinia M. Valdezco	PNRI
• TLD Dosimetry for Personnel Dosimetry Services	Eulinia M. Valdezco	PNRI
• Feasibility Study of Integrated Control of Fruit Flies	Eugenia C. Manoto	PNRI
• Air Pollutant Characterization and Source Identification	Flora L. Santos	PNRI
• Biological Nitrogen Fixation	Erlinda S. Paterno	Institute of Plant Breeding/UPLB
• Assessing Pesticide Residues in Food and Environment	Amelia W. Tejada	National Crop Protection Center/UPLB
• Isotope Techniques in Geothermal Hydrology	Hermes P. Ferrer	Philippine National Oil Company
• Groundwater Systems Studies by Isotope Techniques	Angel A. Alejandrino	National Hydraulics Center/UP
• Upgrading Brachytherapy Services for Cancer Treatment	Miriam Joy C. Calaguas	St. Luke's Medical Center

**TABLE 3. LIST OF 1996 GRANTS-IN-AID<sup>4</sup>**

PROJECT	PROPONENT	AGENCY
• Publication of the Nucleus	Ma. Teresa Yulo-Nazarea	Radioisotope Society of the Philippines
• Integrated Fruit Fly Management Based on Sterile Insect Release Method (SIRM) in Guimaras Island	Gorgonio P. Linterna	National Mango Research Development Center
• Economic Viability Study of an Integrated Management Program in Guimaras Island	Aida R. Librero	Philippine Council for Agriculture, Forestry and Natural Resources
• Consumer Acceptance and Market Testing of Irradiated Onions, Garlic and Other Spices	Alicia O. Lustre	Food Development Center
• Manpower Development in Nuclear Science and Technology in the Cordilleras	Cipriano C. Consolacion	Benguet State University

**TABLE 4. LIST OF 1996 EXPERTS/MISSIONS**

NAME	FIELD/PURPOSE	DATE
Jeffrey Turner	Evaluation of Hydrochemical and Isotope Data	27 Feb - 2 Mar '96
Yizhen Sun	IAEA Project Officer	8 - 16 Mar '96
Norman Harding	Conduct of National Training Course	9 - 30 Mar '96
A. S. Nanda	Animal Production Strategies	14 - 19 Apr '96
Celia Hacker	Thermoluminescence Dosimeter (TLD) Dosimetry for Personnel Dosimetry Services	6 - 10 May '96
Nicklaus Studer	Preparation of Feasibility Study for Project Aimed to Establish an Industrial Radiation Facility for Sterilization of Medical Products and Pharmaceuticals	20 - 24 May '96
Yuecel Yurtsever	Isotope Hydrology	27 May - 1 June '96
Nicanor Liquido	Feasibility Study of Integrated Control of Fruit Flies	24 - 29 June '96

<sup>3</sup> Technical Cooperation Projects are under the IAEA Technical Cooperation Programme and are funded by the Technical Assistance Committee Fund (TACF) and the extrabudgetary contributions to the IAEA. Financial support is provided in the form of three components, namely, expert assistance, equipment donation and overseas training.

<sup>4</sup> The PNRI grants-in-aid program provides substantial support to its research and development activities which otherwise cannot be fully implemented because of PNRI's limited manpower resources. Through this program, the PNRI is able to avail of the organizational resources of other institutions in pursuit of its mandated objectives.

**TABLE 4. LIST OF 1996 EXPERTS/MISSIONS**

NAME	FIELD/PURPOSE	DATE
Peter Kump	Assessment of TXRF System	7 - 20 Jul '96
John Rodda	Promotion of Nondestructive Testing (NDT) Level 3 Personnel	5 - 16 Aug '96
Harry C. Mussman	Feasibility of a Commercial Food Irradiation Plant	7 - 18 Oct '96
Yves Marie Henon		
James Francis Fons	Development of Food Irradiation Protocols for Phytosanitary Control	7 - 18 Oct '96
Stanley Leake	Groundwater Modeling	7-18 Oct '96
Marga Utama	Follow-Up Mission on Radiation Vulcanization of Natural Rubber Latex	28 Oct - 9 Nov '96
Keith Entwistle	Monitoring Production and Reproduction of UMMB-Fed Cattle	4 - 15 Nov '96

**TABLE 5. PNRI HOSTINGS**

FIELD	ORGANIZER	VENUE	DATE
• Experts Advisory Group Meeting on National Services to Produce Procedures and Guidance on Mutual Assistance	IAEA/PNRI	PNRI	22 -26 Jan'96
• Final Meeting of the Coordinated Research Programme on Treatment Technologies for Low and Intermediate Level Waste from Nuclear Applications	IAEA/PNRI	Innotech, Quezon City	22 - 26 Apr '96
• First Research Coordination Meeting on Reference Asian Man Project (Phase 2): Ingestion and Organ Content of Trace Elements of Importance in Radiological Protection	IAEA/PNRI	Rembrandt Hotel, Manila	1 -4 Jul '96
• Regional Training Course on Quality Assurance in Radiation Therapy Dosimetry	IAEA/PNRI/Radiation Health Services/DOH	Holiday Inn, Manila	21 -25 Oct'96
• Experts Advisory Group Meeting on Biological Dosimetry	IAEA/PNRI	PNRI	25-29 Nov '96
• Seminar on Public Acceptance (PA) and PA Contact Persons' Meeting	STA <sup>5</sup> /PNRI	Holiday Inn Hotel, Manila	9 - 13 Dec '96
• 2nd Philippine Nuclear Congress	PNRI in cooperation with other agencies	Manila Midtown Hotel	10-12 Dec. '96

**TABLE 6. NON-PNRI MANPOWER DEVELOPMENT (FOREIGN)**

NAME	AGENCY	FIELD	COUNTRY	DATE	SPONSOR
<b>ON - THE - J O B   T R A I N I N G</b>					
Evelyn Delfin	Institute of Plant Breeding	Soil Science, Irrigation and Plant Nutrition	UK	5 Feb - 4 June '96	IAEA
Jose Ma. Salvador Ugjoc	Philippine National Oil Company (PNOC)	Nuclear Centers and Laboratories	Pakistan	1 Apr - 31 May '96	IAEA
Arturo R. Torres	Energy Research and Development Center, PNOC	Application of Isotopes and Radiation in Hydrology	Austria	2 Sept-2 Dec '96	IAEA
Salvador P. Catelo	University of the Philippines, Los Baños	Economics of Fruit Fly Control	UK	12 Oct-11 Dec '96	IAEA
Zoraida Manalastas	Food Development Center	Food Preservation	USA	30 Sept- 29 Oct '96	IAEA
<b>T R A I N I N G   C O U R S E S</b>					
Lucia Valencia	Bureau of Food and Drugs	Industrial Sterilization: Regulations, Standards and Enforcement	Malaysia	15-19 Jan '96	IAEA
Vida Osorio	National Power Corporation	Electron Beam Technology for Purification of Flue Gases	Japan	5-9 Feb '96	IAEA
Angelito I. David	Department of Energy				

<sup>5</sup> Science and Technology Agency - Japan

**TABLE 6. NON-PNRI MANPOWER DEVELOPMENT (FOREIGN)**

NAME	AGENCY	FIELD	COUNTRY	DATE	SPONSOR
Blesilda Verin	Bureau of Animal Industry	Use of Immunoassay Technologies for Studies on the Diagnosis and Control of Foot and Mouth Disease in Southeast Asia	Vietnam	4-22 Mar '96	IAEA
Patrick S. Fernandez Samson C. Pablonia Leoncio O. Rebosa, Jr.	National Power Corporation	Integrated Energy and Electricity Planning for Nuclear Power Development with Emphasis on the ENPEP Package	Thailand	17 June- 26 Jul '96	IAEA
Rolando Peña	Department of Environment and Natural Resources	Applications of Isotope Techniques to Water Resources	China	27 May - 7 June '96	IAEA
Wilhelmina Santos	Bureau of Plant Industry	Irradiation as Quarantine Treatment	Thailand	13-23 Aug '96	IAEA
Mayflor R. Candelaria	Energy Development Center, PNOC	Analyses of Flow and Transport Dynamics in Hydrological Systems	Austria	9-27 Sept '96	IAEA
Danilo Quintana	National Power Corporation	System Technology for Nuclear Power Plants	Korea	9-30 Oct '96	IAEA
Edna A. Felipe	Bureau of Animal Industry	Use of Molecular Techniques for the Diagnosis and Monitoring of Major Livestock Diseases	Austria	21 Oct - 15 Nov '96	IAEA
Rico Caldo	Philippine Rice Research Institute	Improvement of Vegetatively Propagated Plants	Malaysia	28 Oct-8 Nov '96	IAEA
Vicente C. Mallari	Forest Products Research and Development Institute	Radiation Curing	Japan	18-22 Nov '96	IAEA
<b>WORKSHOPS</b>					
Salvador Flores	National Power Corporation	Application of NCS to Coal Processing Operations	Thailand	11-22 Mar'96	IAEA
Socorro Rosario Julongbayan Millard Villanueva	National Power Corporation	Infrastructure Requirements and Organizational Aspects of Nuclear Power Programmes	Indonesia	22-26 Apr '96	IAEA
Jose Montero	National Economic Development Authority				IAEA
Hermes P. Ferrer	Energy Development Center, PNOC	Isotope Techniques in Hydrology and Geochemistry for Geothermal Energy Development	China	10-13 June '96	IAEA
Rowena A. Isidro Angel B. Mateo Leni Qurit	Philippine Animal Health Center University of the Philippines	Feed Supplementation Strategies Application of ISO-25 and Other International QA/QC Standards in Laboratories Employing Nuclear and Complementary Techniques for Environmental Analyses	Sri Lanka Korea	17-21 Jun'96 24-28 June'96	IAEA IAEA
Nelson Santos	Philippine General Hospital	Quality Control of Multi-SPECT Systems	Korea	26 Aug-6 Sept '96	IAEA
Rey Banguilan					
<b>SEMINARS</b>					
Zalson C. Espino	Department of Energy	Application of NCS to Coal Processing Operations	Thailand	11-13 Mar'96	IAEA
Oscar Flaviano	National Power Corporation				
<b>SCIENTIFIC VISITS</b>					
Reynaldo Palis	Bureau of Soils and Water Management	Nuclear Techniques in Agro-Forestry Systems	Indonesia and Australia	26 Feb-8 Mar'96	IAEA
<b>CONFERENCE</b>					
Pablo C. Formaran III	Department of Justice	10th Pacific Basin Nuclear Conference	Japan	20 -25 Oct'96	Phil. Gov't
Lorenzo L. Jacinto II Geri Geronimo R. Saniez	National Power Corporation Environmental Management Bureau				

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**TABLE 6. NON-PNRI MANPOWER DEVELOPMENT (FOREIGN)**

NAME	AGENCY	FIELD	COUNTRY	DATE	SPONSOR
Aida C. Pujanes	Department of Energy				
Betty Lou S. Pendera	Philippine Information Agency				
Reynaldo B. Veja	UP, Diliman				
<b>MEETINGS</b>					
Norberto Agcaoli	Philippine General Hospital	National Coordinators Meeting on Tissue Grafts	Australia	30 Sept- 4 Oct '96	IAEA

NAME	FIELD	COUNTRY	DATE	SPONSOR
<b>ON-THE-JOB TRAINING</b>				
Edwin M. Azarlon	Receptor Modelling	Belgium	1 Feb - 1 Apr '96	IAEA
Vangelina K. Parami	Safety in Nuclear Energy	Austria	26 Feb - 25 May '96	IAEA
Erlinda M. Bague	Radiation Protection	Australia	15 Apr - 14 Jul '96	IAEA
Carl M. Nohay	Radiation Protection in the Medical Field	Australia	6 May - 6 Aug '96	IAEA
Nydia C. Medina	General Atomic Energy Development	Austria	10 Jun - 10 Sept '96	IAEA
Alan M. Borras	Radiation Protection	South Africa	5 Aug - 4 Nov '96	IAEA
Roel A. Loterña	Radiation Control in Working Environment	Japan	26 Aug - 23 Nov '96	STA
Jocelyn S. Lagarde	General Industrial Applications	Malaysia	2 Sept - 1 Dec '96	IAEA
Estrella S. Caseria	Radiation Protection	Austria	1 Oct - 31 Dec '96	IAEA
Patricia V. Carillo	Genetic Sexing of Fruit Fly	USA	22 Oct '96- 21 Apr '97	IAEA
Ma. Visitacion B. Palattao	Attachment: Waste Management	Canada	23 Sept - 24 Dec '96	IAEA
<b>TRAINING COURSES</b>				
Samuel D. Pablo	Nuclear Power Generation	Japan	9 Jan - 15 Mar '96	JICA <sup>6</sup>
Luvimina G. Lanuza	Industrial Sterilization: Regulations and Enforcement	Malaysia	15 - 19 Jan '96	IAEA
Dante E. Margate	Determination of Radionuclides in Environmental Samples	Austria & Germany	15 Apr - 10 May '96	IAEA
Teofilo Y. Garcia	Advance Applications of Isotope Techniques to Water Resources	China	27 May - 6 June '96	IAEA
Arturo F. Salih	Implementation of State Systems of Accounting for and Control of Nuclear Materials	Russian Fed.	17 - 27 June '96	IAEA
Lynette B. Cayabo	Nuclear Technology	Japan	7 May - 19 June '96	JICA
Alejandro Q. Nato	Environmental Radioactivity Analysis and Measurement	Japan	10 Sept- 20 Oct '96	Gov't of Japan
Demetrio S. Salom	Disposal of Low and Intermediate Level Wastes	United Kingdom	30 Sept - 18 Oct '96	IAEA
Librado S. Gesalta	Nuclear Safety and Regulations	Japan	13 Oct - 10 Nov '96	JICA
Arlean L. Alamares	Contamination Monitoring	Japan	21 -25 Oct '96	IAEA
Sylvia S. Busine	Regulatory Control of Nuclear Power Plants	Korea	28 Oct - 8 Nov '96	IAEA
Teresa Y. Nazarea	Implementation of IAEA Basic Safety Standards	India	18 - 29 Nov '96	IAEA
Edilberto M. Rivera				
<b>WORKSHOPS</b>				
Imelda S. Delfin	Nuclear Information Services	Malaysia	18 - 29 Mar '96	IAEA
Julietta E. Seguis	Sealed Radiation Sources Registry	Austria	10 - 20 June '96	IAEA
Adoracion L. Alejandrino	Improving Animal Production Through the Application of Feed Supplementation Strategies and Immunoassay Techniques	Sri Lanka	17 - 21 June '06	IAEA

<sup>6</sup> Japan International Cooperation Agency

TABLE 7. PNRI MANPOWER DEVELOPMENT (FOREIGN)

NAME	FIELD	COUNTRY	DATE	SPONSOR
Flora L. Santos	Application of ISO-25 and Other International QA/QC Standards in Laboratories Employing Nuclear and Complementary Techniques for Environmental Analysis	Korea	24 June - 5 Jul '96	IAEA
Edgar G. Racho	Nondestructive Examination	Singapore	26 - 30 Aug '96	IAEA
Virginia S. Calix	Reactor Utilization	Indonesia	21 - 28 Nov '96	IAEA
Renato H. Pecho	Regulation and Inspection of Operation of Radiation Facilities	Indonesia	9 - 13 Dec '96	IAEA
S E M I N A R S / S Y M P O S I A				
Alumanda M. Dela Rosa	Symposium on Radiation Vulcanization of Natural Rubber Latex	Malaysia	15 - 17 Jul '96	IAEA
Elvira Z. Sombrito	Seminar on Nuclear Safety	Japan	22 Aug - 10 Sept '96	JAERI <sup>7</sup>
Rosita R. Daroy				
Graceta DL. Cuevas	10th Seminar for Nuclear Administrators	Japan	24 Sept - 4 Oct '96	STA
Eulinia M. Valdezco	Seminar on Radioactive Waste Management	Malaysia	14 - 18 Oct '96	BICRON NE (Germany)
Edith A. Marcelo				
Florencio I. S. Medina III	Mutation Breeding in Horticultural Crop	Thailand	3 - 10 Nov '96	Gov't of Japan
Cecilia M. de Vera	Seminar on Use of Isotope Techniques in Marine Environmental Studies	Greece	11 - 22 Nov '96	IAEA
M E E T I N G S				
Florencio I. S. Medina III	A Molecular and Genetic Approach to Develop Sexing Strains for Field Application in Fruit Fly Sterile Insect Technique (SIT) Programmes	Argentina	18 - 22 Mar '96	IAEA
Sylvestre Abaya	Advanced Data Analysis	Korea	8 - 19 Apr '96	IAEA
Aida D. Eugenio	Radioimmunoassay for Hepatitis-B Diagnosis	Singapore	6 - 10 May '96	IAEA
Eulinia M. Valdezco	Evaluation of Technical Cooperation on Radioactive Waste Management	Austria	20-24 May '96	IAEA
	HARSHAW Thermoluminescence Dosimeter (TLD) Users' Meeting	USA	14 - 18 Oct '96	BICRON NE (Germany)
Carlito R. Aleta	18th Regional Cooperative Agreement (RCA) Working Group Meeting (WGM)	China	20 - 24 May '96	Phil. Gov't
	WGM on Regional Cooperative Agreement Management	Austria	11 - 13 Sept '96	Phil Gov't
	25th RCA General Conference Meeting		18 Sept '96	Phil Gov't
Imelda S. Delfin	International Nuclear Information System (INIS) Liaison	Japan	28-31 May '96	IAEA
	Nuclear Information System Project	Japan	3 - 4 June '96	IAEA
Alumanda M. Dela Rosa	Research Reactor Utilization	Thailand	24 - 28 June '96	IAEA
	Radiation Vulcanization of Natural Rubber Latex	Malaysia	18 - 19 Jul '96	IAEA
Glenda B. Obra	Irradiation as Quarantine Treatment of Mites, Nematodes, Insects Other than Fruit Fly	China	15 - 19 Jul '96	IAEA
Estelita G. Cabalfin	Standardized Methods to Verify Absorbed Dose in Fresh and Dried Fruits, Tree Nuts in Trade	Germany	5 - 9 Aug '96	IAEA
	Radiation Technology	Japan	11 - 16 Dec '96	
Flora L. Santos	Nuclear Analytical Techniques	China	2 - 6 Sept '96	IAEA
Nathaniel B. De Vera	Regional Association of Gamma Camera Users	Japan	30 Sept - 4 Oct '96	IAEA
Alejandro J. Mateo	Nondestructive Testing	India	2 - 6 Dec '96	IAEA

<sup>7</sup> Japan Atomic Energy Research Institute

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**TABLE 7: PNRI MANPOWER DEVELOPMENT (FOREIGN)**

NAME	FIELD	COUNTRY	DATE	SPONSOR
<b>C O N F E R E N C E S</b>				
Cariño R. Aleja	Nuclear Cooperation in Asia	Japan	5 - 7 Mar '96	JAEC <sup>a</sup>
	40th IAEA General Conference	Austria	6 -20 Sept '96	Phil. Gov't
Victoria Fe O. Medina	40th IAEA General Conference	Austria	13 -20 Sept '96	Phil Gov't
Gabriel P. Santos	10th Pacific Basin Nuclear Conference	Japan	20-25 Oct '96	Phil. Gov't (NPSC)
Magno B. Yoshisaki	Tokyo Conference on Nuclear Safety in Asia	Japan	5 - 6 Nov '96	Gov't of Japan
Florencio I. S. Medina III	22nd Japan Conference on Radiation and Radioisotopes	Japan	17-19 Dec '96	
Estelita G. Caballin				
<b>S C I E N T I F I C V I S I T</b>				
Alejandro J. Mateo	Effective Management of and Implementation of Regulatory Inspection and Enforcement Programs	Australia	22 Apr - 3 May '96	IAEA
<b>D E G R E E C O U R S E</b>				
Alwyn B. Anfone	Ph. D. in Chemistry	USA	7 Nov '96 -7 Nov '97	
Corazon M. Garcia	Ph. D. in Chemical Engineering	Australia	30Nov'96-30Nov'97	

**TABLE 8: PNRI MANPOWER DEVELOPMENT (LOCAL)**

NAME	FIELD	VENUE	DATE
<b>T R A I N I N G C O U R S E S</b>			
Pilar C. Rocoles	Management and Implementation of Foreign-Assisted Projects	Ateneo de Manila	19-23 Mar'96
Cecilia M. de Vera	Introductory Course on Applied Inferential Statistics	Quezon City	17-28 Jun'96
Mitos M. Tolentino	Microbiological Analysis of Foods	UP, Quezon City	8-12 Jul'96
Estrella D. Relunja	Supervisory Effectiveness	Pasay City	26-30 Aug'96
Vangelina K. Parami			
Thelma P. Artificio	IAEA Regional Training Course on Quality Assurance in Radiation Therapy Dosimetry	Quezon City	9-25 Oct '96
Edwin M. Azañon	Process Quantitative Risk Assessment	Tagaytay City	14-17 Oct '96
<b>S E M I N A R S / W O R K S H O P S / C O N F E R E N C E S</b>			
Grace DL. Cuevas	Alma S. Piñera	Conference /Workshop with Commision on Audit	DOST
Pilar C. Rocoles			12-13 Jan '96
Aida D. Eugenio	Alumanda dela Rosa	Seminar on Nuclear Power	Manila
Eugenia C. Manoto	F. Isagani Medina III		26 Jan '96
Edilberto A. Caballin	Alejandro J. Mateo		
Grace DL. Cuevas	Gonzalo S. Puga		
Gabriel P. Santos	Vangelina K. Parami		
Osroxxon L. Amparo	Eulinia M. Valdezco		
Renato T. Banaga	Cristina A. Petrache		
Pilar C. Rocoles	Corazon C. Bernido		
Rhodora R. Leonin	Imelda S. Delfin		
Estelita G. Caballin	Magno B. Yoshisaki		
Antonio E. Refre	Reynaldo P. Jacinto		
Victoria Fe O. Medina	Celerina M. Ramiro		
Lourdes G. Fernandez	Angelito F. Ramos		
Teofilo V. Leonin, Jr.	Maria V. B. Palattao		
Erlinda S. Natera			

<sup>a</sup> Japan Atomic Energy Commission

**TABLE 8. PNRI MANPOWER DEVELOPMENT (LOCAL)**

NAME		FIELD	VENUE	DATE
Esperanza I. Cancio	Virginia B. Cauton	Seminar on Expanded Value Added Tax	DOST	30 Jan '96
Crispina M. Rosales		Seminar on N-15 Investigation in Lowland/ Flooded Rice	Bureau of Soils and Water Management, QC	5-7 Feb '96
Alma S. Piñera		Seminar/Workshop on Communications, Audit Report Writing and Presentation Skills	Department of Foreign Affairs (DFA)	14-16 Feb '96
Susan S. Pascual		Seminar-Workshop on Questioned Documents Examination and Forgery Detection	Department of Foreign Affairs (DFA)	21-23 Feb'96
Ana Elena L. Conjares		Briefing on INTERNET	Quezon City	24 Feb'96
Domingo Domondon	Estrella S. Caseria	Nuclear Regulatory Information Conference	Quezon City	29 Feb'96
Eulinia M. Valdezco	Librado S. Gesalta			
Alejandro J. Mateo	Edgar G. Racho			
Ozroxon L. Amparo	Julietta E. Seguis			
Magno B. Yoshisaki	Sylvia S. Busine			
Teofilo V. Leonin, Jr.	Maria V. B. Palattao			
Thelma P. Artificio	Arlean A. Alamares			
Alan M. Borras	Jesulito B. Junio			
Corazon M. Garcia	Raquel T. Espiritu			
Veronica J. Marcelo	Luzviminda L. Venida			
Rosita R. Daroy	Roel A. Loteriña			
Editha A. Marcelo	Carl M. Nohay			
Edilberto A. Cabalfin	Alicia F. Lagunzad	Lecture-Seminar on the Intellectual Property Rights PD 1594	DOST	4 Mar '96
Alan M. Borras				
Antonio E. Refre		Connect World '96 Exhibit/Conference	Makati City	6-8 Mar'96
Eulinia M. Valdezco	Estrella S. Caseria	Seminar on Advancement in the Implementation of the New IAEA Basic Safety Standards	Makati City	6 Mar'96
Arlean L. Alamares	Teofilo V. Leonin, Jr			
Veronica J. Marcelo	Rosita R. Daroy			
Raquel T. Espiritu	Teresita B. de Jesus			
Edgar G. Racho	Maria V. B. Palattao			
Luzviminda L. Venida	Julietta E. Seguis			
Sylvia S. Busine	Erlinda S. Natera			
Teofilo Y. Garcia	Dante E. Margate			
Lorna Jean H. Palad	Fe M. dela Cruz			
Eliza B. Enriquez				
Josefina J. Omandam	Beverly G. Briones	Seminar/Workshop on Records and Archives Management	Davao City	26-29 Mar'96
Esperanza I. Cancio	Alma S. Piñera	PAGBA <sup>9</sup> 1st Quarterly Membership Meeting with Seminar/Workshop	Davao City	25-26 Mar'96
Alicia F. Lagunzad	Louie del R. Castillo	Seminar on Values Enrichment, Key to Productivity Improvement	Baguio City	17-20 Mar'96
Salvacion O. Dean	Marissa Robles			
Estrella B. Cortez				
Osmalic Gupit		Records Management Seminar	MIRDC/DOST	26-28 Mar'96
Zenaida de Guzman	Mitos Tolentino	Seminar on Total Quality Control	Ortigas, Pasig City	3/28
Azucena de Vera				
Lourdes R. Fontanilla		Seminar on Property and Supply Management	Quezon City	15-26 Apr'96
Flora S. Santos		Seminar on Safety in the Laboratory	Quezon City	19 Apr'96
Grace DL. Cuevas	Alma S. Piñera	Seminar on Risk Analysis & Assessment	Malate, Manila	25-26 Apr'96
Victoria Fe O. Medina	Reynaldo P. Jacinto	Seminar on Strategizing for Credible Reports	DAP, Pasig City	8-10 May'96
Denia A. Datoon		Seminar on Accounting for Non-Accountants	MIRDC/DOST	7-11 May'96
Grace DL. Cuevas	Edilberto A. Cabalfin	Seminar on Performance Management	DAP, Pasig City	27-31 May'96
Luzviminda U. Ramallosa		Seminar on Issues and Problems in the Execution Implementation of Gov't Contracts	Innotech, Quezon City	18 May'96

<sup>9</sup> Philippine Association for Government Budget Administration, Inc.



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**TABLE 8. PNRI MANPOWER DEVELOPMENT COURSES**

NAME		FIELD	VENUE	DATE
Ma. Teresa L. Borrás	Loma S. Relleve	Total Lab Show 96, Advance in Laboratory Tech. Towards the Next Millenium	Manila	6-10 May '96
Luvimina G. Lanuza	Concepcion Matias			
Virginia S. Calix	Luz V. Esguerra			
Charito T. Aranilla				
Justina S. Cerbolles	Simplicio V. Bayron	Seminar on Basic Photography	DOST	24 and 31 May '96
Luzviminda Bentulan		Seminar on Audit of Expenditures	SAAC, Quezon City	24 May'96
Expectacion P. Duca		Seminar on National Gov't Budgeting	Innotech, Quezon City	10-14 Jun'96
Antonio E. Tiong		Seminar on Property Inventory Custodianship Accountability Control	Innotech, Quezon City	01 Jun'96
Luzviminda Ramallosa	Estrella B. Cortez	Seminar on Updates on Gov't Auditing , Rules and Regulations	Innotech, Quezon City	7-8 Jun'96
Justina S. Cerbolles	Custer C. Deocaris	Seminar/Workshop on Science Writing	DOST	17-20& 27 Jun'96
Grace DL. Cuevas	Estrella D. Relunia	First Conference of Professionals	Manila	18 Jun'96
Victoria Fe O. Medina	Edilberto M. Rivera			
Estelita G. Cabalfin	Celia O. Asaad			
Isabel M. Amiscaray	Cristina P. Aguilar			
Elizabeth Vidal	Juana S. Gregorio			
Samuel D. Pablo	Mitos M. Tolentino			
Alma S. Piñera		Seminar/Workshop on Audit, Tools and Technology	Manila	26-27 Jun'96
Denia A. Datoon		Seminar on Cash Management and Control	COA, Quezon City	24 Jun- 5 Jul '96
Estrella B. Cortez		Seminar on Updates on Internal Control System	Innotech, Quezon City	28-29 Jun '96
Gonzalo S. Puga	Ana Marie S. Veluz	Workshop on Intellectual Property Rights	DOST	28-29 Jun '96
Alan M. Borrás	Reynaldo P. Jacinto			
Zenaida de Guzman	Virginia B. Cauton			
Simplicio V. Bayron		Seminar on Advance Photography	Fort Santiago, Manila	23 Jun-4 Aug '96
Adoracion Alejandrino	Zenaida de Guzman	Scientific Seminar on Modern Cell Culture and Fermentation Technology	Manila	5 Jul '96
Oliver Luz	Ana Villanueva	Seminar/Workshop on Organizing Government Documents	Quezon City	16 Jul '96
Laura R. Pineda	Ruth B. Alicer			
Aurora D. Rapadas	Pablo D. de Castro, Jr.			
Angel B. Anden		Seminar/Workshop on Multimedia	DOST	9 Aug '96
Bernadette Sablan		Seminar/Workshop on Technical Drawing with CAD Applications	MIRDC/DOST	19-24 Aug '96
Vangelina K. Parami		Seminar on Supervisory Effectiveness for Improved Quality and Productivity	Manila	23 - 30 Aug '96
Marife R. Roa		Seminar on Audit of Expenditures	COA, Quezon City	26-30 Aug '96
Virginia B. Cauton	Carolina M. Andres	Seminar/Workshop on PAGBA	Cebu City	5-7 Sept '96
Ruby Liza Maglalang		National Government Accounting Seminar	COA, Quezon City	16-27 Sept '96
Susan S. Pascual		Seminar on Internal Audit Tools and Technology	Manila	11-13 Sept '96
Soledad R. del Castillo		Moral Recovery Program and Seminar/Workshop on the Establishment of Integrity Circles	Antipolo	9-12 Sept '96
Ruth B. Alicer		Records Management Seminar	MIRDC/DOST	24-28 Sept '96
Bernadette C. Sablan		Seminar on Basic Computer Aided Design	MIRDC/DOST	23-28 Sept '96
Hazel S. dela Cruz	Erlinda Vera Cruz	Seminar on Basic Networking	UP, Diliman	28 Sept & 5 Oct '96
Vangelina K. Parami	Jean M. Casyao	Conference/Workshop on Industrial Relations and the Re-Engineering Program in the Philippine Public Sector	Makati City	9 - 12 Oct '96
Teofilo Y. Garcia		Ennvironmental Law Seminar	Quezon City	23-25 Oct '96
Soledad R. del Castillo		Seminar/Workshop on Human Resources Management	Davao City	24-26 Oct '96
Ruth B. Alicer		Seminar/Workshop on Records Management& Data Banking	Davao City	24-26 Oct '96
Imelda S. Delfin	Isabel M. Amiscaray	Seminar on Information Technology Application to Libraries & information Centers and Regional Convention	Manila	28-30 Oct '96
Elizabeth Vidal		Seminar/Workshop and Annual Convention of the MAHLAP	Mandaluyong City	5-7 Nov '96
Bernard de Lara	Cecilia T. Perez	Seminar on Audit of Expenditures	COA, Quezon City	11-15 Nov '96
Aurora D. Rapadas				

**TABLE 8. PNRI MANPOWER DEVELOPMENT (LOCAL)**

NAME	FIELD	VENUE	DATE
Justina S. Cerbolles	DOST 1997 Communication Plan Planning Workshop	Tagaytay City	20-22 Nov '96
<b>S Y M P O S I A / F O R A</b>			
Angelito F. Ramos	Public Forum on Coastal Zone Management	Quezon City	26 Jan '96
Adoracion L. Alejandrino	Lecture-Forum on Urban Environmental Management in Metro Manila	DAP, Pasig City	7-8 Mar '96
Custer C. Deocaris	Alejandro Q. Nato	Youth Forum on APEC National Conference	Ateneo de Manila
		Quezon City	23-24 Aug '96
Grace DL. Cuevas	Jean M. Casyao	Symposium on How Do We Protect The Pay of Gov't Personnel from Inflation	UP, Diliman
Soledad R. del Castillo			11 Jul '96
Soledad S. Castañeda	Concepcion Matias	KKP Symposium Trends in Environmental Analysis	UP, Diliman
Luz V. Esguerra			27 Nov '96
<b>C O N V E N T I O N / C O N G R E S S</b>			
Mary Rose D. Quizana	57th Phil. Institute for Chemical Engineers (PICHE) Convention	Quezon City	8-10 Feb '96
Hazel S. dela Cruz	Information Technology Professionals Congress	Manila	14 Feb '96
Alumanda dela Rosa	Soledad S. Castañeda	12th Philippine Chemistry Congress	Iloilo City
Corazon C. Bernido	Lucille V. Abad		23-25 May '96
Elvira Z. Sombrito	Concepcion Matias		
Alwyn B. Anfone			
Alan M. Borrás	Gonzalo S. Puga	28th National Convention and Gen. Assembly of Association of Gov't Mechanical, Electrical and Electronics Engineers of the Philippines	Quezon City
Joselito dela Cruz			29-31 May '96
Esperanza I. Cancio		19th Annual National Convention of GACPA	Cebu City
Adoracion Alejandrino	Celia O. Asaad	Joint Congress of the Asian Buffalo Association, Phil. Society of Animal Science and Phil. Society of Animal Nutritionist	Makati City
Custer C. Deocaris	Azucena C. de Vera		3-5 Oct '96
Samuel D. Pablo	John M. Marquez	44th Annual National Convention of Mechanical Engineers	9-12 Oct '96
Estrella D. Relunia		First Congress on Tertiary Environmental Education	Cebu City
Marie Agnes T. Reyes	Susan Pascual	Annual Convention of Association of Gov't Internal Auditors	Quezon City
Crispina M. Rosales		6th PHILARM Annual Convention	Leyte
Gabriel P. Santos		9th Annual Geological Convention GEOCON'96	24-26 Oct '96
Laura R. Pineda	Cristina P. Aguilar	32nd Annual Convention of PAMET	Davao City
Lucille V. Abad	Alejandro Q. Nato	2nd Philippine Nuclear Congress	28-29 Oct '96
Adoracion Alejandrino	Carl M. Nohay		Quezon City
Charito T. Aranilla	Glenda B. Obra		4-6 Dec '96
Adelina M. Bulos	Norma L. Pablo		5-7 Dec '96
Virginia S. Calix	Vangelina K. Parami		10-12 Dec '96
Grace M. Carlos	Cristina Pascual		
Soledad S. Castañeda	Gonzalo S. Puga		
Zenaida de Guzman	Antonio E. Refre		
Custer C. Deocaris	Lorna S. Relleve		
Luz V. Esguerra	Crispina M. Rosales		
Teofilo Y. Gracia	Flora S. Santos		
Luningning Lansangan	Elvira Z. Sombrito		
Luvimina G. Lanuza	Eften Sta. Maria		
Avelina G. Lapade	Ana Maria S. Veluz		
Dante Margate	Erlinda Vera Cruz		
<b>M E E T I N G S</b>			
Gerardo Robles	88th PDA Annual Session and Scientific Meeting	PICC, Manila	1-8 May '96
Isabel M. Amiscaray	SciNET-PHIL Meeting	STII/DOST	8,13, Nov & 17 Dec '96
Aida D. Eugenio	Executive Briefing on Organizational Change	DAP, Pasig City	28 Nov '96

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- Aakrog, A., M.S.Baxter, A.O.Bettencourt, R.Bojanowski, A.Bologa, S.Charmasson, I.Cunha, R.Delfanti, E.Duran, E.Holm, R.Jeffree, H.D.Livingston, S.Mahapanyawong, H.Nies, I.Osvalth, Li Pingyu, P.P.Povinec, A.Sanchez, J.N.Smith and D.Swift. *A Comparison Dose from  $^{137}\text{Cs}$  and  $^{210}\text{Po}$  in Marine Food: A Major International Study*. Journal of Environmental Radioactivity. Vol. 34 No. 1, pp. 69-90.
- Africa, Lorena B. and Virginia S. Calix. *Total Reflection X-ray Fluorescence Spectrometry Theory, Instrumentation and Applications*. The Nucleus. Vol. XXXII, pp. 24-30, 1996.
- Asencion, Apolinar B., Amelia S. Asencion, Florencio Isagani S. Medina III and Artemio Galvez. *Mutagenicity of Sodium Azide in Mungbean*. Sciencetech Press, pp. 139-154. 1996.
- Borras, Alan M. and Magno B. Yoshisaki. *Loss and Recovery of an Ir-192 Gamma Radiography Exposure Device*. The Nucleus. Vol XXXII, pp. 43-46. 1996.
- Carillo, Patricia Andrea V., Juana S. Gregorio, Cristina P. Aguilar, Lilia R. Dela Paz and Florencio Isagani S. Medina III. *Observation on the Chromosome of Philippine Bats A: Scotophilus Temminckii (Horsfield)*. Araneta Res. J. Vol. 33, pp. 65-69. 1996.
- Castañeda, Soledad S., Concepcion R. Matias, Einstein Yu and Flora S. Santos. *Determination of Polycyclic Aromatic Hydrocarbons in Metro Manila Air Particulates by High Performance Liquid Chromatography with Fluorescence Detection*. KIMIKA. Vol. 12, 1996.
- Castillo, Marilyn K., Gabriel P. Santos, Jr., Angelito F. Ramos and Davoud Karimian Teherani. *Instrumental Neutron Activation Analyses of Geological Materials from Northern Palawan and Marinduque Island in the Philippines*. The Nucleus, Vol. XXXII, 1996. pp. 17-23.
- De Guzman, Zenaida M. and Yongyudth Vajaradul. *Mechanical Properties of Freeze-Dried and Irradiated Bone Chips, Fascia Lata and Dura Mater*. The Nucleus, Vol. XXXII, 1996.
- De Jesus, Elizabeth M. and Ma. Teresa A. Salabit. *Radioiodination of T3 and T4 Using Chloramine T Method*. The Nucleus. Vol. XXXII, 1996.
- Deocaris, Custer C., Alejandro Q. Nato, Apolonio D. Nazarea and A.B.Mateo. *"Winged" Hypermutated Epitopic Mimetics of VP1(135-146): A Novel Molecular Design for Broad-Spectrum, Multivalent Synthetic Vaccines for the Foot-and-Mouth Diseases Virus Serotype A*. Recent Research Developments in Buffalo Production- Proceedings of the 2nd Asian Buffalo Association Congress. Shangri-La Hotel, Makati City, Philippines, 9-12 October 1996, pp. 181-193.
- Deocaris, Custer C., Virginia D. Monje, Ameurfin D. Santos and Lourdes Cruz. *Interspecific Molecular Comparisons Between a Newly Sequenced Conotoxin Preproregion from Conus Geographus and a Known w-Conotoxin Precursor from Conus Magus- An Example of Essential Radioisotope Usage in Molecular Biology*. The Nucleus. Vol XXXII, 1996.
- Duran, Emerenciana B., Cecilia M. De Vera, Eliza B. Enriquez, Ma. Teresa Y. Nazarea and Antonio A. Asada, Jr.  *$^{137}\text{Cesium}$  Levels in Fish and Shellfish in the Filipino Diet*. The Nucleus. Vol. XXXII, pp. 13-16. 1996.
- Duran, Emerenciana B., Cecilia M. De Vera, Teofilo Y. Garcia, Fe M. Dela Cruz, Lorna Jean H. Palad, Eliza B. Enriquez, Antonio A. Asada, Jr. and Javier M. Eduardo. *Environmental Radioactivity Measurements in the Philippines*.

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*Proceedings of a Symposium on Environmental Radioactive Nuclides Impact in Asia*. Taiwan, Taipei, Republic of China, 6-8 September 1996.

- Duran, Emerenciana B., Cecilia M. De Vera and Teofilo Y. Garcia. *Baseline Radioactivity Measurements Around the Philippine Nuclear Research Institute (PRR-1)*. TRIGA Safety Analysis Report. 15 September 1996.
- Garcia, Teofilo Y. *Tritium Measurement in Environmental Water Using Eletrolytic Enrichment Technique*. The Nucleus, Vol. XXXII, pp. 31-35 (Published as Notes).
- Lapade, Avelina G., Ibarra S. Santos, Ana Maria S. Veluz, Lucia J. Marbella, Apolinar B. Asencion and Florencio Isagani S. Medina III. *Country Report: Mutation Breeding in Agricultural Crops in the Philippines*. Proceedings of the Seminar on Mutation Breeding in Horticultural Crops for Regional Nuclear Cooperation in Asia. Bangkok, Thailand, 3-10 November 1996.
- Medina III, Florencio Isagani S. *The Expectation from Radiation Mutation Breeding in the Southeast Asia-2000*. Proceedings of the 22nd Japan Conference on Radiation and Radioisotopes. Pacifico Yokohama Conference Centre, Yokohama, Japan, 17-19 December 1996.
- Medina III, Florencio Isagani S., Apolinar B. Asencion, Avelina G. Lapade and Victoria Fe O. Medina. *Radiation-Induced Mutation for Crop Improvement and Plant Domestication*. China Agrc'l.,-Proceedings of the Seminar on Plant Mutation in Asia. Beijing, China, 1996. pp. 67-76.
- Palattao, Maria V.B., Luzviminda G. Venida, Roel A. Loteriña and Raquel T. Espiritu. *An Assessment of the Radiological Impact of the Operation of Brachytherapy Application in Metro Manila Hospitals*. The Nucleus, Vol. XXXII, 1996. pp. 39-42 (as Technical Note).

### PAPERS PRESENTED

- Abad, Lucille V., Alumanda M. Dela Rosa, K. Makuuchi and F. Yoshii. *"The Role of Proteins on the Thermal Oxidative Aging of Radiation Vulcanized Natural Rubber Latex"*. Presented during the Second International Symposium on RVNRL. Kuala Lumpur, Malaysia, 15-17 July 1996.
- Africa, Lorena B., E.E.Barganan, M.G.Quano, C.Ison and R.V.Sarmago. *"Growth Synthesis of BSCCO 2122 by Combustion Technique"*. Presented at the 1996 SPP Physics Congress. ISMED, UP, Diliman, Quezon City, Philippines, 6-8 December 1996.
- Africa, Lorena B. and Virginia S. Calix. *"Total Reflection X-ray Fluorescence Spectrometry: Theory Instrumentation and Applications"*. The Nucleus, Vol. XXXII, 1996, pp. 24-30. ISSN 0115-2300
- Alejandrino, Adoracion L. *"Performance of Dairy Cows Under Smallhold and Communal Management"*. Presented during the Joint Scientific Meetings of the 2nd Asian Buffalo Association Congress, the Philippine Society of Animal Science and the Philippine Society of Animal Nutritionists. Shangri-la Hotel, Makati City, 9-12 October 1996.
- Alejandrino, Adoracion L. *"Farm Application of Radioimmunoassay Technology in Dairy Cattle Management"*. Presented during the 2nd Philippine Nuclear Congress, Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Alejandrino, Adoracion L. *"Communal Dairy Farming in Pontevedra, Capiz (Panay Island) Philippines"*. Presented during the FAO/IAEA 2nd Regional Training Workshop on Improving Animal Production Through the Application of Feed Supplementation Strategies and Immunoassay Techniques. Kandy, Sri-Lanka, 17-21 June 1996.

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- Aleta, Carlito R.** "Nuclear Science and Technology: Perspective and Prospect for Philippine Development." Presented at Plenary Session I of the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Busine, Sylvia S.** "Philippine Regulatory Framework". Country Report Presented at the Regional Training Course on Regulatory Control of Nuclear Power Plants. Taejon, South Korea, 28 October-8 November 1996.
- Cabalfin, Estelita G., Luvimina G. Lanuza, Aurelio L. Maningas, Haydee M. Solomon and Eugenia C. Manoto.** "Development of Process Control for the Irradiation of Fresh Mangoes". Presented at the Second Research Coordination Meeting on Standardized Methods to Verify Absorbed Dose in Fresh and Dried Fruits, Tree Nuts in Trade. Karlsruhe, Germany, August 5-9, 1996.
- Cabalfin, Estelita G. and Alumanda M. Dela Rosa.** "Radiation Processing: A Versatile Technology for Industry". Presented at the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, December 10-12, 1996.
- Cabalfin, Estelita G.** "Achievements in Radiation Technology". Presented at the Fourth National Coordinators Meeting for Radiation Technology. Takasaki, Japan, December 11-16, 1996.
- Calix, Virginia S. and Neil R. Guillermo.** "Investigation of the Structure and Transport Studies of Beta Alumina Type Superionic Conductors". Country Report Presented at the Workshop on Utilization of Research Reactors. Jakarta, Indonesia, 25-28 November 1996.
- Castañeda, Soledad S., Concepcion R. Matias, Einstein Yu and Flora S. Santos.** "Determination of Polycyclic Aromatic Hydrocarbons in Metro Manila Air Particulates by High Performance Liquid Chromatography with Fluorescence Detection". Presented at the Philippine Chemistry Congress. Iloilo City, Philippines, May 1996.
- Cuevas, Graceta D.** "Nuclear Energy Development and Legislation in the Philippines". Presented during the 10th Seminar for Nuclear Administrators. Tokyo, Japan, 24 September - 4 October 1996.
- Dela Rosa, Alumanda M., Lucille V. Abad, Lorna S. Relleve, Charito T. Aranilla and Cristina L. Pascual.** "Radiation Vulcanization of Philippine Natural Rubber Latex". Presented at the following (a) 12th Philippine Chemistry Congress. Iloilo City, 23-24 May 1996 and (b) Second International Symposium on RVNRL. Kuala Lumpur, Malaysia, 15-17 July 1996.
- Deocaris, Custer C.** "Chemical Protection Against Radiation-induced Gastro-Intestinal Syndrome by Putative Radioprotectors Derived from Herbal Sources". Presented during the 18th Annual Scientific Meeting of the National Academy of Science and Technology. Insular Hotel, Lanang, Davao City, Philippines, 9-11 July 1996.
- Deocaris, Custer C.** "Winged" Hypermutated Epitopic Mimetics of VPI (135-146): A Molecular Design for Broad-Spectrum Multivalent Synthetic Vaccines for the Foot-and-Mouth Disease Virus Serotype A". Presented during the 2nd Asian Buffalo Association (ABA) Congress. Shangri-La-Hotel, Makati City, Philippines, 9-12 October 1996.
- De Vera, Cecilia M. and Curtis R. Olsen.** "Assessment of  $^{90}\text{Sr}$  Distribution in a Lake Sediment Sample Core TN567.5". Presented during the IAEA International Seminar on the Use of Isotope Techniques in Marine Environmental Studies. Athens Greece, 11-22 November 1996.
- Domondon, Domingo B., Alejandro J. Mateo, Eulinia M. Valdezco and Vangelina K. Parami.** "Nuclear Regulations: Current Status and Proposed Initiatives". Presented during the 2nd Philippine Nuclear Congress, Manila Midtown Hotel, Philippines, 10-12 December 1996.

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- Duran, Emerenciana B., Cecilia M. De Vera, Fe M. Dela Cruz, Eliza B. Enriquez, Teofilo Y. Garcia, Lorna Jean H. Palad, Sofronio O. Enriquez, Javier M. Eduardo and Antonio A. Asada, Jr.** "Sources and Levels of Radioactivity in the Philippine Environment". Presented during the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Eugenio, Aida D.** "Detection of Hepatitis B Markers by Radioimmunoassay". Presented at the IAEA National Coordinators' Meeting for Asia and the Pacific. Singapore, 6-10 May 1996.
- Eugenio, Aida D.** "Safe Handling of Radiopharmaceuticals in Hospitals." Presented at the Philippine Pharmaceutical Biennial Convention. Davao City, 12-14 April 1996.
- Garcia, Teofilo Y. and Rolando Peña.** "Applications of Isotope Techniques to Water Resources in the Philippines". Country Report Presented during the Regional RCA Training Course on Advanced Applications of Isotope Techniques to Water Resources. Lushan, Jiangxi Province, China, 27 May-7 June 1996.
- Golez, Hernani G. and Eugenia C. Manoto.** "Sterile Insect Technique for the Management of the Oriental Fruit Fly in Guimaras Island". Presented during the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, December 10-12, 1996.
- Jahja, A.K., Marsongkohadi Gunawan, Virginia S. Calix and Neil R. Guillermo.** "High Resolution Neutron Diffraction Investigation of the Structure of  $\text{K}_2\text{O} \cdot 5.33\text{Fe}_2\text{O}_3$  Beta Alumina Type Superionic Conductors". Presented at the 5th Asian Symposium on Research Reactors (ASSR) Meeting. Taejon, Korea, 29-31 May 1996.
- Lapade, Avelina G., Ibarra S. Santos, Ana Maria S. Veluz, Lucia J. Marbella, Apolinar B. Asencion and Florencio Isagani S. Medina III.** "Mutation Breeding in Horticultural Crops in the Philippines". Country Report Presented at the Seminar on Mutation Breeding in Horticultural Crops for Regional Nuclear Cooperation in Asia. Bangkok, Thailand, 3-10 November 1996.
- Lapade, Avelina G., Apolinar B. Asencion, Ibarra S. Santos, Alfonso O. Grafia, Ana Maria S. Veluz, Adelaida C. Barrida and Lucia J. Marbella.** "Crop Improvement Through Induced Mutation Breeding at the Philippine Nuclear Research Institute (PNRI)". Presented in the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Manoto, Eugenia C.** "Disinfestation as a Quarantine Treatment for Ornamentals". Presented during the Third Research Coordinated Meeting on Irradiation as a Quarantine Treatment of Mites, Nematodes and Insects Other than Fruit Fly. Beijing, China, 15-19 July 1996.
- Manoto, Eugenia C.** "Sterile Insect Technique for the Management of the Oriental Fruit Fly in Guimaras Island". Presented during the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Medina III, Florencio Isagani S., Juana S. Gregorio, Cristina P. Aguilar and Patricia Andrea V. Carillo.** "Biological Dosimetry at the Philippine Nuclear Research Institute's Cytogenetics Laboratory". Presented at the IAEA/RCA Expert Advisory Group Meeting of Biodosimetry. PNRI, Diliman, Quezon City, Philippines. 25-29 November 1996.
- Medina III, Florencio Isagani S.** "The Expectation from Radiation Mutation Breeding in the Southeast Asia-2000". Presented at the 22nd Japan Conference on Radiation and Radioisotopes. Pacifico Yokohama Conference Centre, Japan, 17-19 December 1996.

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- Medina III, Florencio Isagani S., Patricia Andrea V. Carillo, Cristina P. Aguilar and Juana S. Gregorio.** "Genetic Sexing of *B. philippinensis* in the Philippines" (IAEA Research Contract # 8682/RO). Country Report Presented during the First FAO/IAEA Research Coordination Meeting of the Coordinated Research Programme (CRP) on Molecular and Genetic Sexing Strains for Field Application in Fruit Fly SIT Programmes. Mendoza, Argentina, 18-22 March 1996.
- Medina III, Florencio Isagani S.** "Genetics of Small Laboratory Animals." Presented at the Philippine Association of Laboratory Animals Science Convention. Unilab, Mandaluyong City, Philippines, May 1996.
- Medina III, Florencio Isagani S.** "Cytogenetics." Presented during the Philippine Association of Medical Technologists Convention, Manila Midtown Hotel, Philippines, 5-7 December 1996.
- Nato, Alejandro, Jr. Q.** "Country Report for the Group Training Course in Environmental Radioactivity Analysis and Measurement". JICA/Japan Chemical Analysis Center, Japan, 10 September-20 October 1996.
- Nazarea, Ma. Teresa Y.** "Implementation of IAEA Basic Safety Standards in Medical and Research Institutions in the Philippines". Country Report Presented during the RCA Training Course on Implementation of the Basic Safety Standards. Bombay India, 18-29 November 1996.
- Obra, Glenda B.** "Disinfestation as a Quarantine Treatment for Ornamentals". Presented during the Third Research Coordinated Meeting on Irradiation as a Quarantine Treatment of Mites, Nematodes and Insects Other Than Fruit Fly. Beijing, China, 15-19 July 1996.
- Pedregosa, Reynaldo V., Lynette B. Cayabo and Linda L. Leopando.** "Nucleonic Gauges in Philippine Industry: Current Applications." Presented during the 2nd Philippine Nuclear Congress, Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Refre, Antonio E.** "Information Technology for Nuclear Education/Public Awareness Program". Paper presented during the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Rosales, Crispina M., A.O.Grafia and F.G.Rivera.** "Biological Nitrogen Fixation in Mungbean Under Stress Environment (Acid Soils)". Presented during the 2nd Philippine Nuclear Congress, Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Santos, Flora L.** "Nuclear Analytical Techniques Applications in Air Pollution". Presented during the Radioisotope Society of the Philippines Annual Convention. Sulo Hotel, Quezon City, Philippines, February 1996.
- Santos, Flora L.** "Nuclear Analytical Techniques in Air Pollution". Presented in KKP-Division of Analytical Science Symposium on Trends in Environmental Analysis, November 1996.
- Seguis, Julietta E.** "Radiation Source Control System in the Philippines." Country Report Presented at the Workshop on Sealed Radiation Sources Registry. Vienna, Austria, 10-20 June 1996.
- Sombrito, Elvira Z., Adelina Bulos and Merrian Tangonan.** "Development of a Gel-Type Chromatographic <sup>99</sup>Mo-<sup>99m</sup>Tc Generator". Presented during the 12th Philippine Chemistry Congress, Iloilo City, Philippines, 23-26 May 1996.
- Valdezco, Eulinia M.** "Mga Kaalaman sa Bosyo Ayon sa Philippine Nuclear Research Institute". Presented at the Public Forum on Nuclear Medicine and the Thyroid Gland. Department of Health Convention Hall, Philippines, 26 July 1996.

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- Valdezco, Eulinia M.** "100 Years of Radioactivity". Presented at the 1996 Quezon City Science Community Celebration of the National Science and Technology Week. Social Science Building, Ateneo de Manila, Philippines, 18 July 1996.
- Valdezco, Eulinia M.** "Application of International Standards". Presented at the 2nd Seminar on Radioactive Waste Management for Regional Cooperation in Asia. Kuala Lumpur, Malaysia, 15-17 October 1996.
- Valdezco, Eulinia M.** "Reduction of Patients' Exposures in Nuclear Medicine". Presented at the 5th National Congress of the Philippine Organization of Medical Physicists. St. Luke's Medical Center, Quezon City, Philippines, 9 Nov. 1996.
- Valdezco, Eulinia M. and Editha A. Marcelo.** "Radioactive Waste Management: The Philippine Experience". Presented at the 2nd Seminar on Radioactive Waste Management for Regional Cooperation in Asia. Kuala Lumpur, Malaysia, 15-17 October 1996.
- Valdezco, Eulinia M. and Editha A. Marcelo.** "R&D on Radioactive Waste Management Technologies in the Philippines". Presented at the 2nd Seminar on Radioactive Waste Management for Regional Nuclear Cooperation in Asia. Kuala Lumpur, Malaysia 15-17 October 1996.
- Valdezco, Eulinia M., Editha A. Marcelo, Jesulito B. Junio, Arlean L. Alamares and Demetrio S. Salom.** "The National Approach to Radioactive Waste Management: The Philippine Experience". Presented at the 2nd Philippine Nuclear Congress, Manila Midtown Hotel, Philippines, 10-12 December 1996.

### POSTER PRESENTATIONS

- Africa, Lorena B., Virginia S. Calix, Alwyn B. Anfone, Merrian Tongonan and Efren Sta. Maria.** "Advantage of TXRF Spectrometry in the Analyses of Air Samples Over Atomic Absorption Spectrometry in the Analysis of Air Samples Over Atomic Absorption Spectrometry". Presented at the 12th Chemistry Congress. Sarabia Manor Hotel, Iloilo City, Philippines, 23-24 May 1996.
- Alejandrino, Adoracion L., Celia O. Asaad, Azucena C. De Vera, Angel Mateo (BAI), Buenaventura Malabayabas (National Dairy Authority), Custer C. Deocarís, Luzviminda M. Ignacio and Marissa S. Herrera.** "Progesterone Radioimmunoassay (RIA) as a Tool in Dairy Cattle Breeding Management in Southern Luzon Villages". Presented during the Annual Convention of the Philippine Society of Biochemistry and Molecular Biology. University of Sto. Tomas, Manila, Philippines, 6-7 December 1996.
- Alejandrino, Adoracion L., Celia O. Asaad, Azucena C. De Vera, Angel Mateo (BAI), Buenaventura Malabayabas (National Dairy Authority), Custer C. Deocarís, Luzviminda M. Ignacio and Marissa S. Herrera.** "The Use of Radioimmunoassay Technology in Dairy Farming". Exhibited during the Annual Convention of the National Academy of Science and Technology. Davao City, the Philippines, July 1996.
- Alejandrino, Adoracion L., Celia O. Asaad, Azucena C. De Vera, Angel Mateo (BAI), Buenaventura Malabayabas (National Dairy Authority), Custer C. Deocarís, Luzviminda M. Ignacio and Marissa S. Herrera.** "RIA del Barrio". Presented during the PNRI Atomic Energy Week Celebration. 9-13 December 1996. (Awarded 3rd Prize).
- Calix, Virginia S. and Neil R. Guillermo and Pablo P. Saligan.** "Mossbauer Effect Studies of Ferrites". Presented in the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.

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- Calix, Virginia S., Lorena B. Africa and Pablo P. Saligan. "Applications of Radioisotopes Excited XRF in the Quality Control of Jewelry". Presented in the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- De Jesus, Elizabeth, Ma. Teresa Borrás, Ma. Teresa Salabit and Rizalina Osorio. "Preparation of Anti-T4 Magnetic Particles for T4 RIA". Presented at the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- De Jesus, Elizabeth, Ma. Teresa Borrás, Ma. Teresa Salabit and Rizalina Osorio. "TSH Antibody Iodination". Presented during the Atomic Energy Week Celebration. PNRI, Philippines, 9-13 December 1996.
- Deocaris, Custer C., J.P. Bunagan and K.C. Perey. "Radioprotector-Modified Lethality Shifts In Gamma Irradiation Mouse Cryptogenic Model". Presented during the 1996 Annual Convention of the Philippine Environmental Mutagen Society. College of Science, University of the Philippines, Quezon City, 5 December 1996.
- Deocaris, Custer C., J.P. Bunagan and K.C. Perey. "Apoptosis and Survival Parameters During Protection from Radiation-induced Thymocyte Death by a Herbal Radioprotector, GC-2112 from *Allium Sativum*". Presented during the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Deocaris, Custer C., Alejandro Q. Nato, Jr., Apolonio D. Nazarea and A.B. Mateo. "Molecular Engineering Of Winged-Epitomorph Combi-peptides Mimicking FMDV Serotype A VP1 Polyprotein (135-146)". Presented at the 21st Annual Convention of the Philippine Society for Molecular Biology and Biochemistry (PSBMB). University of Sto. Tomas, 6-7 December 1996.
- Duran, Emerenciana B., Cecilia M. De Vera, Fe M. Dela Cruz and Teofilo Y. Garcia. "Remedies to Enable the Use of Phosphogypsum as Construction Material Despite Its Radon Content". Presented at the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.

**TABLE 9. LIST OF TECHNICAL PAPERS**

- Manoto, Eugenia C., et. al. "Integrated Fruit Fly Management Program Based on Sterile Insect Technique in Guimaras Island." Presented during the Annual Review of BAR-Funded Projects (Luzon and Visayas). Subic, Zambales, 3-6 December 1996 (First Prize Award).
- Manoto, Eugenia C. "Oriental Fruit Fly Management Program on the Mango in Guimaras Island". Presented during the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, 10-12 December 1996.
- Manoto, Eugenia C. "Radiosensitivity of the Orchid Weevil". Presented during the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Nazarea, Ma. Teresa Y. and Alejandro Q. Nato, Jr. "A Chromogenic Test for Irradiated Oriental Fruit Fly, *Bactrocera Philippinensis*, as a Quarantine Diagnostic Kit." Presented at the 2nd Philippine Nuclear Congress. Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Rosales, Crispina M., Alfonso O. Grafia and Faye G. Rivera. "Biological Nitrogen Fixation Under Stress Environment II - The Effects Of Lime And Phosphorous On Nitrogen Fixation In Mungbean Under Acid Soil Conditions Using Isotope Dilution Technique". Presented at the 2nd Philippine Nuclear Congress, Manila Midtown Hotel, Philippines, 10-12 December 1996.
- Valdezco, Eulinia M., Editha A. Marcelo, Arlean L. Alamares, Jesulito B. Junio and Joselito M. Dela Cruz. "Treatment of Low-Level and Intermediate Aqueous Waste Containing Cs-137 by Chemical Precipitation". Presented at the 2nd Philippine Nuclear Congress., Manila Midtown Hotel, Philippines, 10-12 December 1996.

P

## NRJ AWARDS

*Cecilia T. Perez*  
Bookkeeper III

*Benjamin J. Mandiguado*  
Electrician II

*Danilo Ken J. Cacatian*  
Machinist III

*Lynette B. Cayabo*  
Science Research Specialist II

*Conrado M. De Guzman*  
Supply Officer II

*Josefina G. Natera*  
Secretary II

*Librado G. Gosalta*  
Senior Science Research Specialist

*1990 Model Employee*

*Best Maintenance Staff Worker*

*Best Technician*

*Best Staff Worker (Technical Staff)*

*Best Staff Worker (Administrative Staff)*

*Exemplary Attendance*

O

## OTHER AWARDS

*Dr. Carlito R. Alca*  
Director

*Aida D. Eugenio*  
Deputy Director

*Eulimia M. Valdezco*  
Supervising Science Research Specialist

*Estralla D. Rehunia*  
Senior Science Research Specialist

*Dr. Florencio Isagani S. Medina III*  
Chief Science Research Specialist

*Custer C. Dewaris*  
Science Research Specialist I

*Most Outstanding Alumnus*

Given by National Defense College of the Philippines

*Professional Award for 1996*

Given by the University of the Phil. in Diliman, Quezon City

*Two of the Most Outstanding Alumni*

Given by FEATI University

*Most Outstanding Alumnus for 1995-96*

Given by the Gregorio Araneta Foundation  
University Alumni Chapter Association Inc.

*3rd Best Biomedical Research Paper Award*

Sponsor: Phil. Association of Laboratory Animal Science

A

## TECHNICAL EXHIBIT

*(Technical poster contest during the 24th Atomic Energy Week)*

*"Bayanilhan Spirit in Case of a Radiological Emergency"* *1st Place*  
Radiological Impact Assessment Group, NRLSD

*"Kung Kaya, Nila, Kaya Rin Namin"* *2nd Place*  
Engineering Services (Instrumentation Group), NSTD

*"Alpha, Beta, Gamma Everywhere"* *3rd Place*  
Health Physics Research Group, ARD

*"RIA del Barrio"*  
Biomedical Research Group, ARD

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*Justina S. Cerbolles*  
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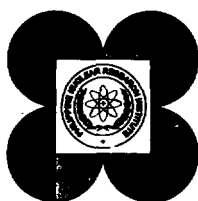
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