RSIC Newsletter

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Faith and doubt both are needed)not as antagonists but working side by side)to take us around the unknown curve.)Lillian Smith

ANS Honors Shielding Achievements

At its Winter Meeting in November 1990 the American Nuclear Society (ANS) conferred honors on a number of people for their achievements in shielding and other branches of nuclear engineering.

On behalf of its Radiation Protection and Shielding Division, the Society presented the Rockwell Lifetime Achievement Award to **Herbert Goldstein**, who recently retired from Columbia University. Announcement of the award was carried in the June issue of the newsletter. Formal presentation was made to Goldstein at the Awards Banquet of the ANS Winter Meeting in November.

The 1990 Radiation Science and Technology Award was presented to **Martin Berger**, recently retired from the National Institute of Standards and Technology. The citation reads as follows:

> For outstanding contribution in research or basic development to the industrial application of radiation technology presented to
>
> **Martin Berger**
>
> For his outstanding contributions to the advancement of radiation physics, especially in the development of transport theory, Monte Carlo methods, and interaction cross sections for the penetration and diffusion of charged particles and photons.

The Reactor Physics Division established the **Eugene P. Wigner** Award, named for its first recipient. The citation reads as follows:

> In recognition of his fundamental contributions as educator and researcher to the advancement of nuclear reactor physics as a discrete field of scientific investigation. Your place in the pantheon of eminent scientists who have shaped this uniquely twentieth century body of scientific truths is hereby respectfully acknowledged. By a lifetime of singular accomplishments as a nuclear pioneer, you have set the standards of achievement to which all others in the field of reactor physics aspire.

The Director of RSIC, **Robert W. Roussin**, received the Radiation Protection and Shielding Division Award for Distinguished Service. His citation reads as follows:

> He has been a major influence on the radiation shielding and protection community for over 25 years. His experience in radiation transport calculations provides a foundation for his excellent leadership in the development of nuclear data for radiation transport and shielding analysis. As Data Coordinator for the Radiation Shielding Information Center (RSIC) and as Chairman of the Shielding-Data Testing Committee of the Cross Section Evaluation Working Group (CSEWG), he played a leading role in the national effort to develop and refine standards for nuclear data, especially as it pertains to shielding, and to develop the necessary processed data libraries needed by radiation transport codes. Specifically, his efforts lead to the development of the VITAMIN series of data sets which are used world-wide to derive application-dependent data libraries from preprocessed fine-group data.
>
> His services to ANS and to the Radiation Protection and Shielding Division have been numerous. He has served as Vice Chairman and Chairman of the Division, has served on its Executive Committee, and has been at various times the Chairman of the Publication, Membership, and Nominations Committees. He has also served on the ANS Publication Committee, the Membership Committee, the Shielding Standards Working Group 6.1.2, and chaired an ANS student conference.
>
> As long time staff member of RSIC, and now as its Director, he continues to serve the radiation shielding community by encouraging advancements in radiation protection and shielding and by ensuring that state-of-the-art radiation transport technology is available to scientists and engineers around the world.

The RP&S Division Award for Technical Excellence was awarded to **Kalman Shure** of Westinghouse. His citation reads as follows:

> Over a thirty-five year career, he has developed numerous improved methods for shield design and related analyses. The shielding community has gained, through his work, a better understanding of the technical basis for calculating and measuring neutron and gamma ray doses as well as predicting material damage in shields. Of special note is his work on the attenuation of neutrons in water-iron shields, refined methods for calculating the ductile-to-brittle transition temperature of steel as a function of neutron exposure. Important contributions to the establishment of decay-heat and gamma-ray transport standards, and the application of point kernels, P3 approximations, and discrete-ordinate codes to neutron transport problems.
>
> Besides the development of shielding methods, he has provided invaluable fundamental data needed by the shielding analyst. Specifically, he has made important contributions to compilations of gamma-ray cross sections and buildup factors, fast neutrons conversion factors, neutron attenuation kernels, and neutron cross sections.
>
> From his many publications and presentations at ANS meetings, he has shown the shielding community how to use appropriate tools and proper techniques for the analysis of many different gamma and neutron shielding problems. Shielding specialists around the world have benefitted greatly from the efforts and creativity of this outstanding researcher whose discoveries have profoundly influenced the art and science of shield analysis.

Three well-known radiation shielding specialists were also honored by elevation to the rank of Fellow. Their citations follow:

Mohamed A. Abdou • For his outstanding contributions to fusion science and engineering and the development of fusion nuclear technology including pioneering research in fusion neutronics, blanket, and shielding analysis, and for exceptional leadership of several reactor design studies and fusion nuclear engineering research projects.

Donald R. Harris • For outstanding contributions in nuclear cross section evaluation and measurements, nuclear criticality evaluations, reactor noise theory and experiments, shielding methods development, reactor fuel management, reactor incore detector development, Monte Carlo methods applications, and nuclear criticality safety analysis.

Edward A. Warman • For outstanding contributions in nuclear engineering: innovative shielding designs for naval reactors and space nuclear systems; pioneering dosimetry applications, including first satellite-image use in dosimetry (Chernobyl); key source-term evaluations for light-water reactors; and international leadership in improving knowledge and understanding of severe-accident risks and nuclear power safety.

The staff at RSIC extends its congratulations to those who have been recognized for outstanding work by ANS.

EPMD Director and RSIC Staff Member Retire

Fred C. Maienschein, Director of the Engineering Physics and Mathematics Division, is planning to retire from ORNL at the end of the year. **Robert C. Ward** succeeds Maienschein as Director of the division effective December 1, 1990.

Maienschein came to Oak Ridge in 1951 to work on Fairchild's nuclear-powered aircraft project. He performed research on reactor physics and reactor shielding, worked at the Bulk Shielding Reactor, and studied MeV neutron inelastic scattering using facilities in the Physics Division, which led to the construction of the Oak Ridge Electron Linear Accelerator and its utilization for applied and basic research on neutron reactions.

Ward's background is in applied mathematics. He came to ORNL in 1974 after working at NASA Langley Research Center in Hampton, Virginia. Ward's research interests include numerical linear algebra, parallel computing, and large-scale scientific computing. He is a Fellow of the American Association for the Advancement of Science.

Constance Marie Anthony retired from RSIC effective November 16, 1990. She had served as the documentation coordinator for RSIC since early 1969. Her duties included the supervision and maintenance of records on incoming computing technology and working with the contributor to prepare and maintain the documentation included with a code package or data library. We at RSIC wish Marie a serene retirement.

CHANGES TO THE COMPUTER CODE COLLECTION

Seventeen additions or changes were made to the computer code collection during the month. Thirteen new code systems were packaged and added to the collection, three additional hardware versions were added to existing code packages, and one code package was updated. Ten changes resulted from foreign contributions.

CCC-164/NAC

Ebasco Services Inc. contributed an IBM PC version for NAC, a neutron activation analysis and product isotope inventory code package converted from the IBM 3033 version. NAC predicts neutron-induced gamma ray activity for a wide variety of composite materials. The unshielded induced radioactivity is calculated as a function of neutron exposure and decay times. The PC version was compiled and linked using Microsoft FORTRAN Version 4.01 under the DOS 3.3 operating system. The code is transmitted on one DS/DD diskette. References: NASA TM X-52460 (1968). FORTRAN 66; IBM (A), CDC (B); FORTRAN 77, IBM PC (C).

CCC-240/CAMERA-PC

Experimental and Mathematical Physics Consultants, Gaithersburg, Maryland, contributed this PC version of CAMERA. The original code was written for the CDC Cyber computers. CAMERA, developed for use in analyzing the radiation dose absorbed by man, is capable of combining subgeometry models, performing error tests on geometric models, tracing rays through the geometry, collapsing ray-tracing information to areal density distributions, and preparing cross section view plots. Microsoft FORTRAN Version 5.1 is needed for the FORTRAN sources; the Assembler routines require Microsoft Assembler Version 5.1. The executable program was linked with the math emulator library, thus a math co-processor is not required, but is desirable. The code runs on IBM PCs and compatibles under the DOS 3.3 operating system. CAMERA-PC is transmitted on one DS/HD 5.25-inch (1.2 MB) diskette. References: MDC-G4655 (September 1973); Informal notes, EPMC, July 1990. FORTRAN 77; IBM PC.

CCC-379/SHIELDOSE

This code system for space shielding radiation dose calculations, originally contributed by the National Institute for Standards and Technology (formerly the National Bureau of Standards), Gaithersburg, Maryland, and Martin Marietta Aerospace, Denver, Colorado (CYBER Version), was converted to run on a PC at

Experimental Physics and Mathematical Consultants of Gaithersburg, Maryland. The code will run on an IBM PC with or without a math co-processor. SHIELDOSE was compiled and linked for the PC with Microsoft FORTRAN Version 5.00 under DOS 3.3 using the math emulator library. The code is transmitted on one DS/HD (1.2 MB) diskette. Reference: NBS Technical Note 1116 and informal notes. FORTRAN 77; IBM, VAX, and CDC (A); IBM PC (B).

CCC-538/FISP-6

Berkeley Nuclear Laboratories of England, through the NEA Data Bank at Gif-sur-Yvette Cedex, France, contributed FISP-6, an enhanced code for the evaluation of fission product inventories and decay heat. FISP-6 calculates fission product inventory and release rates in irradiated fuel using a point model for irradiation and cooling conditions specified by the user. FISP-6 uses an analytical solution with linearized build-up and decay chains of the fission products. Using a particular form of the general solution, the code is able to reduce the problems of rounding errors. Reference: TPRD/B/ 0097/N82 (June 1982). FORTRAN IV, IBM 3090.

CCC-540/INVENT

Associated Nuclear Services of Surrey, England, contributed this new code system through the NEA Data Bank. INVENT is a radiological assessment code for the disposal of low and intermediate level wastes. It calculates the radiological activity of the waste as a function of time. It also computes hazard indices for the individual nuclides for both ingestion and inhalation routes. Reference: Associated Nuclear Services Report 595-1 through 595-3. FORTRAN 77; VAX.

CCC-548/KENO5A-PC

The contributors of this code at ORNL have made available an update to the Hansen Roach AMPX working library. The library contains the corrected mixtures for: 200, 300, 301, 302 and 701. The corrected file is available on one DS/HD 5.25-inch diskette. The full package is available on three DS/HD 5.25-inch diskettes. References: NUREG/ CR-0200 Rev. 2 (ORNL/NUREG/CSD-2/R2) Vol. 2, Section F11 (December 1984). FORTRAN 77; IBM PC.

CCC-556/QUINCE-PC

Union Electric Company, St. Louis, Missouri, contributed QUINCE for personal computers. The program QUINCE, an enhanced version of the VARSKIN code (CCC-522), computes absorbed dose and survival froma disc or point source on the skin surface, irradiating cells at the base of the skin. VARSKIN assumes that the dose from the last point of integration was close to zero and any remaining dose from that point was negligible. QUINCE was modified to add the dose from the last integration point out to the maximum range based on a straight line extrapolation to zero. QUINCE provides a smooth integral function by which the integrated dose is obtained, as opposed to the step function method in VARSKIN. QUINCE allows dose calculation for mixtures of up to 5 isotopes, whereas VARSKIN requires separate runs for each isotope in the mixture. QUINCE prints dose averaged over a 1 square centimeter area and the new area that is selected. QUINCE runs on the IBM PC and compatibles. A math coprocessor is not required, but is desirable. The code was written in FORTRAN 77 and tested under PC-DOS (IBM PC). An executable file produced by the Microsoft FORTRAN Version 4.01 is included; this file was linked with the math emulator library. The code is transmitted on one DS/DD 5.25-inch (360k) diskette. References: ``Validation, Verification and Use of the Computer Software Program QUINCE for Skin Dose Calculation," informal document, Union Electric Company, St. Louis, Missouri, 1990; and *Radiation Protection Management*, Vol. 4, No. 6 (Nov/Dec 1987), pp. 25 ! 34. FORTRAN 77; IBM PC.

CCC-558/ALKASYS-PC

Oak Ridge National Laboratory, Oak Ridge, Tennessee, contributed the ALKASYS code used for the creation of design concepts of multimegawatt space nuclear power systems that employ potassium Rankine power conversion cycles. ALKASYS calculates performance and design characteristics and mass estimates for the major subsystems composing the total power system. Design and engineering performance characteristics are determined by detailed engineering procedures rather than by empirical algorithms. Mass estimates are developed using basic design principles augmented in some cases by empirical coefficients determined from the literature. The code was written in IBM Basic and tested under PC-DOS (IBM PC), using the IBM Basic interpreter. An ASCII file produced by the Basic interpreter is included. The code is transmitted on one DS/DD 5.25-in. diskette (360kb). Reference: ORNL/TM-10427. Basic, IBM PC.

CCC-559/XPORT

Oak Ridge National Laboratory, contributed the code system, XPORT, which approximates the air-transported x-ray spectrum from nuclear detonations in the atmosphere. The method in XPORT consists of: (1) representing the black body continuous spectrum by discrete emission windows, (2) consulting tables of photon buildup factors for the discrete emission energies, (3) unfolding the buildup photons by using air kerma

response functions and an assumption for redistributing these photons to windows of lower energy, and (4) applying cutoff and weighting factors to improve the correlation with the Monte Carlo benchmark calculations. The code runs on the IBM PC and compatibles. The code was written in Microsoft QuickBasic under PC-DOS (IBM PC). An executable file produced by the Basic compiler is included. XPORT is transmitted on one DS/DD, 5.25-inch diskette. Reference: ORNL/TM-10810. Basic, IBM PC.

CCC-560/TRITAC

Osaka University, Japan, through NEA Data Bank, contributed TRITAC written in FORTRAN 77 for the VAX 8810 and ACOS-100 computers. TRITAC, a three-dimensional discrete ordinates transport code for solving eigenvalue problems in reactor cores, uses diffusion synthetic acceleration (DSA) to solve the eigenvalue problem in X-Y-Z geometry. DSA is applied not only to the inner iteration but also to the outer iteration. A seven-point difference scheme is used. The code is distributed on one DS/HD 5.25-inch diskette (1.2 MB). Reference: NEA 1087/01, August 1986. FORTRAN 77, VAX 8810 and ACOS-100.

CCC-561/WHATIF-AQ

Risø National Laboratory, Roskilde, Denmark, through NEA Data Bank, contributed WHATIF-AQ, written in ALGOL for the Burroughs 7800. WHATIF-AQ is part of a family of programs for calculating geochemistry in the near-field of radioactive waste with temperature gradients. The program calculates speciation and saturation indices for an aqueous solution at temperatures in the range 0-125 degrees centigrade. The chemical equilibrium is determined by solving a set of nonlinear equations consisting of the equilibrium constant and mass balance constraints. WHATIF-AQ takes into account the following components: Si, Al, Ca, Mg, K, Na, Fe^{2+}, Fe^{3+}, Cl, SO_4, and total HCO_3 or carbon dioxide pressure. Construction of 37 different aqueous species and saturation state of 84 minerals are calculated. The set of equations is solved using a generalized Newton-Rhapson technique. The code is distributed on one DS/DD 5.25-inch diskette. Reference: EUR 10119 EN; NEA 1147/01, May 1987. ALGOL, Burroughs 7800.

PSR-279/DANCOFF-3

Allgemeine Elektricitäts-Gesellschaft, of Frankfurt, Germany, through the NEA Data Bank, contributed DANCOFF-3 which calculates Dancoff correction for cylindrical fuel rods in square and hexagonal infinite lattices, for fuel element rods near water gaps, and for fuel rod clusters. Evaluation is done by direct numerical integration over the moderator region. DANCOFF-3 was developed on the IBM 7040 and converted to run on the VAX 8810 at NEA DB using the VAX FORTRAN compiler under VMS 5.0. Reference: AEG Informal Notes, ``How to Use the Code DANCOFF-3," July 1966; FORTRAN IV; VAX.

PSR-280/TRAX

The Institute For Nuclear Power Reactors, Pitesti, Romania, through the NEA-Data Bank, contributed this neutron spectrometry code. TRAX computes the resolution matrix and characteristic line widths and intensities for three-axis slow neutron spectrometers with flat or curved, mosaic or perfect crystals, with or without Soller collimators or limiting diaphragms. Reference: Informal Notes from Institute For Nuclear Power Reactors, 1987; FORTRAN IV; CDC Cyber.

PSR-287/ACTIV-PC

The Joint Institute of Nuclear Research, Dubna, USSR, through the NEA Data Bank, contributed ACTIV-PC, which analyzes gamma-ray spectra measured by various types of detectors and under a large variety of conditions. ACTIV performs calibration of the measurement apparatus, deletes outliers from the spectrum, and creates peak models with the use of histograms. The spectrum is divided into several intervals and peak search is performed in each of these intervals. A least squares estimator is used to determine peak positions and areas. ACTIV-PC will run on IBM PCs and compatibles with a math co-processor. The code was written in FORTRAN 77 and uses RM/FORTRAN Version 4.0 or higher compiler. The PLINK86 overlay linker (supplied with the RM/FORTRAN software) is used for linking the object modules. The executable program as packaged was linked with the math co-processor library. Alternatively, the code can be compiled and linked using the math emulator library. The code is transmitted on one DS/DD 5.25-inch diskette. Reference: ``The Long Write Up of the Program ACTIV," informal notes by V. B. Zlokazov, JINR, Dubna, USSR. FORTRAN 77; IBM PC.

PSR-288/UNIFY-ECN

The Chinese Nuclear Data Center, Beijing, China, contributed this code based on the unified model. The UNIFY code is used for the calculation of fast neutron data for structural materials, which involves: (1) cross section)total cross section, all kinds of reactions channels, the cross section of the discrete levels and continuum emission, (2) angular distribution)elastic scattering angular distribution and its Legendre coefficients and transition matrix elements, the Legendre coefficients of the discrete levels in the inelastic scattering channels, (3) energy spectra, (4) double

differential cross section of the inelastic channel and of the neutron outgoing channels. Gaussian integration is used in the program for all kinds of numerical integrations. UNIFY-ECN runs on the CDC Cyber 825/170. The code was written in FORTRAN 77 and requires the ICSSCU subroutine from the Internal Mathematics and Statistics Library (IMSL). The code is transmitted on one DS/DD 5.25-inch diskette. Reference: Informal document, Chinese Nuclear Data Center, 1990. FORTRAN 77, CDC Cyber 825/170.

PSR-289/MUP2

The Chinese Nuclear Data Center, Beijing, China, through the NEA Data Bank, contributed MUP2 which calculates fast neutron data for medium-heavy nuclei. The program includes the optical model, width fluctuation corrected Hauser-Feshbach formula and pre-equilibrium statistical theory based on the exciton model. This code can calculate the cross sections of all reaction channels, the elastic and inelastic scattering angular distributions for the discrete states and secondary neutron spectra. The radial wave function in the optical model is solved by the Cowell method. The calculations are restricted to medium-heavy nuclei, for which the fission reactions are absent. The maximum number of the isotopes of the target nucleus is limited to six. The energy region for incident neutrons is .01 to 20 MeV. The maximum number of energy points of outgoing secondary neutrons is 100. The code is distributed on one DS/DD 5.25-inch diskette. Reference: IAEA0907/03, May 1988, France. FORTRAN 77, IBM 3090.

PSR-290/REX2-87

Indira Gandhi Center For Atomic Research, India, through the NEA Data Bank, contributed REX2-87 (version 1), written in FORTRAN IV for the VAX 8810. REX2-87 was developed to calculate self-shielded multigroup average cross sections, and self-shielding factors for total, elastic, fission and capture processes from an ENDF/B formatted nuclear data file in which the tabulated cross sections follow linear interpolation. The linearly interpolated tabulated cross sections are normally obtained with the preprocessing codes RECENT, LINEAR, SIGMA1 (see PSR-159). REX2-87 is applied on the output of the SIGMA1 code which gives the Doppler broadened point cross sections so that self-shielded average cross sections and the associated self-shielding factors can be obtained corresponding to the temperature to which the point cross sections refer. The code calculates by default the averages in the resolved resonance region. The code was written in FORTRAN IV. NEA Data Bank used the VAX FORTRAN (version 5.0) under the VAX/VMS operating system. The code is distributed on one DS/HD 5.25-inch diskette (1.2 MB). Reference: IGCAR/NDS-18 (IAEA 0935), November 1988. FORTRAN-IV, VAX computers under VMS.

PERSONAL ITEMS

In serving a specialized area of scientific endeavor, it seems important that we note significant changes in the activities 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.

Edward T. Cheng is now with TSI Research, Solana Beach, California. Dr. Cheng will be engaged in research relevant to fusion neutronics and applications of nuclear technology.

S. Ganesan, Head of Nuclear Data Section, Indira Gandhi Centre for Atomic Research, Kalpakkam, has joined the IAEA Nuclear Data Section as a staff member.

Visitors to RSIC

During the month the following persons came for an orientation visit and/or to use RSIC facilities: *Samin Anghaie*, University of Florida; *Christopher Nelson*, U.S. Environmental Protection Agency; *Shun-ichi Tanaka*, and *Hiroshi Nakashima*, JAERI, Tokyo, Japan.

CONFERENCES, COURSES, SYMPOSIA

RSIC attempts to keep its users/contributors advised of conferences, courses, and symposia in the field of radiation protection, transport, and shielding through this section of the newsletter. Should you be involved in the planning/organization of such events, feel free to send your announcements and calls for papers to RSIC.

Advanced Modelling and Computer Codes Specialists' Meeting

A Specialists' Meeting on Advanced Modelling and Computer Codes for Calculating Local Scale and Meso-Scale Atmospheric Dispersion of Radionuclides and Their Applications will be held March 6!8, 1991, in Saclay, France. The meeting will focus on detailed discussion of advanced meteorological and dispersion models and their

use in specific applications in the nuclear field or for other environmental studies. Advanced models that describe three-dimensional wind fields (mass-consistent models, hydrodynamic models, etc.), together with concentration of atmospheric pollution (e.g. radionuclides, etc.), will be discussed. The objective region considered concerns mainly short and medium ranges including topography. For model validation purposes, comparisons with experiment are expected to be discussed. The state of the art of real time modelling of emergency situations after accidental releases will be examined. Global long-range and simple analytic models will be discussed also. The deadline for submission of abstracts is **December 31, 1990**.

Further information about this Specialists' Meeting may be obtained by writing to Enrico Sartori, OECD/NEA Data Bank, Bat. 445, F-91191 Gif-sur-Yvette, Cedex, France. Sartori may also be reached by phone (33 1 6908 6095), Fax (33 1 6941 3965), or Telex (690920 neadata).

IRPA8

Worldwide Achievement in Public and Occupational Health Protection Against Radiation is the theme of the 8th World Congress of the International Radiation Protection Association conference to be held May 17 ! 22, 1992, in Montreal, Canada. This Congress will focus on protection against ionizing and non-ionizing radiation, against a background of other public health and industrial hygiene experience. Health risks from radiation will be compared with those from other industrial and environmental hazards, as well as the public perception of those risks. Contributors will review current topics in plenary sessions, workshops, and scientific paper sessions. Training sessions aimed at providing a basic understanding of ionizing and non-ionizing radiation protection will be a major feature of the Congress. Those who wish to participate may submit an abstract of not more than 250 words in either French or English on the following topics.

1. **Radiation Risks in Perspective.** Risks in relation to benefits, comparisons with other risks, e.g. chemical hazards.

2. **Perceptions of Risks from Radiation**. Communication to the public, public education.

3. **Biological Effects of Radiation.** Epidemiological and other human studies, use of animal data, possible beneficial effects (hormesis) from radiation.

4. **Protection Concepts, Policies and Standards.** Derivation of international recommendations and their implementation. Use of biological data in deriving standards. Dosimetry concepts for non-ionizing radiation.

5. **Optimization of Radiation Protection.** Procedures for carrying out optimization. The relationship of optimization to levels and limits.

6. **Exposures in the Practice of Medicine.** Measurements or assessments of doses. Application of protection standards including justification. Prevention of overexposure.

7. **Exposure to Natural Radiation.** Ambient ultra-violet monitoring. Measurement of exposure to radon and limitation schemes. Hazards from other naturally occurring radionuclides, e.g. thorium and polonium.

8. **Occupational Exposure.** Experience from the nuclear fuel cycle and other industrial and research facilities. Exposure to non-ionizing radiation.

9. **Medical Surveillance of Workers.** Criteria for medical involvement in normal situations. Medical handling of accidental overexposures.

10. **Exposure to the Public from Radioactive Materials in the Environment.** Assessment and regulatory procedures, environmental transfer and modeling studies.

11. **Assessment and Control of Exposures to the Public not Related to Contamination of the Environment by Radioactive Material.** Ionizing radiation; consumer goods, air travel, other. Non-ionizing radiation; radar, power lines, other.

12. **Instrumentation and Measurement Techniques.** Developments in internal and external dosimetry. Non-ionizing radiation measurement techniques.

13. **Radiation Accidents.** Assessment of consequences. Emergency preparedness. Intervention levels for counter-measures.

14. **Environmental Surveillance and Monitoring.** Routine and accident situations.

15. **Decontamination and Decommissioning of Large Facilities.** Regulatory aspects, dose reduction techniques, volume reduction measures and

recycling.

16. **Transport of Radioactive Materials.** Dose assessment, accident analysis and regulatory requirements.

17. **Radioactive Waste Disposal.** Assessment of repository behavior and consequent doses, regulatory procedures and compliance demonstration.

18. **Protection of the Environment.** Reasons for concern, possible protection criteria.

19. **Litigation.** Approaches to compensation. Case histories.

20. **Education and Training in Radiation Protection.** Curriculumdevelopment, recognition of courses and qualifications, certification.

Further information about the Congress may be obtained by writing to IRPA8, 2155 Guy Street, Suite 820, Montreal, Quebec, Canada H3H 2R9 or you may Fax a request to 514-932-9419.

Calendar

Your attention is directed to the following events of interest.

January 1991

8th Symposium on Space Nuclear Power Systems, Jan. 7!10, 1991, in Albuquerque, New Mexico, sponsored by the U.S. Department of Energy, NASA, Los Alamos National Laboratory, Sandia National Laboratory, and the American Institute of Chemical Engineers. Contact: Mary Bragg, Univ. of New Mexico, Albuquerque, NM 87131 USA (phone 505-277-4950).

PIME '91)The International Workshop on Nuclear Public Information in Practice, Jan. 27!30, 1991, Annecy, France, sponsored by the European Nuclear Society. Contact: PIME '91 Secretariat, c/o ENS, P.O. Box 5032, CH-3001 Berne, Switzerland (phone 031 21 61 11).

February 1991

Nuclear News Marketing Conference, Feb. 4!6, 1991, Clearwater Beach, Florida, USA, sponsored by the American Nuclear Society. Contact: ANS Meetings Dept., 555 N. Kensington Ave., La Grange Park, IL 60525 (phone 708-579-8258).

7th All-Union Conference on Monte Carlo Methods in Computational Mathematics and Mathematical Physics, Feb. 19!21, 1991, in Novosibirsk, USSR. Contact: Dr. J. V. Bulavsky, Computational Center of Siberian Branch of Academy of Science, 6, prospect Ak.Lavrentyeva, Novosibirsk 630090, USSR (phone 356721).

*Waste Management `91*, Feb. 24!28, 1991, Tucson, Arizona, sponsored by the University of Arizona, the American Society of Mechanical Engineers, the American Nuclear Society, and the U.S. Department of Energy. Contact: Waste Management `91, College of Engineering and Mines, Building 20, University of Arizona, Tucson, AZ 85721 USA.

April 1991

27th Annual Meeting of the National Council on Radiation Protection and Measurements, Apr. 3!4, 1991, Bethesda, Maryland. Contact: NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814 (phone 301-657-2652).

Advances in Mathematics, Computations, and Reactor Physics, Apr. 28!May 1, 1991, Pittsburgh, Pennsylvania, an International Topical Meeting sponsored by the ANS, Mathematics & Computation Division and the Reactor Physics Division. Contact: J. E. Olhoeft, Westinghouse Electric Corp., P.O. Box 355, WEC-E205, Pittsburgh, PA 15230-0355 USA (phone 412-374-5704).

1991 International High-Level Radioactive Waste Management Conference, Apr. 28!May 3, 1991, Las Vegas, Nevada, sponsored by the ANS and the American Society of Civil Engineers. Contact: Dillard B. Shipler, Technical Program Chair, American Nuclear Society, 555 N. Kensington Ave., La Grange Park, IL 60525 USA.

Conference on Occupational Radiation Protection, Apr. 29!May 3, 1991, Guernsey, United Kingdom, sponsored by the British Nuclear Energy Society. Contact: British Nuclear Energy Society, Secretariat, 1-7, Great George St., London SW1P 3AA U.K.

May 1991

Radiopharmaceutical Dosimetry Symposium, May 7!10, 1991, in Oak Ridge, Tennessee, sponsored by the Radiopharmaceutical Internal Dose Information Center. Contact: Audrey T. Schlafke-Stelson, Program Committee, 5th International Dosimetry Symposium, Radiopharmaceutical Internal Dose Information Center, Medical Sciences Division, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37831-0117 USA (phone 615-576-3450).

June 1991

ANS Annual Meeting, June 2!6, 1991, Orlando, Florida. Contact: General Chair John A. DeMastry, Florida Power & Light Co., P.O. Box 14000, Juno Beach, FL 33408 (phone 407-694-3613).

5th International Symposium on Radiation Physics, June 10!14, 1991, Dubrovnik, Yugoslavia. Contact: Dr. Ante Ljubi‡i*f*, ISRP-5 Chairman, Ruder Bo×kovi*f* Inst., P.O. Box 1016, 41001 Zagreb, Yugoslavia (phone 41 425-563 or 41 434-467, Telex 21383 irbzg yu, Fax 41 425-497).

A Joint Symposium on Radiation Protection, June 16!23, 1991, in Winnipeg, Canada. Contact: Danny Buksak, Conference Chairman, The University of Manitoba, 191 Frank Kennedy Bldg., Winnipeg, Manitoba, R3J 2N2, Canada (phone 204-474-6633).

July 1991

2d International Symposium on Biophysical Aspects of Auger Processes, July 5!6, 1991, University of Massachusetts, Amherst, Massachusetts, sponsored by the American Association of Physicists in Medicine. Contact: Roger W. Howell, Dept. of Radiology, Div. of Radiation Research, M.S.B. F-451, Univ. of Medicine & Dentistry of NJ, 185 South Orange Ave., Newark, NJ 07103 USA (phone 201-456-5067).

Health Physics Society Annual Meeting, July 21!26, 1991, Washington, D.C. Contact: Nancy E. Newman, NIH Bldg. 21, Rm. 236, 9000 Rockville Pike, Bethesda, MD 20892 (phone 301-496-5774).

International Illinois Low Level Radioactive Waste (LLWM) Symposium: The Quiet Revolution⁄Innovations in Low-Level Waste Management, July 29!Aug. 1, 1991, Chicago, Illinois, sponsored by the Illinois Dept. of Nuclear Safety. Contact: Ms. P. Burnett, Illinois Dept. of Nucl. Safety, 1035 Outer Park Drive, Springfield, IL 62704 USA.

September 1991

ICNC '91, Sept. 9!13, 1991, Christ Church, Oxford, England, sponsored by AEA Technology, the OECD Nuclear Energy Agency, with cooperation from IAEA. Contact: John Bentley, 062/A32, AEA Technology Winfrith, Dorchester, Dorset DT2 8DH, England (phone 0305 203316; Fax 0305 202122).

Brazilian Meeting on Reactor Physics and Thermal Hydraulics, Sept. 17!20, 1991, São Paulo, Brazil. Contact: José Rubens Maiorino, IPEN-CNEN/SP, Caixa Postal 11049 (Pinheiros), 05499-São Paulo-SP-Brazil (phone 011 211-6011 Ext. 270; Telex 11 83592-IPEN-BR).

October 1991

1991 Joint International Waste Management Conference, Oct. 21!26, 1991, Seoul, Korea. Contact: Mr. Larry C. Oyen, Sargent & Lundy, 55 East Monroe St., Chicago, IL 60603 (phone 312-269-6750, Fax 312-269-3475, Telex 280603).

November 1991

Nuclear Energy Forum, Nov. 10!13, 1991, San Francisco, California. Contact: Conference Office, U.S. Council for Energy Awareness, 1776 I Street, N. W., Suite 400, Washington, DC 20006-2495 USA.

April 1992

New Horizons in Radiation Protection and Shielding, Apr. 26!May 1, 1992, Pasco, Washington, a topical meeting of the ANS Radiation Protection and Shielding Division. Contact: Wilbur Bunch, HO-36, Westinghouse Hanford Co., P.O. Box 1970, Richland, WA 99352 (phone 509-376-6313).

May 1992

8th International Radiation Protection Association Conference, May 17!22, 1992, Montreal, Canada. Contact: G. Webb, NRPB, IRPA 8 Secretariat, Chilton, Didcot, Oxon OX11 ORQ, United Kingdom.

NOVEMBER 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.

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