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REPORT OF FOREIGN TRAVEL BY SHIRLEY A FRY, ORAU

Robert W. Wood, Director of Physical and Technological Research, ER-74,  
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Attached is a copy of a trip report prepared by Shirley A. Fry covering her travel to the United Kingdom during the period September 9-18, 1988. The traveler attended the 14th L.H. Gray Conference on "Low Dose Radiation - Biological Bases of Risk Assessment" and presented an invited paper entitled, "Epidemiological Studies of Populations Occupationally Exposed to Radiation."

The report has been reviewed and does not contain any classified information.

*Roanne O. Alexander*  
for Larry L. Radcliffe, Acting Director  
Research and Waste Management Division

Attachment

cc w/atchmt:

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COVER SHEET  
FOR TRIP REPORTS SUBMITTED TO THE  
OFFICE OF ENERGY RESEARCH

Destination(s) and Dates for  
Which Trip Report Being Submitted: United Kingdom, September 9-18, 1988

Name of Traveler: Shirley A. Fry

Joint Trip Report  Yes

No

If so, Name of Other Traveler(s): \_\_\_\_\_  
\_\_\_\_\_

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FOREIGN TRIP REPORT

Dr. Shirley A. Fry

Director, Center for Epidemiologic Research  
Medical and Health Sciences Division  
Oak Ridge Associated Universities

England, September 9-18, 1988

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1. Traveler

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Report dated: November 2, 1988

2. Destination

2.1 Travel from Oak Ridge, Tennessee, to London, England, September 9-10, 1988

2.2 14th L. H. Gray Conference, Oxford, England, September 11-15, 1988

2.3 Travel day, London, Eastbourne, England, September 16-17, 1988

2.4 Travel from London, England, to Oak Ridge, Tennessee, September 18, 1988

3. Purpose

The purpose of this travel was to attend the 14th L. H. Gray Conference on "Low dose radiation - biological bases of risk assessment" and to present an invited review paper entitled "Epidemiological studies of populations occupationally exposed to radiation."

4. Abstract

Papers presented at the 14th L. H. Gray Conference on "Low dose radiation - biological bases of risk assessment" reported on the present state of knowledge in this area from an epidemiological and experimental (in vivo and in vitro) perspective. The papers generally addressed the issue of and provided a basis for considerable discussion of the contribution of current knowledge to the scientific basis for estimates of the health risks, particularly the cancer risks associated with such exposures. The issue remained unresolved, however. Specific areas were identified in which additional research is needed to resolve questions of low level radiation effects. Information provided and obtained by the traveler is relevant to ORAU's epidemiologic studies for DOE/OHER of health and mortality among DOE workers.

The 14th L. H. Gray Conference, New College, Oxford, UK, September 11-15, 1988, focused on the biological bases for estimates of risk from low level radiation. The conference was attended by >200 individuals from research institutions in approximately 20 countries. The majority of the participants were experimentalists. The conference organizers were disappointed by the limited representation of epidemiologists. They attributed this to a misunderstanding of the conference focus and objectives.

The organizers' major objective was to stimulate presentations and discussion that would contribute to the resolution of a series of radiobiologic and radioepidemiologic questions; these were:

1. Which models are consistent with what we know about mechanisms for tumor induction?
2. To what extent do the period of exposure and subsequent tissue repair processes modify the carcinogenic risk following radiation exposure, i.e., how important is "biological time?"
3. How much does radiation quality modify the carcinogenic risk?
4. Which are the most realistic models for risk projection?
5. How relevant are cell transformation and animal studies to carcinogenesis in man?
6. There may be groups sensitive to radiation carcinogenesis in the population; what defines them and can they be identified?
7. How do age, sex, or other interacting factors influence the carcinogenic risk from radiation and is the fetus particularly sensitive?
8. What changes in the genome are involved in radiation carcinogenesis?
9. To what extent do non-homogeneous distributions of dose either in the whole body or within specific tissues influence the carcinogenic risk?
10. Do non-stochastic effects, teratogenesis, and mental retardation need to be taken into account at low doses?
11. Which new developments in fundamental science are likely to contribute to answering any of the above questions?
12. What are the major uncertainties in risk assessment and can they be quantified?

The questions generally were addressed but most remained unresolved in part because of the limited opportunity for give and take discussion and in part because the data are incomplete.

Reviews of various aspects of the usual "high dose" epidemiologic studies, i.e., A-bomb survivors, therapeutically irradiated patients, uranium miners,

and radium dial painters, occupied most of the first day. The newly determined reduction of the genetic risk attributed to radiation among the children of A-bomb survivors reported by Neel, University of Michigan, was noteworthy, with the doubling dose estimated to be 2-4x the previously reported value. Despite the exhaustive efforts applied in reassessing the A-bomb dosimetry (G. Kerr, ORNL, U.S.), it remains incomplete for almost 50% of Nagasaki residents previously assigned to the 200-300 rem group. The apparent increase in the cancer risk in this population is largely a result of the longer follow up (through 1985) rather than more precise dosimetry (H. Kato, RERF, Japan). Schull (University of Texas, U.S.) reviewed and updated the results of his studies with Otake (RERF, Japan) among children in utero at the time of the A-bomb of the effects of radiation on the developing CNS. These appear to confirm his earlier findings of impaired development when exposure to radiation occurs between the 8th and 15th week of gestation even at doses of <10 rem to the fetus. This study is ongoing and is being expanded to include the children's school performance and IQ as end points of interest.

Professor J. F. Bittell, U.K., reviewed the so-called Oxford survey studies of the relationship between irradiation of the mother during pregnancy and the subsequent development of malignant disease (leukemia or solid cancers) in the coincidentally irradiated fetus. While a good case was made for a dose response relationship (increased risk with increasing number of radiographs taken) the problem remains of non-replication of these findings, lack of support by experimental data, and the possibility that this represented a susceptible sub-population.

I reviewed the scope of ongoing studies of occupationally exposed populations, with the exception of studies of the uranium miners and radium dial painters; these were reviewed by Ellett (NRC, U.S.) and Mays (NCI, U.S.), respectively, who summarized the results to date. I also commented on the strengths and weaknesses of nuclear worker studies in the context of their contribution to the assessment of risk associated with low levels of radiation.

Surprise and interest were expressed to me following my presentation about the amount of data now becoming available for the nuclear industry workers being studied in the U.S., U.K., and Canada. Concern was expressed about the effects of confounding factors such as chemical exposures, smoking, and socioeconomic status in these studies. There continues to be a general lack of comprehension of the scope of the DOE/OHER sponsored epidemiologic studies of DOE/DOE contractor employees, both in terms of the size of the population or nature of the exposures, i.e., internal as well as external, alpha as well as penetrating radiation. Several participants commented on the difference between the dose rate at which occupational exposure occurs, i.e., protracted low doses vs. the acute single doses received by the A-bomb survivors and the other populations that to date have provided the basis for estimates of cancer risks from low level radiation. This was encouraging as these differences and the consequent greater complexity of the dosimetry and analytic problems associated with the effects of protracted exposure are frequently lost sight of by scientists not directly involved.

D. Thomas, U.S., reviewed the models for predicting radiation induced cancer risks considered by the BEIR V committee. Models were necessary because of (1) small sample sizes, particularly for specific subgroups; (2) confounding and modifying factors; and (3) censored data. The Committee used data from

original and combined population analyses of cancer mortality/ incidence among irradiated populations with respect to all cancers combined, breast, and thyroid cancer. An RBE of 20 was assumed for neutrons. Background cancer rates were estimated by internal comparisons within available data sets. Carcinogenesis models considered were: (1) Initiation-latency; (2) Armatage and Doll's; and (3) Moogkhar and Knutsen's; the initiation-latency model was used to produce the estimates to be reported by the Committee. Models were first fitted to individual data sets; then an attempt was made to fit a common model, with separate parameters being set for breast and thyroid cancer only. Animal data were used where there were insufficient human data, e.g., in assessing the cancer risk of neutrons, and in the determination of the so called "dose rate effectiveness factor." Lifetime risk projections were derived using life table methods. The only human data available to assess extended exposure are those for breast cancer. Other problems addressed included the choice of cancer site groupings, "transportation" of risk models between populations. Uncertainty analyses evaluated the sampling variability in the parameters of the models fitted; model misspecification; and the effect of the biases in the data. Thomas stopped short of enumerating the Committee's conclusions pending completion of the review process, but outlined the anticipated general thrust of the BEIR V report as: (1) the BEIR V cancer risks differ from those reported by BEIR III; (2) the uncertainties are narrower than for the BEIR III estimates; (3) there now is  $\leq 10\%$  difference in risks predicted by the relative (RR) and absolute (AR) risk models; (4) the risks predicted by RR are not always the higher of the two; and (5) AR nearly always underestimates the risk.

C. Muirhead, U.K., was one of several speakers who addressed the question of the appropriateness of the use of the RR vs. AR models in projecting risk. His presentation was based on updated mortality data for the British ankylosing spondylitics (N = 14,106) who received single X-ray treatments between 1935 and 1954. 639 deaths were observed through 1982; this represented an overall cancer mortality (omitting leukemia or colon) increase of 28% compared with the U.K. general population. Emphasis has been placed on dose assessment; it is now believed that most sites received  $>1$  Gy (hardly low level!). For all cancers combined the RR declined over years 1-5 post exposure, it then rose during years 5-15 before appearing to tail off, although it has not yet reached the baseline rates. A similar tailing off effect has been observed among the radium dial painter and uranium miner populations, but not in the A-bomb survivors. Models were fitted to evaluate the joint effects of age at exposure, time since exposure, attained age, and sex. The projection model that best fits the spondylitic data appears to vary according to one or more of these variables, particularly age at exposure.

On the second day, papers were presented in sequential sessions dealing with animal studies and sensitive populations. Papers on radiation effects on lung, and epidemiology and effects on the fetus were presented in a subsequent split session; this latter arrangement was unfortunate as both sessions were of interest. J. Broerse, Netherlands, and R. J. M. Fry, U.S., reviewed current knowledge of the respective roles of physical and host factors on radiation carcinogenesis in experimental animals. Broerse emphasized the need to retain facilities for HLET experimental studies; the necessity of following irradiated animal colonies for their full natural life span; and the importance of having similar age distributions in both the experimental and control groups (epidemiologists also consider this to be important!). For physical factors,

the animal data indicate that (1) fractionated doses of LLET radiation are less tumorigenic than the same total dose delivered acutely; (2) low levels of HLET are associated with a linear dose response, whereas for LLET the shape of the dose response curve in this region appears to be tissue dependent; (3) data from neutron irradiation studies having different end points suggest an RBE ranging from 7 to 100 but 20 appears to be a reasonable general approximation; (4) LLET is more effective per unit dose at high vs. low dose rates as is HLET (neutrons) for ovarian tumors but the reverse appears to be true for mammary tumors in mice. This apparent contradiction may be related to the range of end points evaluated in these studies; (5) the results of HLET studies evaluating the effects of fractionation or dose rate reduction on (a) tumor induction and (b) longevity, are equivocal; some show increased risks while others show decreased risks.

Michael Fry reviewed studies of irradiated animals in the context of (1) the questions that might be answered by animal experiments and (2) which questions needed to be addressed first. He suggested that animal studies could effectively test the appropriateness of the relative vs. the absolute risk model in projecting cancer risk, and address the questions of: (1) age dependent susceptibility and (2) independence of tumors.

Tom Fritz, U.S., presented data from Argonne National Laboratory's life span studies of mice and dogs exposed to HLET. In these studies 97% of the dogs who received high total doses and 35% of the controls are now dead. The mortality rate is influenced by the total dose, not the dose rate. Fatal tumors were responsible for most of the life shortening effect of irradiation. With continuous irradiation the dogs developed aplastic anaemia from which they either died or recovered and went on to live a long time before dying (typically) of myeloid leukemia. There was nothing remarkable about the distribution of specific non-cancer causes of death.

The group (aplastic anaemia vs. leukemia) into which individual study animals fell was directly related to the hematopoietic stem cells sensitivity to radiation; the fewer the stem cells surviving, the greater the risk of the animals developing aplastic anaemia. The radiation sensitivity of the stem cells appeared to be related to their environment; the response was dependent on whether irradiation of hematopoietic tissue was conducted in vivo or in vitro. These researchers presented a convincing argument against relying on in vitro studies to evaluate the biological effects of radiation.

F. Hahn, U.S., discussed irradiation of the tracheobronchial lymph (TBL) nodes after deposition of radioactive particles in lung which is relevant to ORAU's epidemiologic studies of DOE workers exposed to uranium dust. He noted the increased risk of non-Hodgkins lymphoma in the spondylitics who received external x-ray therapy and of malignant lymphomas in the patients with internal Thorotrast deposits. At ITRI, beagle dogs were briefly exposed to  $^{144}\text{Ce}$  fused in aluminosilicate particles and  $^{239}\text{Pu}$ , both in aerosol form, and were followed to death. It was found that the dose to lung from the  $^{144}\text{Ce}$  deposited in lung accumulated more rapidly than to the TBLs but that the total dose was less than to the TBLs. At 800 days post exposure the dose to the TBL was 3x the lung dose. The dogs with the highest dose to lung died in shortest time. The primary tumors found in the TBLs at autopsy were hemangiosarcomas, and hemangiomata; there were no lymphoid tissue tumors. The lung tumor incidence in the  $^{144}\text{Ce}$  exposed animals was higher than that of TBL tumors. No tumors

developed in the TBLs of dogs exposed to  $^{239}\text{Pu}$  by inhalation. Hahn concluded that the risk of TBL tumors due to irradiation from radionuclides deposited in lung was less than the risk of lung tumors, and that TBLs were not at special risk after inhalation of insoluble radionuclides. He said there was evidence (scarring) that the cells at risk were the endothelial cells lining the blood vessels.

M. Peterson, Canada, reviewed the evidence for radiation sensitive subpopulations and the relationship with abnormal DNA metabolism. N. Gentner discussed the likelihood that susceptible populations were not uniformly distributed among the general population.

In the session devoted to radiation effects in lung, Peter Groer, U.S., presented the results of his reanalysis of the Colorado uranium miner data taking into account the miners' exposure to radon daughters in other hard rock mines prior to their working in the uranium mines. The results indicated a threshold for an increased lung cancer risk as there appeared to be no increased risk below 15 WLM/year or <5 years of working underground. In the concurrent session entitled "Epidemiology and effects on the fetus," K. Ennow, Denmark, reported the results of a preliminary analysis of cancer risk among Danish radiotherapy departments' staff, considered to be the most highly exposed occupational group in Denmark.

E. Gilman, U.K., updated information on the Oxford Survey study of cancer risk among children irradiated in utero. This data set includes children aged <16 years who died of cancer in England, Wales, and Scotland between 1951 and 1985. Doses to individuals had been estimated based on geographic area at death and using estimates compiled on a national grid by NRB. Based on an unexplained and remarkably smooth graph the authors reported that risk of childhood cancer declined from the 1940s to a minimum in the 1960-1970 period, then began increasing again. According to the investigators this increase was due almost entirely to fetal irradiation from environmental sources. They suggested that (1) the cancer risk from irradiation during the first trimester is 3x greater than in the third trimester, (2) dose for dose terrestrial gamma irradiation appears to be 3x more effective than prenatal x-rays, (3) 70% of childhood cancer is due to prenatal irradiation. Participants generally were skeptical of these findings in the absence of adequate supporting data. Lars-Eric Holm, Sweden, reported the results of a follow-up study of patients at 7 hospitals who received diagnostic doses of  $^{131}\text{I}$  between 1951 and 1969 for evaluation of suspected thyroid tumors or dysfunction. 3,943 patients aged <75 years who received <1 mCi were traced through 1984, with 98% follow-up. The cohort was linked to the Swedish Cancer Registry to identify thyroid cancers. 79% of the cohort was female; 81% of the cohort had only 1 diagnostic exam. Results showed the period of greatest risk of developing thyroid cancer following a diagnostic dose of  $^{131}\text{I}$  was during years 5-9 post exposure, the risk was not significantly increased during this or any other period. There appeared to be a dose response but patients examined because of a suspected thyroid cancer had the highest exposures. The authors estimated that  $^{131}\text{I}$  is 33% less carcinogenic than gamma or alpha radiation.

Dr. Alice Stewart reported data in support of her hypothesis that cancer is not the only late effect of radiation and that the A-bomb study population comprises "survivors" and thus is "selected" and underestimates the cancer risk

of radiation exposure. Unfortunately there is no way to test her hypothesis in retrospect.

Later sessions dealt with the experimental bases for effects of low levels of radiation. These gave rise to much discussion of the so-called "reverse dose effect" of HLET radiation, i.e., an apparent enhancement of the effect of HLET in the low dose (low dose rate) region of the dose-response curve. This was of particular interest to the British participants who are grappling with possible explanations of the leukemia excess found among children living around the Sellafield and Duneray nuclear plants. S. Curtis, U.S., suggested that exposure rate may influence the lung cancer risk of alpha radiation, and that use of the coefficients derived from the uranium miner data may overestimate the lung cancer risk associated with "indoor radon."

The final session, planned as a panel discussion chaired by J. Vennart, U.K., and W. Sinclair, U.S., was more a series of presentations that attempted to respond based on the conference proceedings, to the questions posed at the beginning of the conference. Comments included:

J. Schull, U.K. (A-bomb studies):

- From now on only the DS86 (new) dosimetry data should be used in analyses of the A-bomb survivor data.
- Currently there is no clear evidence that the linear dose response model is superior to the linear quadratic (or vice versa) in the low dose region; but it does seem appropriate to exclude the quadratic model as viable in this region.
- There is no demonstrated cancer mortality excess in this population below about 20 rads.
- The difference between the cancer risk among the Hiroshima population vs. the Nagasaki population is no longer significant but is still present.
- The data are insufficient to estimate an RBE for neutrons.

M. Charles, U.K. (other epidemiologic studies)

- Urged that other (non-A bomb) radioepidemiologic data be taken into account in evaluating the risks of low level radiation.
- Stressed the importance of longer follow-up of the cohorts currently under study.
- Medically irradiated populations may be influential in defining estimates for certain end points, e.g., leukemia; thyroid and breast cancer.

J. Dennis, U.K. (sensitive groups)

- Cancer risks from other hazardous agents, e.g., tobacco, may outweigh the risk associated with radiation.

J. Vennert, U.K.

- Animal studies have a place in addressing unanswered questions, including (1) the differences in the magnitude of the risks associated with brief vs. protracted exposures. The data on the protraction effect are incomplete; it may be different depending on the total dose. (2) What is the RBE for neutrons?
- Animal studies can provide a basis for extrapolation models.

Literature Acquired

Committee on Medical Aspects of Radiation in the Environment (COMARE).  
Chairman: Professor M. Bobrow, Second Report.

Investigation of the possible increase of leukaemia in young people near the  
Dounreay Nuclear Establishment, Carthress, Scotland. HMSO, London 1988.  
(Courtesy of L. Salmon, United Kingdom Atomic Energy Authority)

L. H. Gray Conference Sept 11-15, 1988  
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Dr R Young  
Defence Nuclear Agency  
Washington USA



Oak Ridge  
Associated Universities Post Office Box 117  
Oak Ridge, Tennessee 37831-0117

Executive  
Office

December 13, 1988

Mr. Larry L. Radcliffe, Acting Director  
Research and Waste Management Division  
Department of Energy  
Oak Ridge, Tennessee 37830

Subject: TRANSMITTAL OF FOREIGN TRIP REPORT  
SHIRLEY A. FRY - UNITED KINGDOM

Dear Mr. Radcliffe:

Seven copies of the subject report are enclosed. We apologize for any  
inconveniences caused to your staff as a result of this late submission.

This report has been reviewed and does not contain any proprietary data.

Sincerely,

Jon M. Veigel  
President

BAKER

Enclosures

1128170

SF  
~~X 7332~~



**Department of Energy**  
Oak Ridge Operations  
P.O. Box 2001  
Oak Ridge, Tennessee 37831 - 8622

December 5, 1988

Dr. Jon M. Veigel  
Executive Director  
Oak Ridge Associated Universities  
Post Office Box 117  
Oak Ridge, Tennessee 37831-0117

Dear Dr. Veigel:

**DELINQUENT TRIP REPORTS BY ORAU REPRESENTATIVES**

Trip reports are required on all foreign travel within 25 days after the traveler's return to duty station. A review of our records reveals that trip reports are outstanding covering foreign travel by ORAU representatives as follows:

<u>Traveler</u>	<u>Destination</u>	<u>Period of Travel</u>
James E. Crook	Taiwan	October 28-November 6, 1988
Diane S. Flack	United Kingdom	September 9-21, 1988
<del>██████████</del>	United Kingdom	September 9-18, 1988
Peter G. Groer	United Kingdom and Austria	September 10-22, 1988

Enclosed is a copy of the guidelines which should be followed in the preparation of the trip reports.

In the event any of the trips were cancelled, please advise. Otherwise, your assistance in assuring that the required trip reports are submitted as soon as possible will be appreciated.

Sincerely,

*M.C. Wallace*  
for Larry L. Radcliffe, Acting Director  
Research and Waste Management Division

Enclosure

1128171

# memorandum

DATE: SEP 2 1988

REPLY TO:  
ATTN OF: ER-622

SUBJECT: Approved 1512.1's

TO: Margie Wallace, ER-122  
Agreement Administrative Specialist  
Oak Ridge Operations Office

Please find attached approved 1512.1's for the foreign travel of the following individuals:

- Flack, Diane S. - ORAU
- ~~Fry, Shirley A.~~ - ORAU
- Groer, Peter G. - ORAU
- Mougy, Jean - CEBAF

A trip report is required from each traveler upon completion of his/her travel. If the travel was cancelled or revised in any way, please advise us.

*Robert L. Main*  
 Robert L. Main  
 Office of Management  
 Office of Energy Research

Attachment(s)

9/9/88 copy of approved 1512.1's to be reviewed, OPA/aa

1128172

*Lamar*  
V-507

REQUEST FOR APPROVAL OFFICIAL FOREIGN TRAVEL

(Previous Editions are Obsolete)

PART B--To be completed by traveler's administrative officer

Budget and Reporting Classification to be charged: HA 020 1010  
(see Chapter II, Accounting Practices and Procedures Handbook) I

PART C--To be completed by traveler

1a. NAME OF TRAVELER Shirley A. Fry	c. DATE AND PLACE OF BIRTH [REDACTED] England
b. CITIZENSHIP USA	d. PASSPORT NUMBER (if available) [REDACTED]
2a. HOME ADDRESS [REDACTED]	b. BUSINESS ADDRESS Oak Ridge Associated Universities P.O. Box 117, Oak Ridge, TN 37831-0117
3a. EMPLOYER Oak Ridge Associated Universities	c. TELEPHONE NUMBER 615/576-3480
b. ORGANIZATIONAL UNIT Medical and Health Sciences Division	d. CONTRACT NUMBER DE AC05 76OR00033
	d. POSITION TITLE (including profession) Director, Center for Epidemiologic Research

4. PURPOSE OF TRAVEL--Include all pertinent background information leading to travel and attach copies of invitations and correspondence regarding travel to present papers, give speeches, or to attend conference or symposia. Justification for travel must be provided including benefit to be derived by the government if trip is taken. Also identify by name and organization other DOE and contractor personnel who, to the traveler's knowledge, are going to the same destination at the same time as the traveler. In addition, specify nature and classification of information to be disclosed including titles of papers to be presented; nature of information to be obtained at each of the places to be visited and conferences to be attended and its relation to traveler's work. Travelers are responsible for obtaining clearances for papers or speeches when necessary. If more space is required, attach a separate sheet. NOTE: IF THIS INFORMATION IS CLASSIFIED BE SURE TO CLASSIFY THIS FORM APPROPRIATELY.

- To attend the 14th L. H. Gray Conference on Low Dose Radiation - Biological Bases of Risk Assessment at which I shall present an invited review paper entitled, "Epidemiology of groups occupationally exposed to radiation." This participation provides an opportunity
  - 1) to disseminate information about the epidemiologic studies of DOE workers ORAU is conducting for DOE/OHER,
  - 2) to learn of recent work on low dose radiation effects, and
  - 3) to interact with and learn from peers involved in similar areas of research, all of which can benefit the ORAU studies.
- Other DOE contractor personnel presenting papers at this meeting include P. G. Groër, ORAU; R. J. M. Fry, ORNL; D. J. Grdina, Argonne; G. D. Kerr, ORNL; and T. E. Fritz, Argonne, D. S. Flack, ORAU.
- The conference will not involve classified or otherwise restricted information.

1128173

Robert W. Wood

-2-

JUL 27 1988

Please have Margie Wallace (FTS 626-0714) notified as soon as a determination is made regarding the travel and return the signed originals of DOE F 1512.1 to this office.

ORIGINAL SIGNED BY  
M. C. WALLACE

*for*

W. D. Adams, Director  
Research and Waste Management Division

Attachment

cc w/atchmt:  
J. A. Lenhard, ER-10, ORO  
M. M. Dare, AD-43, ORO  
D. J. Cook, DP-82, ORO

CONCURRENT		
RTG SYMBOL	ER-122	
INITIALS/SIG.	WALLACE	
DATE	<i>MCW</i>	
DATE	<i>7/26/88</i>	
RTG SYMBOL	ER-122	
INITIALS/SIG.	ATCHLEY	
DATE	<i>KA</i>	
DATE	<i>7/20/88</i>	
RTG SYMBOL	AD-40	
INITIALS/SIG.	MARQUES	
DATE	<i>Dare</i>	
DATE	<i>Marques</i>	
RTG SYMBOL	ER-122	
INITIALS/SIG.	WALLACE	
DATE	<i>MCW</i>	
DATE	<i>7/27/88</i>	
RTG SYMBOL		
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INITIALS/SIG.		
DATE		

1128174

REQUEST FOR APPROVAL OFFICIAL FOREIGN TRAVEL

All Other Editions Are Obsolete

PART A-SUMMARY TRAVEL INFORMATION

STI FAXED  
TO IE-1  
7/27/88

ORGANIZATION: ORAU

COST TO DOE: \$1,788.00

FUND SOURCE: HA 02 01 01 0 (The organizers are prepared to cover the cost of registration and accommodations and hope to be able to make a substantial contribution towards airfare depending on number of registrants.)

NAME OF TRAVELER: Fry, S. A.

DOE/CONTRACTOR/UNIVERSITY: C

DESTINATION: New College, Oxford, UK

DATES: 09/11/88 TO 09/15/88

PURPOSE: To attend the 14th L. H. Gray Conference on Low Dose Radiation - Biological Bases Risk Assessment. Traveler will present an invited review paper, "Epidemiology of Groups Occupationally Exposed to Radiation."  
AGREEMENT: NO AGREEMENT

DESTINATION: \_\_\_\_\_

DATES: \_\_\_/\_\_\_/\_\_\_ TO \_\_\_/\_\_\_/\_\_\_

PURPOSE: \_\_\_\_\_

AGREEMENT: \_\_\_\_\_

DESTINATION: \_\_\_\_\_

DATES: \_\_\_/\_\_\_/\_\_\_ TO \_\_\_/\_\_\_/\_\_\_

PURPOSE: \_\_\_\_\_

AGREEMENT: \_\_\_\_\_

DESTINATION: \_\_\_\_\_

DATES: \_\_\_/\_\_\_/\_\_\_ TO \_\_\_/\_\_\_/\_\_\_

PURPOSE: \_\_\_\_\_

AGREEMENT: \_\_\_\_\_

REQUEST FOR APPROVAL OFFICIAL FOREIGN TRAVEL

(Previous Editions are Obsolete)

PART B--To be completed by traveler's administrative officer

Budget and Reporting Classification to be charged: HA 020 1010  
(see Chapter II, Accounting Practices and Procedures Handbook)

PART C--To be completed by traveler

1a. NAME OF TRAVELER Shirley A. Fry	c. DATE AND PLACE OF BIRTH [REDACTED], England
b. CITIZENSHIP USA	d. PASSPORT NUMBER (if available) [REDACTED]
2a. HOME ADDRESS [REDACTED]	b. BUSINESS ADDRESS Oak Ridge Associated Universities P.O. Box 117, Oak Ridge, TN 37831-0117
3a. EMPLOYER Oak Ridge Associated Universities	c. TELEPHONE NUMBER 615/576-3480
b. ORGANIZATIONAL UNIT Medical and Health Sciences Division	e. CONTRACT NUMBER DE AC05 76OR00033
	d. POSITION TITLE (including profession) Director, Center for Epidemiologic Research

4. PURPOSE OF TRAVEL--Include all pertinent background information leading to travel and attach copies of invitations and correspondence regarding travel to present papers, give speeches, or to attend conference or symposia. Justification for travel must be provided including benefit to be derived by the government if trip is taken. Also identify by name and organization other DOE and contractor personnel who, to the traveler's knowledge, are going to the same destination at the same time as the traveler. In addition, specify nature and classification of information to be disclosed including titles of papers to be presented; nature of information to be obtained at each of the places to be visited and conferences to be attended and its relation to traveler's work. Travelers are responsible for obtaining clearances for papers or speeches when necessary. If more space is required, attach a separate sheet. NOTE: IF THIS INFORMATION IS CLASSIFIED BE SURE TO CLASSIFY THIS FORM APPROPRIATELY.

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  - 1) to disseminate information about the epidemiologic studies of DOE workers ORAU is conducting for DOE/OHER,
  - 2) to learn of recent work on low dose radiation effects, and
  - 3) to interact with and learn from peers involved in similar areas of research, all of which can benefit the ORAU studies.
- Other DOE contractor personnel presenting papers at this meeting include P. G. Groër, ORAU; R. J. M. Fry, ORNL; D. J. Grdina, Argonne; G. D. Kerr, ORNL; and T. E. Fritz, Argonne, D. S. Flack, ORAU.
- The conference will not involve classified or otherwise restricted information.

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