RSIC Newsletter

OAK RIDGE NATIONAL LABORATORY
POST OFFICE BOX X • OAK RIDGE, TENNESSEE
OPERATED BY UNION CARBIDE CORPORATION
FOR THE U.S. DEPARTMENT OF ENERGY

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No. 225 *August 1983*

The pursuit of truth shall set you free – even if you never catch up with it. — Clarence Darrow

6th ICRS Overview

What follows is a brief summary of the 6th Conference on Radiation Shielding as given by *T. Asaoka* (JAERI), *T. Hyodo* (Kyoto University), *T. Suzuki* (JAERI), and *S. Kikuchi* (Kyoto University).

INTRODUCTION *The Sixth International Conference on Radiation Shielding (ICRS) was held in Tokyo, Japan, May 16–20, 1983, under the sponsorship of Japan Atomic Energy Research Institute (JAERI), in cooperation with IAEA, OECD-NEACRP and American Nuclear Society (ANS) in addition to various Japanese supporting organizations, namely the Science and Technology Agency (STA), the Power Reactor and Nuclear Fuel Development Corporation (PNC), the Japan Nuclear Ship Research and Development Agency, the Federation of Electric Power Companies, Atomic Industry Groups, Construction Companies, Engineering Companies, Data Services Companies and the Atomic Energy Society of Japan.*

As compared with the previous conferences in this series held about every 5 years, the conference name was changed from "Reactor Shielding" to "Radiation Shielding" because the activity area has become very wide to cover all radiation shielding. Accordingly, the scope of the conference was extended to comprise advances in shielding and radiation protection for fission, fusion, fuel handling, rad-waste and other related facilities. In addition, emphasis was put on practical aspects of shielding design, requirements for nuclear data, and occupational exposure problems in operating power reactors.

The conference was held in two meeting rooms with about 230 participants from 22 countries and 2 international organizations, namely Australia, Canada, China (RO), Denmark, Finland, France, Germany (FR), Hungary, India, Iran, Israel, Italy, Japan, Korea (RO), Libya, Poland, Sweden, Switzerland, Turkey, United Kingdom, United States, USSR, EC and OECD-NEA.

In the opening session of May 16, Y. Takaoka, *Director General for Atomic Energy Bureau, STA, gave a talk under the title of "Current Status of the Development of Nuclear Energy in Japan," following the opening address of* H. Ishikawa, *General Chairman of the Japanese Organizing Committee for the Sixth ICRS. At the luncheon of May 19,* Betty F. Maskewitz, *Director of the Radiation Shielding Information Center, ORNL, gave a speech titled "RSIC After 20 Years – A Look Back and a Look Ahead," and in the closing session of May 20,* J. Butler, *Head of Radiation Physics and Shielding Group, AEE Winfrith, summarized the Sixth ICRS by utilizing notes written by session chairmen (or co-chairmen) and proposed the next ICRS be held in Italy or the Federal Republic of Germany.*

On May 23, technical visits were performed to the Mihama nuclear power plant of Kansai Electric Power Company, as well as to the Tokai Research Establishment of JAERI and the Oarai Engineering Center of PNC.

NUCLEAR DATA AND ANALYSIS METHODS *The need for transport-method development for 3-dimensional analyses urged in the Fifth International Conference on Reactor Shielding (ICRS) held in Knoxville, Tennessee, USA, in 1977, are going to be met with the development of discrete-ordinates codes and finite-element codes, while Monte Carlo codes are continuously updated to improve calculation effi-*

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ciency and to make better use of available nuclear data.

Concerning the nuclear data which have become necessary to seek improvements as the analysis methods have advanced, the result of the Specialists' Meeting on shielding benchmark calculations to compare the various in-house data sets was presented to emphasize the necessity for the use of coherent data. The use of sensitivity analysis has advanced from a theoretical status to an operational one.

As for cross-section data, major developments could be observed in the introduction of large fine-group libraries, the utilization of covariance information and the introduction of an adjusted multigroup library for LWR shielding.

Well-defined integral benchmark experiments have now become available for data and methods testing. In the analysis of these experiments, Monte Carlo methods with pointwise cross-section representation is going to be utilized in order to avoid an ambiguous interpretation of the results, especially for the improvements of nuclear data sets by using adjustment techniques.

SHIELD DESIGNS *The combined use of the discrete-ordinates method and the Monte Carlo method has given successful results for most of the shield designs for fission reactors (FFTF, PHENIX, French PWR and PEC). The AGR's design in the UK was performed with a combination of the removal-diffusion method and the Monte Carlo method, while for MONJU and MUTSU the discrete-ordinates method was mainly utilized. In addition, a practical example of the use of generalized perturbation methods was illustrated to optimize the material distribution in an LMFBR lateral shield.*

For shield designs of fusion facilities, the 3-dimensional Monte Carlo method is necessary due to the complicated geometry and the requirement of a comparison of calculated results with experimental data. For US INTOR, French TORE SUPRA, and Japanese FER, the discrete-ordinates codes are utilized in combination with Monte Carlo codes, while in the UK only the Monte Carlo method is used for JET and for the neutral beam line of Culham Conceptual Tokamak Reactor MK-II. However, data and methods of nuclear design calculations for fusion reactors need to be verified by utilizing various integral experiments.

Radiation streaming, which was one of the major problems for LWRs in the last ICRS, has now come to be treated using discrete-ordinates codes and/or Monte Carlo codes for fission reactors. Contrary to the tendency to transfer from simple methods to 3-dimensional, sophisticated methods in the last conference, new simple and efficient methods are being developed to replace the direct use of discrete-ordinates or Monte Carlo codes. On the other hand, for the analysis of radiation streaming for fusion reactors, which significantly affects the reactor cost, personnel access and reactor operation, it has been pointed out that the utilization of transport codes using continuous-energy cross-section data may represent the only feasible approach.

It has been shown furthermore that radiation skyshine from fission reactors, accelerators and reprocessing installations can now also be analyzed successfully with discrete-ordinates methods or Monte Carlo methods. In addition, there were some presentations related to the optimization of shield designs under ALARA criteria.

SHIELDING EXPERIENCE *For the topic of radiation protection experience, the presentation was made on FFTF shielding measurements carried out prior to routine operation, shielding analyses of JOYO compared with the measured data, and radiation distributions in BWR drywells of CAORSO power station at the Hamaoka site. In addition, there were various presentations related to reprocessing plants, spent fuel transport casks, accelerators and so on.*

Concerning the radiation exposure with operating reactors, most of the presentations dealt with the transport and deposition of fission, corrosion and activation products in the primary coolant systems of water- or gas-cooled reactors. However, no presentation was made on the contamination of the primary sodium system, which is of concern in fast breeder reactors.

As for the energy deposition for radiation damage, the presentation was related to an accurate prediction of the fracture toughness and embrittlement of irradiated pressure vessels, as well as the application of newly developed microcalorimeters for measuring energy-deposition rates in the mixed radiation fields.

Concerning radiation shielding for post-accident and decommissioning, there were presentations on shielding measures during the de-

commissioning of Otto Hahn and during the dismantling of the Niederaichbach nuclear power plant, and shielding requirements for the decommissioning of Windscale AGR. In addition, presentations were made on dose rate evaluations after accident in PWRs, safety analyses of spent fuel shipping casks and radioactive waste repository plants in mines.

CONCLUSIONS *The Sixth ICRS has shown that data and methods for radiation shielding have so advanced that it will now be possible to identify target accuracies in shielding. Accordingly, a recipe will be given to fill the gap between the present accuracy of nuclear data and the required value for achieving the target accuracies. On the other hand, accumulated information from operating facilities will now be used to reduce occupational exposure.*

It is expected furthermore that radiation protection and shielding standards will be established as a result of these, with the help of the systematic development of shield optimization techniques. It may be worthwhile to note that for fusion reactor systems it is necessary first to validate a consistent set of shield design tools.

RSIC ORIENTATION VISIT TO CHINA (PRC)

Betty F. Maskewitz made an RSIC orientation visit May 23–June 3, 1983, to the People's Republic of China (ROC) hosted by the Institute of Atomic Energy (IAE), Academia Sinica. The invitation to visit ROC was extended as a result of RSIC's reputation and the presumed expertise of the RSIC director in radiation protection, transport, and shielding technical areas.

Betty was requested to lecture on the historical development and current methodology of shielding technology, the status of multigroup data generation and availability, and the concept, organization, and operation of information analysis centers. She also gave selected summaries of the state of the art as indicated by the coverage of the 6th ICRS. The host personnel (IAE, Beijing and visiting shielders) made technical presentations of their work and gave a tour of the IAE facilities.

During the visit, the agenda for IAE was condensed to allow for a day of CO_2 discussions in Beijing, a visit to the Beijing Institute of Nuclear Engineering (BINE), and a day at the 728 Research & Design Institute in Shanghai.

ANS APPOINTS NEW STANDARDS STEERING COMMITTEE CHAIRMAN

C. K. Soppet, Project Manager for Limerick Generating Station for Bechtel Power Corporation, San Francisco, has been appointed the 1983–84 American Nuclear Society (ANS) Standards Steering Committee Chairman.

A graduate of Michigan State University, Soppet began his nuclear career at Argonne National Laboratory in 1950. During the years since, he has been involved in a number of reactor projects, including the Materials Testing Reactor (MTR), the Submarine Test Reactor (STR), the Argonne Research Reactor, CP-5, at Argonne National Laboratory, and the Georgia Tech Research Reactor for General Nuclear Engineering. He became manager of Nuclear Operations for Aerojet General in 1963. His affiliation with Bechtel began in 1970 as project manager for both Peach Bottom Atomic Power Station and Limerick Generating Station, Philadelphia Electric Company projects.

Soppet is a past member of the ANS National Program Committee, and is a member of the Executive Committee of the Power Division as well as the Program and Public Information Committees of that division.

DOT USERS ALERT (R-Θ CALCULATION OPTION)

We have been informed of a bug in subroutine PCON of the DOT two-dimensional discrete ordinates transport code system. The problem, not thought to be serious for most practical problems, will cause erroneous results for the most backward-directed angular fluxes computed in runs using R-Θ geometry. The problem affects all versions of CCC-276/DOT 3.5, CCC-320/DOT 4.2, and CCC-429/DOT 4.3, and we are in the process of making appropriate updates. The coding change is minor and details will be provided upon request from RSIC to DOT users wishing to update their own source code.

CHANGES TO THE COMPUTER CODES COLLECTION

During the month a new code package was added to the RSIC Computer Codes Collection, an existing code package was replaced with a new version, and an existing package was updated to add new options.

CCC-200/MCNP

This general purpose, continuous-energy, gener-

alized geometry, time-dependent, coupled neutron-photon Monte Carlo transport code was contributed by Los Alamos National Laboratory, Los Alamos, New Mexico. This version replaces the previously existing CCC-200/MCP.

The code system treats an arbitrary three-dimensional configuration of materials in geometric cells bounded by first- and second-degree surfaces and some special fourth-degree surfaces. Pointwise cross-section data are used. For neutrons, all reactions in a particular cross-section evaluation are accounted for. For photons, the code takes account of incoherent and coherent scattering, fluorescent emission following photoelectric absorption, and absorption in pair production with local emission of annihilation radiation.

This package is based on MCNP version 3 which is now under trial usage in-house at LANL. Potential users are encouraged to acquire the package now to gain experience in its use. It allows the user to derive a given hardware version from a master source using a special conversion routine, PRPR. It is expected that this initial release will provide feedback which will allow the contributors and RSIC to collect indicated revisions over the next few months. This feedback from the user community in general and from in-house use at LANL is expected to result in an update on a 6- to 12-month time frame. Reference: "MCNP – A General Monte Carlo Code for Neutron and Photon Transport," informal report (April 1981). FORTRAN 77; IBM 3033 (A), CRAY 1 (B), VAX 11 (C), CDC 7600 (D).

CCC-203/MORSE-CG

All versions of this Monte Carlo multigroup neutron and gamma-ray transport code package were updated to add new options to the package. The new options include a Klein-Nishina estimation capability and are explained in detail in the new MORSE report, ORNL-4972-R1 which was added to the CCC-203 package documentation. FORTRAN IV; UNIVAC 1108 (A), CDC 6600 (B), and IBM 360 (C).

CCC-446M/TWOGEE

This two-group, one-dimensional neutron diffusion code system was contributed by Pennsylvania State University, University Park, Pennsylvania. Written for use on an APPLE computer to perform various reactor calculations, TWOGEE is based upon the solution of the one-dimensional neutron diffusion equation. The input data can be either typed in through the keyboard or read in from the data file which has previously been generated and saved on the diskette by the program. The system can handle 1 or 2 groups, up to 200 mesh points and up to 5 regions. The main features of the program are:

a) choice of three geometries;
b) calculation of the fluxes and multiplication factor;
c) plotting of the flux shapes on the TV screen;
d) one-iteration problems; and
e) choice of one of nine possible sets of boundary conditions.

Reference: Thesis from Pennsylvania State University (January 1983). BASIC; APPLE II.

PERSONAL ITEMS

In serving a specialized area of scientific endeavor, it seems important that we take note of the movement of people concerned with radiation protection, transport, and shielding in the nuclear industry. We, therefore, continue to carry personal items as they are brought to our attention. During the past month we have been informed of the following changes: *Fred Welfare*, and *Harry W. Webb*, from Babcock and Wilcox, to General Electric Co., Wilmington, North Carolina; *William A.* Reiners, from Dartmouth College, Hanover, New Hampshire, to the University of Wyoming, Laramie, Wyoming; *M. A. Behrooz*, from the University of Dundee, United Kingdom, to Ahwaz, Iran; and *Frank* Dombek, from Cygna Corporation, Solana Beach, California, to Cygna Energy Service, San Diego, California.

Henry C. Honeck, a principal in the initial establishment of the ENDF/B Nuclear Data System at Brookhaven National Laboratory and the development of the modular code system JOSHUA at Savannah River Laboratory, is now head of Computer Application Technology, Inc., Aiken, South Carolina.

Nicholas Tsoulfanidis has been appointed chairman of the Nuclear Engineering Department of the University of Missouri-Rolla.

Renken Named Manager of SNL Radiation Effects

The newly created Radiation Effects Department of Sandia National Laboratories will be managed by *James H. Renken.*

The mission of the department is to provide information about radiation environments and their effects on Sandia-designed nuclear weapons hardware. This will

be done by using a combination of radiation transport analysis and other computational modeling, and radiation-effects experimentation.

Since first joining a nuclear weapons effects group at Sandia in 1964, Renken has worked as supervisor of the Calculational Physics Division, the Hostile Environments Division, and most recently in the Radiation Application Division.

Renken holds BS and MS degrees in physics from Ohio State University and a PhD in physics from the California Institute of Technology, and is a member of the American Physical Society and the American Nuclear Society.

VISITORS TO RSIC

During the month of July the following eight persons came to visit/use EPIC facilities: *Huan-Tong Chen,* Univ. of Tennessee, Knoxville, Tennessee; *Takashi Maruyama,* National Institute of Radiological Sciences, Japan; *Dennis Keefer* and *Monty Smith,* Univ. of Tennessee Space Institute, Tullahoma, Tennessee; *John C. Garth,* Hanscom Air Force Base, Massachusetts; *Hsing-chow Hwang,* Raytheon, Sudbury, Massachusetts; *John Halbleib,* Sandia National Laboratories, Albuquerque, New Mexico; and *Horst P. Bruemmer,* Ingenieurgesellschaft für Nuklearschutz, München, Federal Republic of Germany.

UPCOMING CONFERENCES, COURSES, AND SEMINARS

Note the following events of interest to the radiation shielding community.

Annual Waste Management Meet Set

A call for papers has been issued for Waste Management (WM) '84, a symposium to be held March 11–15, 1984, in Tucson, Arizona. The conference is sponsored by the University of Arizona, U.S. Department of Energy (DOE), the Amercian Nuclear Society (ANS), and the American Society of Mechanical Engineers Radwaste Systems Committee.

The topics selected for WM '84 will have both invited and contributed papers on State, DOE/Contractor, Regulatory and Congressional Perspectives on Progress in Screening and Site Characterization for HLW Repositories; HLW/Spent Fuel – Storage vs. Disposal Under the NWPA of 1982; Economics of Fuel Cycle and Waste Management Systems; "Demonstrated" Disposal – What Is It?; Status of Defense Waste Disposal Plan and Related Projects (TMI and West Valley); Repository Construction – Standards and Criteria, Equipment and Operating Systems; Socio-Economic Impacts of HLW Repositories; Regional Plans for the Storage and Disposal of LLW; Economic Impact of 10CFR61; Corrosion of Waste Packages; Operating Experience with Advanced Volume Reduction Techniques; Radwaste System Modifications at Nuclear Power Plants; and International Programs, an Update.

Titles and abstracts (about 900 words) of contributed papers should be submitted, with three copies, by **September 20, 1983**, to the Technical Program Chairman, M. E. Wacks, or to the Publications Chairman, J. G. McCray, Department of Nuclear and Energy Engineering, University of Arizona, Tucson, Arizona, 85721. Authors will be notified of paper acceptance by November 1, 1983. Completed papers are required by February 15, 1984.

5th ASTM-EURATOM Dosimetry Conference Planned

A call for papers has been issued for the 5th ASTM-EURATOM Symposium on Reactor Dosimetry to be held at GKSS Research Centre in Geesthacht (near Hamburg), Federal Republic of Germany, on September 24–28, 1984. This 5th ASTM-EURATOM meeting is sponsored by: Commission of the European Communities, ASTM Committee E-10 on Nuclear Technology and Applications, U.S. DOE, U.S. Nuclear Regulatory Commission (NRC), and the U.S. Electric Power Research Institute (EPRI), all in cooperation with the International Atomic Energy Agency (IAEA). The symposium is organized into oral presentations, poster sessions, and workshops.

The theme of the symposium is radiation metrology techniques, data bases, and standardization. Emphasis will be on the application and requirements for radiation metrology of irradiated fuels and materials in fission and fusion technology.

Papers are solicited for the following topics (involving light water reactors, fast breeder reactors, and fusion systems) as well as related subjects: Characterization of Environments, Irradiation Monitoring of Experiments, Adjustment Codes and Uncertainties, Benchmark Fields and Calibration Procedures, Nuclear Data Needs and Problems, Metrology Techniques (new developments and improvements), Radiation Damage Correlations and Analysis, Techniques, Nuclear Heating and Gamma-Ray Dosimetry, Neutron and Gamma-Ray Transport Calculations, and LWR Surveillance.

Simultaneous interpretation of the oral presentations will be provided in English, French, and German.

Prospective authors should send four copies of a 150–250-word abstract to the applicable program committee secretary by **December 1, 1983.** The program committee secretary for authors from Japan and the United States is E. B. Norris, Southwest Research Institute, P.O. Drawer 28510, San Antonio, Texas 78284 USA. All other authors should send their abstracts to H. Rottger, Joint Research Centre, Petten Establishment, HFR Division, Postbus 2, 1755 ZG Petten (N. H.), The Netherlands.

Notification of acceptance or rejection will be made by March 8, 1984. Authors of those papers accepted will be asked to provide 125 copies of their papers, in final form, for distribution at the opening of the symposium.

Calendar

Your attention is called to the following additional events.

September 1983

International Conference on Numerical Methods in Nuclear Engineering, September 6–9, 1983, Montreal, Quebec, Canada, sponsored by the Nuclear Science and Engineering Division, Canadian Nuclear Society. Contact: Riccardo A. Bonalumi, Nuclear Studies & Safety Dept., H16 H17, Ontario Hydro, 700 University Ave., Toronto, Ontario, Canada M5G 1X6 (phone 416-592-7026).

Environmental, Safety and Health Considerations Associated with Fusion Energy Systems Seminar, September 14, 1983, Germantown, Maryland. Contact: Boyd Shultz, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37830 (phone 615-576-3406).

Short Course on Radiation Protection and Measurements, Idaho Falls, Idaho, September 19–21, 1983, sponsored by Technical Seminars, Inc., New York. Contact: Program Administrator, TSI, 425 Northern Blvd., Great Neck, NY 11021 (phone 516-829-3787).

3rd Topical Meeting on Fusion Reactor Materials, September 19–22, 1983, Albuquerque, New Mexico, sponsored by U.S. DOE, ANS, and the Nuclear Metallurgy Committee of the TMS/AIME. Contact: M. J. Davis, Sandia National Laboratory, Dept. 1830, P.O. Box 5800, Albuquerque, New Mexico 87185 (phone 505-844-4164).

Health Physics in Radiation Accidents, Sept. 19–23, 1983, Oak Ridge, Tenn., sponsored by USDOE, Washington, DC, Contact: Robert C. Ricks, REAC/TS, Oak Ridge, Associated Universities, P.O. Box 117, Oak Ridge TN 37830 (phone 615-576-3131).

11th Regional Congress of the International Radiation Protection Association: Recent Developments and Trends in Radiation Protection, September 20–24, 1983, Vienna, Austria, co-sponsored by the Austrian Association for Radiation Protection. Contact: A. Hefner, Congress Secretary, c/o Österreichischer Verband für Strahlenschutz, Lenaugasse 10, A-1082 Vienna, Austria.

Lifespan Radiation Effects Studies in Animals – What Can They Tell Us? (22nd Hanford Life Sciences Symposium), September 27–29, 1983, Richland, Washington, sponsored by U.S. Department of Energy, Battelle Memorial Institute, and Pacific Northwest Laboratories. Contact: Patricia M. Bresina, Biology & Chemistry Dept., Battelle, Pacific Northwest Laboratories, Richland, WA 99352 USA.

Fall Meeting of the Atomic Energy Society of Japan, September 28–30, 1983, Hokkaido, Japan. Contact: M. Masamoto, Secretary General, Atomic Energy Society of Japan, No. 1-5-4 Ohte-machi, Chiyoda-ku, Tokyo, 100 Japan.

October 1983

23rd National Congress of the Italian Radiation Protection Association, October 5–8, 1983, Capri, Italy. Contact: A. Moccaldi, CNR, Via Serchio 8, I-00198 Rome, Italy.

Environmental Transfer to Man of Radionuclides Released from Nuclear Installations, a seminar, October 17–21, 1983, Brussels, Belgium, sponsored by the International Atomic Energy Agency. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.

Neutron Exposure and Radiological Protection – Some Limitations, October 18, 1983, London, United Kingdom, sponsored by the Society for Radiological Protection. Contact: J. H. Martin, Dept. of Medical Biophysics, Blackness Laboratory, University of Dundee, Dundee DD1 4HN, Scotland, United Kingdom.

Nuclear Facilities Operator Training Topical Meeting, October 19–21, 1983, in Madrid, Spain, sponsored by the Spanish Nuclear Society and European Nuclear Society, Contact: Enrique Ugendo, Sociedad Nuclear Espanol, Estebanez, Calderon 7-9 F, Madrid, Spain.

Transport of Radioactive Materials by Post, a seminar, October 24–27, 1983, in Vienna, Austria, sponsored by the International Atomic Energy Agency. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.

10th Symposium on Engineering Problems in Fusion Research, October 24–28, 1983, Atlantic City, New Jersey. Contact: Charles W. Bushnell, Princeton Plasma Physics Laboratory, P.O. Box 451, Princeton, NJ 08544 (phone 608-683-3051).

American Nuclear Society Winter Meeting, October 30–Nov. 4, 1983, San Francisco, Calif., sponsored by the American Nuclear Society. Contact: A. Philip Bray, Vice President, Nuclear Power Systems Div., General Electric Co., 175 Curtner Ave. - MC 802, San José, CA 95125 USA.

Atmospheric Radiation, October 31–November 3, 1983, Baltimore, Maryland, sponsored by the American Meteorological Society. Contact: American Meteorological Society, 45 Beacon Street, Boston, MA 02108, USA.

November 1983

Seminar on Effective Utilization and Management of Research Reactors, Kuala Lumpur, Malaysia, Nov. 7–11, 1983, sponsored by the International Atomic Energy Agency, Vienna, Austria, Contact: IAEA, PO Box 100, Vienna, International Centre, A-1400 Vienna, Austria.

Radiation Protection in Exploration, Mining and Milling of Radioactive Ores for Developing Countries in Africa, a seminar, November 14–25, 1983, in Libreville, Gabon, sponsored by the International Atomic Energy Agency. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.

December 1983

10th Symposium on Fusion Engineering, December 5–9, 1983, Philadelphia, Pennsylvania, sponsored by the IEEE and Princeton University. Contact: Charles W. Bushnell, Princeton Plasma Physics Laboratory, P.O. Box 451, Princeton, NJ 08544 (phone 608-683-3051).

January 1984

Workshop on Nuclear Model Computer Codes, January 16–February 3, 1984, Trieste, Italy, sponsored by IAEA. Contact: International Centre for Theoretical Physics, Workshop of Nuclear Model Computer Codes, P.O. Box 586, I-34100 Trieste, Italy (phone 224281-6).

April 1984

International Conference on Nuclear Methods in Environmental and Energy Research, April 2–6, 1984, Mayaguez, Puerto Rico, sponsored by American Nuclear Society, American Chemical Society, U.S. DOE, and University of Puerto Rico-Recinto. Contact: James R. Vogt, Univ. of Missouri, 214 Research Reactor, Columbia, MO 65211 (phone 314-882-4211).

May 1984

6th Congress of the International Radiation Protection Association, and Exhibition, May 7–12, 1984, Berlin, West Germany. Contact: R. Neider, Bundesanstalt für Materialprüfung (BAM), Under den Eichen 87, D-1000 Berlin 45.

June 1984

24th Annual International Conference of the Canadian Nuclear Association, June 3–6, 1984, Saskatoon, Saskatchewan, Canada. Contact: J. A. Weller, General Manger, Canadian Nuclear Association, 111 Elizabeth Street, 11th Floor, Toronto, Ontario, Canada M5G 1P7.

Annual Meeting of the American Nuclear Society, June 3–8, 1984, New Orleans, Lousiana. Contact: Thomas H. Row, ORNL/ND - Union Carbide, Bldg. 4500 SN, MS-S-178, Oak Ridge, TN 37830 USA.

July 1984

Fission Product Behavior & Source Term Research, July 15–19, 1984, Snowbird, Utah, sponsored by Idaho Section of the American Nuclear Society, EPRI, Canadian Nuclear Society, and Atomic Energy Society of Japan. Contact: W. J. Quapp, EG&G Idaho, Inc., P.O. Box 1625, Idaho Falls, Idaho 83415 (208-526-9606).

October 1984

Clinical Radiophysics, a symposium sponsored by the Clinical Radiophysics Section of the Society for Medical Radiology of the German Democratic Republic, October 28–November 1, 1984, Binz (island Rügen, German Democratic Republic). Contact: Dr. sc. techn. Manfred Tautz, 1115 Berlin-Buch, Wiltbergrstrasse 50, Städtisches Klinikum Buch, Spezialabteilung Strahlenphpysik, German Democratic Republic.

November 1984

National Conference on Biomedical Physics and Engineering November 3–4, 1984, in Sofia, Bulgaria, sponsored by the Bulgarian National Society of Biomedical Physics and Engineering. Contact: Chair of Physics and Biophysics, c/o eng. Peter Trindev, Medical Academy - Base No. 1, 1431 Sofia / 1 Boul.G.Sofiiski, Bulgaria.

JULY ACCESSION OF LITERATURE

The following literature cited has been ordered for review, and that selected as suitable will be placed in the RSIC Information Storage and Retrieval Information System (SARIS). This early announcement is made as a service to the shielding community. Copies of the literature are not distributed by RSIC. They may generally be obtained from the author or from a documentation center such as the National Technical Information Service (NTIS), Department of Commerce, Springfield, Virginia 22161.

RSIC maintains a microfiche file of the literature entered into SARIS, and duplicate copies of out-of-print reports may be available on request. Naturally, we cannot fill requests for literature which is copyrighted (such as books or journal articles) or whose distribution is restricted.

THIS LITERATURE IS ON ORDER. IT IS NOT IN OUR SYSTEM. PLEASE ORDER FROM NTIS OR OTHER AVAILABLE SOURCE AS INDICATED.

RADIATION SHIELDING LITERATURE

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