RSIC Newsletter

No. 234   *May 1984*

A prudent question is one-half of wisdom.—Francis Bacon

ANS/HPS To Hold Crossover Sessions in New Orleans

The annual meetings of both the American Nuclear Society and the Health Physics Society are being held concurrently in New Orleans, June 3-8, 1984. Through the special efforts of members of both societies it will be possible for participants to attend several sessions of mutual interest to both organizations at no additional cost. Individuals registered for one meeting may attend any of the designated "crossover" sessions by showing their registration badges. The designated HPS and ANS sessions are listed below.

HPS Sessions

Tuesday Morning, June 5

Beta Dosimetry

Computers/Microprocessors

Replication of Little Boy I

Power Reactor Section I

Tuesday Afternoon

Replication of Little Boy II

Power Reactor Section II

Thursday Morning, June 7

Personnel and Physics Dosimetry

ANS Sessions

Wednesday Morning, June 6

Radiation Protection and Health Phyics Practices and Experience in Operating Reactors Internationally

Mobilization of Toxic Material During Decommisioning

Wednesday Afternoon

Measurement and Reduction of Radiation Exposure to Medical Workers

De Minimis (jointly organized by HPS and ANS Program Committees)

Nuclear Waste Transportation: Issues and Technology

Health Implications of Transuranics

Emergency Response to Nuclear Accidents

Criticality Accident Experience

Preplanning for Radiation Protection During Maintenance Operations

Remote Technology in Waste Management

A shuttle bus service will be provided between the two conference hotels from 6:30 AM and 7:30 PM.

Book Review: Chilton, Shultis, and Faw

Principles of Radiation Shielding by Arthur B. Chilton, J. Kenneth Shultis, and Richard A. Faw (Hardbound, 488 pages, $39.95, from Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632 USA).

"Nuclear radiation shielding contains an integrated body of common principles which do not depend on specific applications." In their newly-published, nearly 500-page textbook, the authors convincingly demonstrate this thesis.

The discipline known as shielding has always suffered from identity problems. It is not just a subset of reactor physics, although many of the mathematical methods have diffused into shielding from reactor physics. It is not just a subset of radiation protection (i.e., health physics) although any respectable health physics text has a chapter on shielding. At RSIC, we define shielding in this way: if a particle moves, it's a shielding problem. The late *E. P. Blizard*, whom we regard as one of the pa-

triarchs of American shielding, defined it in terms of the "unusual neutron." It is the unusual (i.e., high energy) neutron that escapes the reactor and poses a shielding problem. Actually, Chilton, Shultis, and Faw (CSF) integrate well the various theories and applications which treat photon and neutron shielding problems and thus provide us with a coherent approach to the study of the two common penetrating radiations.

This book is intended as a beginners text, suitable for senior undergraduates and graduate students in nuclear engineering. All three authors are university professors (University of Illinois and Kansas State University) and their teaching experience shows. As an example of this, they include an extensive set of problems following each chapter.

The topics covered include characterization of radiation fields and sources, interaction of radiation with matter, common radiation sources encountered in shield design, detector response functions, basic concepts in neutral particle penetration, special techniques in photon and neutron attenuation, approximate techniques under special geometric conditions, the transport description of radiation penetration, and material and structural considerations in shield design.

When I pick up a new publication, whether it is a journal, report, or book, I look at the references and make a judgement. Do the authors take into account all the prior work that even I know about? In this case, with but a few exceptions, they do. The final references of the first chapter list all the well-known, English-language shielding textbooks that have been published. This list, repeated in our bibliography below, taken as a whole provides an interesting history of shielding over its 3-4 decades of development. Of these, the most useful books now, aside from the present one, are probably the Schaeffer book, developed under government sponsorship, and the Engineering Compendium, probably too costly for the individual. The current prices of these two are shown in our list.

It might be mentioned that in contrast to many previous works, the present volume is not a collection of chapters by various authors, and thus is a much more coherent, unified presentation.

If one could characterize this textbook, it is "meticulous." The authors were careful, not only to avoid errors, typographical and otherwise, but they used extreme care in their development of concepts. Their development of the concepts of flux density and current are good examples. Many a writer stumbles over the various nuances. Just about the only errors I saw were the misspelling of Hubbell's name on page 141 and the references to the ANSI standard "Glossary of Terms in Nuclear Science and Technology," ANSI-9/ANSI N1.1-1976. The authors show the older 1967 edition.

In any review, I feel obligated to be the devil's advocate, at least a little. For this reason I would bring up the matter of archaic data to be found in the appendixes. For example, photon cross sections are taken from 1966 and 1967 compilations with no hint of the many compilations of Hubbell in recent years. Worse, the table of thermal neutron cross sections are taken from the "Reactor Physics Constants" of 1963.

Possibly the consistency to be found in this work is carried to a fault in the matter of the exclusive use of the word "photon," rather than "gamma-ray." The only place I saw gamma ray mentioned was in the index, and it said to "see photon."

Now for a few personal gripes. All three authors are experts in air scattering, yet I searched in vain for a discussion of skyshine. Also, I could not find an example of a single-scattering calculation which I think is one of the most useful tools in a shielder's toolbox.

In conclusion, it is clear that this text will take a place as one of the fundamental texts on shielding and should be on the bookshelf of anyone who is learning or practicing the art of shielding. It is handsomely printed, well indexed, and reasonably priced.

Bibliography

T. Rockwell III (ed.), *Reactor Shielding Design Manual*, D. Van Nostrand, Princeton, N. J., 1956.

B. T. Price, C. C. Horton, and K. T. Spinney, *Radiation Shielding*, Pergamon, Elmsford, N. Y., 1957.

H. Goldstein, *Fundamental Aspects of Reactor Shielding*, Addison-Wesley, Reading, Mass., 1959. (Reprinted by Johnson Reprint Corp., New York).

T. Jaeger, *Grundzuge der Strahlenshutztechnik*, Springer-Verlag, Berlin, 1960; translated by L. Dresner as *Principles of Radiation Protection Engineering*, McGraw-Hill, New York, 1965.

E. P. Blizard and L. S. Abbott, (eds.), *Reactor Handbook*, Vol. III, Part B: *Shielding*, 2d ed., Interscience, New York, 1962.

N. M. Schaeffer (ed.), *Reactor Shielding for Nuclear Engineers*, TID-25951, National Technical Information Service, Springfield, Va., 1973. $28.00.

R. G. Jaeger et al. (eds.), *Engineering Compendium on Radiation Shielding*, Vol. I: *Shielding Fundamentals and Methods*; Vol. II, *Shielding Materials and Design*; Vol. III, *Shield Design and Engineering*, Springer-Verlag, New York, 1968–1975. Vol. I $160.10, Vol. II $174.50, Vol. III $172.00

A. E. Profio, *Radiation Shielding and Dosimetry*, Wiley, New York, 1979.

Reviewed by D. K. Trubey
Radiation Shielding Information Center
April 1984

CHANGES TO THE COMPUTER CODES COLLECTION

During the month seven changes were made to the RSIC Computer Codes Collection. Four code packages were updated to enhance the existing software or to correct errors, and three new code systems were packaged. Three of the changes resulted from contributions from India.

CCC-203/MORSE-CG

Different updates were made to each version of this general purpose Monte Carlo multigroup neutron and gamma-ray transport code system. Al Wells, Nuclear Assurance Corp., Atlanta, Georgia provided output for the first sample problem for the UNIVAC version (A). Bill Yucker, McDonnell Douglas Astronautics Co., Huntington Beach, California, provided output for three sample problems for the CDC version (B). Peggy Emmett, Oak Ridge National Laboratory (ORNL), verified the output results. The updates became necessary because over the years sample problem outputs could not be changed as changes were made to the code; therefore users were not able to precisely duplicate the output for the sample problems in the existing packages.

The IBM version (C) tapelist was updated to rename file 28 as the "Printer Plot Package p³." An additional file was also added to the package. It contains the collision site plotting routines and collision density fluence estimator as described in the ORNL-TM-3585 portion of the MORSE documentation. The changes to the IBM version do not affect the remaining versions of the code, UNIVAC (A) and CDC 6600 (B).

CC-262/VCS

This code system for coupled discrete-ordinates-adjoint Monte Carlo calculations of radiation protection factors in vehicles was expanded with the addition of one file of MORSE routines, which are needed to run the sample problem but were omitted from the original package. The addition of these routines was suggested by Radiation Research Associates, Ft. Worth, Texas, and the code contributor at ORNL. FORTRAN IV and Assembler language: IBM 360.

CCC-371/ORIGEN-2

This isotope generation and depletion code system was updated to correct errors in Subroutine MAIN3. The errors were brought to the attention of RSIC by E. Mischkot, Atomic Energy of Canada Limited, Mississauga, Ontario and Chuck Alexander, ORNL, Oak Ridge, Tennessee. The errors caused the input compositions of actinides and fission products not to be stored in the case where the total amount of an element was specified and the natural abundances in the ORIGEN-2 are employed to calculate the isotopic composition. Current users may request details of the update from RSIC.

CCC-381/PLACID

This Monte Carlo simulation of gamma-ray streaming through straight cylindrical ducts is an original contribution from Reactor Research Centre, (RRC), Kalpakkam, Tamil Nadu, India. Monte Carlo simulation is employed with variance reduction devices such as Russian Roulette and cutoff weight for history termination. The user is required to supply photon point total cross sections for the shield material. Klein Nishina formulas are used for differential scattering cross sections. The double rejection technique of Kahn is used for sampling the scattered photon energy and the scattering angle. Next event estimation is used for scoring the streaming flux. Only straight cylindrical ducts in shields are simulated. Reference: FRG/0110/RP-219. FORTRAN IV; IBM 370/155-II.

CCC-453/DUST

This code system for albedo Monte Carlo simulation of thermal neutron streaming through multi-legged ducts was contributed by the RRC, Kalpakkam, Tamil Nadu, India. Using an albedo Monte Carlo method, the albedo data are used in the form of empirical formulas based on measured doubly differential albedo data. Sampling of the reflected polar and azimuth are done by Russian Roulette. The albedo data and the subroutines for sampling the reflected polar and azimuthal angles are specific for concrete ducts. Reference: FRG/01100/RP-217. FORTRAN IV; IBM 370/155-II.

CCC-458/DTF-INDIA

This code system for the solution of multigroup and transport equations with anisotropic scattering was contributed by RRC, Kalpakkam, Tamil Nadu, India. It is based on earlier work (CCC-42/DTF-IV) from Los Alamos National Laboratory. The code system is designed to solve numerically the multigroup form of the neutron transport equation in one-dimensional plane, cylindrical, and spherical geometries. Modifications to the earlier work were done to (1) handle a higher number of groups and (2) to accept inhomogeneous anisotropy boundary sources. DTF uses the method of discrete ordinates in angle and finite differences in space. Reference: FRG-01150/RP-218. FORTRAN IV; IBM 370/155-II.

PSR-151/CHENDF

CHENDF, a collection of codes for handling ENDF/B-V data, was updated to replace the following routines with newly frozen versions: CHECKV, FIZCON, LISTFCV, and RIGELV. The original codes were developed at the National Nuclear Data Center at Brookhaven National Laboratory. Modifications were made at ORNL to make the codes operational on the IBM system. FORTRAN IV; IBM 360.

CHANGES TO THE DATA LIBRARY COLLECTION

During the month two new data libraries were added to the RSIC data library collection.

DLC-109/GAMTOT 78

This compilation of radioactive decay and capture gamma-rays was contributed by Lawrence Livermore National Laboratory. The data are in the format used by GAMIDEN, the retrieval code system included as part of this data package. GAMIDEN, designed to operate on the CRAY1 computer at Lawrence Livermore National Laboratory, is needed to identify isotopes by their gamma-ray emissions to assist nondestructive assay of unknown materials. The PSR-154/GAMIDENT package contains an earlier version of the data library and DLC-109 is currently recommended over that version. Reference: UCRL-50400, Vol. 22, Rev. 1.

DLC-110/ENSL2/CDRL82

This 1982 version of evaluated nuclear structure data, contributed by Lawrence Livermore National Laboratory, is based on the seventh edition of the *Table of Isotopes* (C. M. Lederer and V. S. Shirely, eds., Wiley, New York, 1978). The ENSL82 file contains level schemes derived from decay data, and the CDRL82 file contains the level schemes derived from particle reaction data merged into ENSL file. The CRDL82 and ENSL82 files contain data for 1553 and 1481 isotopes, respectively. The atomic number range from 1 to 105 is covered. The levels of each file are characterized by nucleus, level energy, parity, spin (if parity and spin are known), half-life, and number of decay modes. The nucleus, the level to which the state decays, the probability of occurrence, and the Q value are given for each decay mode of a level. No retrieval program is provided. References: UCRL-50400, Vol. 23 and Addendum. FORTRAN IV; CDC/IBM.

U. Florida Seeks NE Dept. Head

RSIC has been informed that the Department of Nuclear Engineering Sciences at the Univesity of Florida is seeking applications and nominations for the position of department chairman. The Nuclear Engineering Department was one of the first departments established (1955) in the country and is currently one of the largest. Three general areas of research and teaching expertise—Nuclear Reactor Engineering, Medical/Health Physics, and Engineering Physics—allow for a highly diversified education in the nuclear field. Applicants must have a Ph.D. in a relevant engineering and/or scientific discipline with demonstrated administrative

abilities coupled with university level research and teaching experience. Applicants must qualify for a full-professor tenureship. Salary is negotiable and applications and nominations should be postmarked on or before July 30, 1984, and mailed to Genevieve S. Roessler, Ph.D., Chairman, Search Committee, Dept. of Nuclear Engineering Sciences, Univ. of Florida, Gainesville, FL 35611.

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.

Soju Suzuki has completed a two-year assignment to Argonne National Laboratory in Idaho Falls, Idaho, and returned to the Power Reactor and Nuclear Fuel Development Corp. in Japan.

C. E. Newlon has left H & R Technical Associates of Oak Ridge, Tennessee, to become a self-employed criticality safety consultant in Knoxville.

Yu Chien Yuan, formerly of Argonne National Laboratory, Argonne, Illinois, has joined the staff of West Valley Nuclear Services Corp., West Valley, New York.

Kou-John Hong has left Los Alamos Technical Associates, Inc., to join the staff of Stone & Webster Engineering Corp., Cherry Hill, New Jersey.

Huan-Tong Chen has left the Institute of Nuclear Energy Research in Lung-Tan, Taiwan, to study at the University of Tennessee, Knoxville.

Chao-Ming Tsai has left the Institute of Nuclear Energy Research in Lung-Tan, Taiwan, to take a position with the Atomic Energy Council in Taipei.

Ezra B. Mann has left the BDM Corp., Albuquerque, New Mexico, to take a position with Electro Magnetic Applications, Inc., also of Albuquerque.

Visitors to RSIC

During the month of January the following persons came for an orientation visit and/or to use RSIC facilities: *Sergio G. Ribeiro,* of the Brazilian Nuclear Energy Commission, Rio de Janeiro, and *W. U. Schroeder,* of the University of Rochester, New York.

CONFERENCES, SYMPOSIA, AND COURSES

Given below is information for conferences, symposia, and courses that may be of interest to the radiation shielding community.

Radiation Transport and Reactor Analysis Short Courses

The Department of Nuclear Engineering at the University of Tennessee-Knoxville is offering two five-day short courses of interest to radiation transport specialists during Tennessee Industries Week (TIW-14), September 10-14, 1984.

Computational Methods in Reactor Analysis will familiarize the course participant with computational methods and computer codes currently used to describe the neutronic behavior of nuclear fission reactors. Emphasis will be placed on "understanding" the neutronic models and associated numerical methods currently employed in codes. A good understanding of the models and methods employed in reactor analysis codes is essential for the successful use of the codes in designing new reactors or improving the performance and safety of existing reactors. Areas to be covered include multi-dimensional diffusion theory methods and perturbation theory methods for applications in reactor statics, space-dependent kinetics, and fuel depletion; transport theory methods including the discrete ordinates method, integral transport theory, and the Monte Carlo method; and cross section generation and processing utilizing the AMPX and SCALE systems developed at ORNL. The first day of the course will cover the fundamentals of reactor physics beginning with the fission process and proceeding through development of the Boltzmann transport equation and the diffusion approximation of the transport equation. This material will provide a good foundation for the non-nuclear engineer for study of the more advanced material to be presented Tuesday through Friday. For the participant with some nuclear background, the first day would be a review of basic nuclear engineering.

Monte Carlo Analysis is designed specifically for the practicing engineer engaged in shield design and does not presume any prior knowledge of Monte Carlo methods. However, some understanding of radiation transport physics is desirable. A wide range of topics will be presented that will lead to a good understanding of the basics of Monte Carlo analysis and the specialized applications of Monte Carlo methods to practical shield-

ing problems. Many advanced topics will be included that will promote the best use of existing computer code systems. Special attention will be paid to the understanding and Monte Carlo implementation of the adjoint analysis. Advantages and disadvantages of the adjoint mode versus the forward mode of analysis will be described including several practical applications of the adjoint mode of Monte Carlo analysis. Variance reduction techniques will be developed in a comprehensive fashion for both forward and adjoint calculations. The versatile computer code system, MORSE, will be described to illustrate the general features of Monte Carlo computer programs. The relationships of the Monte Carlo methods to other methods of solving radiation transport problems, such as discrete ordinates, will be described, as well as computational advantages and disadvantages of Monte Carlo versus the other methods. This course will cover, in depth, the theory and mathematics a user must have in order to understand and use the Monte Carlo method effectively to solve difficult problems in radiation transport.

The registration fee is $695 per person for each course. The deadline for registration in these two courses is August 15, 1984. For additional information contact P. F. Pasqua, Head of the Dept. of Nuclear Engineering, University of Tennessee, Knoxville, TN 37916.

SMiRT-8 Call for Papers

The call for papers has been issued for the *8th International Conference on Structural Mechanics in Reactor Technology (SMiRT-8)*. The conference will be held August 19–23, 1985, in Brussels. This is the eighth in a series of biennial conferences sponsored by the Commission of the European Communities (CEC) and the International Association for Structural Mechanics in Reactor Technology e. V. (IASMiRT).

Further information about the conference topics and the requirements for entering work in the conference programs and for consideration of the Thomas A. Jaeger prize may be obtained from:

Mme J. Stalpaert
Commission of the European Communities
Directorate-General Information Market and Inovation (DG XIII)
MDB 4/28
200, rue de la Loi
B-1049 Brussels, Belgium

Calendar

Your attention is called to the following additional events of interest to the radiation shielding and protection community.

June 1984

24th Annual International Conference of the Canadian Nuclear Association, June 3–6, 1984, Saskatoon, Saskatche-

wan, Canada. Contact: J. A. Weller, General Manager, Canadian Nuclear Association, 111 Elizabeth Street, 11th Floor, Toronto, Ontario, Canada M5G 1P7.

29th Annual Meeting of the Health Physics Society, June 3–7, 1984, New Orleans, Louisiana. Contact: Richard J. Burk, Jr., Executive Secretary, Health Physics Society, 4720 Montgomery Lane, Suite 506, Bethesda, Maryland 20014, USA.

ANS Annual Meeting, June 3–8, 1984, New Orleans, Louisiana. Contact: Thomas H. Row, ORNL, Bldg. 4500, MS-S-178, Oak Ridge, TN 37831-2008 USA.

Annual Meeting of the Society of Nuclear Medicine, June 5–8, 1984, Los Angeles, California. Contact: Society of Nuclear Medicine, 475 Park Ave. South, New York, NY 10016 (phone 212-889-0717).

Twelfth International Symposium on Effects of Radiation on Materials, June 18–20, 1984, Williamsburg, Virginia, sponsored by the American Society for Testing and Materials. Contact: James S. Perrin, Fracture Control Corp., 340-G South Kellog Ave., Goleta, California 93117 (phone 805-964-8877); or John Koziol, Combustion Engineering, Inc., 1000 Prospect Hill Rd., Windsor, Connecticut 06095 (phone 203-688-1911).

Annual Meeting of the European Nuclear Medicine Society, June 18–20, 1984, Helsinki, Finland. Contact: Esko Riihimaki, Room T 1180, Meilahti Hospital, SF-00290 Helsinki, Finland.

Probabilistic Risk Assessment: Applications and Uses for Decision-Making in the Nuclear Industry, a course offered by the Massachusetts Institute of Technology, June 25–27, 1984. Contact: Office of the Summer Session, Room E19-356, Massachusetts Institute of Technology, Cambridge, MA 02139 (phone 617-253-2101).

Conference on High Energy Physics, June 25–29, 1984, Trieste, Italy, sponsored by the International Atomic Energy Agency (IAEA) and the United Nations Educational Scientific and Cultural Organization. Contact: International Centre for Theoretical Physics, P.O. Box 586, I-34100 Trieste, Italy (phone 224281-6).

July 1984

9th Annual Conference of the Australian Radiation Protection Society, July 9–12, 1984, Darwin, North Territory, Australia. Contact: I. A. Prince, Conference Convenor, 1984 ARPS Conference, C/ - GPO Box 1701, Darwin, NT 5794, Australia.

Topical Meeting on Fission Product Behaviour and Source Term Research, July 15–19, 1984, Snowbird, Utah, sponsored by ANS; Electric Power Research Institute (EPRI); Canadian Nuclear Society; and the Atomic Energy Society of Japan. Contact: W. J. Quapp, EG & G Idaho, Inc., P.O. Box 1625, Idaho Falls, Idaho 83415, USA (phone 208-526-9606).

IEEE Annual Conference on Nuclear and Space Radiation Effects, July 22–25, 1984, Colorado Springs, Colorado. Contact: B. D. Shafer, Div. 2115, Sandia National Laboratories, Albuquerque, NM 87185 (phone 505-846-0629).

August 1984

Practical Applications of Ground Water Models, August 15–17, 1984, Columbus, Ohio. Contact: David M. Nielsen, Conference Coordinator, National Water Well Association, 500 W. Wilson Bridge Rd., Worthington, OH 43085 (phone 614-846-9355).

Medical Planning and Care in Radiation Accidents, August 20–24, 1984, Oak Ridge, Tennessee, a course sponsored by the U.S. Department of Energy (DOE). Contact: Robert C. Ricks, REAC/TS, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831 (phone 615-576-3131).

Occupational and Environmental Radiation Protection, August 20–24, 1984, Boston, Massachusetts, a course offered by Harvard School of Public Health. Contact: Office of Continuing Education, Harvard School of Public Health, 677 Huntington Ave., Boston, MA 02115 (phone 617-732-1171).

International Topical Meeting on Fuel Reprocessing and Waste Management, August 26–29, 1984, Jackson Whole, Wyoming, sponsored by ANS. Contact: L. W. McClure, Technical Program Chairman, P.O. Box 3807, Idaho Falls, ID 83401.

September 1984

Topical Conference on Neutron-Nucleus Collisions: A Probe of Nuclear Structure, September 5–8, 1984, Glouster, OH 45732 (phone 614-594-6928).

5th International Symposium on Capture Gamma Ray Spectroscopy and Related Topics, September 10–14, 1984, Oak Ridge, Tennessee. Contact: S. Raman, Physics Division, ORNL, P.O. Box X, Oak Ridge, Tennessee 37831-2008 USA.

International Meeting on Thermal Nuclear Reactor Safety, September 10–14, 1984, Karlsruhe, Fed. Rep. Germany, sponsored by the European Nuclear Society, ANS, and German Nuclear Technology Society. Contact: H. Rininsland, Kernforschungszentrum Karlsruhe GmbH, Postfach 3640, D-7500 Karlsruhe, F. R. Germany.

Handling of Radiation Accidents by Emergency Personnel, September 11–14, 1984, a course sponsored by the DOE. Contact: Robert C. Ricks, REAC/TS, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831 (phone 615-576-3131).

10th International Conference of Plasma Physics and Controlled Nuclear Fusion Research, September 12–19, 1984, London, United Kingdom, sponsored by the IAEA. Contact: IAEA, P.O. Box 100, Vienna International Centre, A-1400 Vienna, Austria.

ANS Topical Meeting on Physics and Shielding, September 17–19, 1984, Chicago, Illinois. Contact: Leo LeSage, Argonne National Laboratory, Applied Physics Div., 9700 South Cass Ave., Argonne, Illinois 60439 USA (phone 312-972-6045).

Health Physics in Radiation Accidents, September 17–21, 1984, a course sponsored by the DOE. Contact: Robert C. Ricks, REAC/TS, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831 (phone 615-576-3131).

5th ASTM-EURATOM Symposium on Reactor Dosimetry, September 24–28, 1984, Geesthacht, Fed. Rep. of Germany, sponsored by Commission of the European Communities, ASTM, U.S.-DOE, and U.S.-NRC. Contact: E. B. Norris, Southwest Research Institute, P.O. Drawer 28510, San Antonio, Texas 78284 (for Japanese and US authors); H. Röttger, Joint Research Centre, Petten Establishment, HFR Div., Postbus 2, 1755 ZG Petten (N. H.), Netherlands (all other authors).

13th Symposium on Fusion Technology, September 24–28, 1984, Varese, Italy. Contact: 13th SOFT, Joint Research Centre, Ispra Establishment, I-21020 Ispra, Varese, Italy (phone 0332-789988/780131).

October 1984

Conference on Radiation Protection: Standards and Regulatory Issues, October 7–10, 1984, Orlando, Florida, sponsored by Atomic Industrial Forum. Contact: Conference Office, Atomic Industrial Forum, Inc., 7101 Wisconsin Ave., Bethesda, Maryland 20814 (phone 301-654-9260).

International Symposium on High-Dose Dosimetry, October 8–12, 1984, Vienna, Austria, sponsored by the IAEA. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400, Vienna, Austria.

International Conference on Nuclear and Radiochemistry, Ocotber 8–12, 1984, Lindau, Bodensee, F. R. Germany. Contact: Gesellschaft Deutscher Chemiker, Abt. Tagungsorganisation, Postfach 900440, D-6000 Frankfurt-am-Main 90, F. R. Germany.

International Conference on Occupational Radiation Safety in Mining, October 15–18, 1984, Toronto, Ontario, Canada, sponsored by the Canadian Nuclear Assoc., Canadian Dept. of Energy, Mines, and Resources, and the Atomic Energy Control Board. Contact: Internatl. Conf. on Occupational Radiation Safety in Mining, Canadian Nuclear Assoc., 111 Elizabeth St., 11th Floor, Toronto, Ontario, Canada M5G 1P7.

Symposium on Radiation Dosimetry, October 15–18, 1984, Knoxville, Tennessee, sponsored by ORNL. Contact: R. T. Greene, ORNL, P.O. Box X, Bldg. 7710, Oak Ridge, TN 37831-2008 USA.

Meeting of the Nuclear Physics Div. of the American Physical Society, October 18–20, 1984, Nashville, Tenn. Contact: American Physical Society, 335 E. 45th St., New York, NY 10017 USA.

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.

International Symposium on the Implementation of the IAEA Codes of Practice and Safety Guides for Nuclear Power Plants, October 29–November 2, 1984. Contact: Conf. Svc. Sect., IAEA, P.O. Box 100, A-1400 Vienna, Austria.

Nuclear Power Systems Symposium, October 31–November 2, 1984, Orlando, Florida, sponsored by the Institute of Electrical and Electronics Engineers. Contact: D. Louis Costrell, National Bureau of Standards, C333 Radiation Physics, Washington, DC 20234 (phone 301-921-2518).

Nuclear Science Symposium, October 31–November 2, 1984, Orlando, Florida. Contact: L. C. Oakes, Oak Ridge National Lab., P.O. Box X, Oak Ridge, TN 37831 (phone 615-574-5527).

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.

Inter-Regional Seminar on Practical Problems Encountered in the Safe Transport of Radioactive Materials, November 5–8, 1984, Vienna. Contact: Conf. Svc. Sect., IAEA, P.O. Box 100, A-1400 Vienna, Austria.

Joint Meeting of the American Nuclear Society, the Atomic Industrial Forum, and the European Nuclear Society, November 11–16, 1984, Washington. Contact: George W. Cunningham, Nuclear Studies, Mitre Corp., 1820 Dolley Madison Blvd., McLean, Virginia 22102 USA.

8th Conference on the Applications of Accelerators in Research and Industry, November 12–14, 1984, Denton, Texas, sponsored by North Texas State University. Contact: Accelerator Conference, Physics Dept., North Texas State Univ., Box 5368, Denton, TX 76203-5368.

International Conference on Fusion Reactor Materials, November 19–22, 1984, Tokyo, Japan, sponsored by the Atomic Energy Society of Japan, Iron and Steel Institute of Japan, Japan Institute of Metals, and Japan Society of Applied Physics. Contact: R. R. Hasiguti, Science Univ. of Tokyo, Faculty of Engineering, Kagurazaka, Shinjuku-ku, Tokyo 162 Japan.

International Symposium on Assessment of Radioactive Contamination in Man, November 19–23, 1984, Paris, sponsored by the International Atomic Energy Agency. Contact: Conf. Svc. Sect., IAEA, P.O. Box 100, A-1400 Vienna, Austria.

Conference on Radioactive Waste Management, November 27–29, 1984, London, sponsored by the British Nuclear Energy Society. Contact: The Secretariat, British Nuclear Energy Society, at the Institution of Civil Engineers, 1-7 Great George St., London SWIP 3AA, UK.

APRIL 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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