



# RSIC Newsletter

## OAK RIDGE NATIONAL LABORATORY

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OPERATED BY UNION CARBIDE CORPORATION  
FOR THE U.S. DEPARTMENT OF ENERGY

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No. 229

December 1983

*Nothing in the world can take the place of persistence. Talent will not; nothing is more common than unsuccessful men of talent. Genius will not . . . the world is full of educated derelicts. Persistence and determination alone are omnipotent. The slogan "press on" has solved and always will solve the problems of the human race. — Calvin Coolidge*

### SHIELDING EDUCATOR RETIRES

**Arthur B. Chilton**, long-time RSIC friend and participant, has announced that he is now "Emeritus Professor" of the University of Illinois. He maintains an office at the University but does most of his work at home: 805 W. Michigan Ave., Urbana, IL 61801.

Chilton personally and through his work has exercised a strong influence on RSIC activities throughout the past 20 years. The RSIC staff salutes him and calls attention to his accomplishments as follows.

He is an innovator in his field. He helped establish and taught at the Kansas State University Summer Institute on Radiation Shielding; he developed experimental programs in shielding at the University of Illinois; and he made significant contributions to theoretical methods in radiation transport analysis.

Chilton is a leader in developing standards for radiation protection, serving on the National Council on Radiation Protection and Measurements and on the American Nuclear Society (ANS) Shielding Standards Committee (ANS-6).

He has authored many important reports and articles and has collaborated on many books which serve as important references in his field. These include *Radiation Shielding*, (1966); the three-volume *Engineering Compendium on Radiation Shielding*, (1968, 1960, 1975); and *Structure Shielding Against Fallout Gamma-Rays from*

*Nuclear Detonations*, (1980). His latest publication effort, a textbook on shielding (*Principles of Radiation Shielding*, by Chilton, Faw, and Shultis, published by Prentice-Hall) is now available, although the official publication date is 1984.

A former student (now RSIC Director) has this to say:

*I have known him for more than 20 years. He was my teacher in radiation protection and shielding courses at the University of Illinois, my supervisor as a research assistant, my Ph. D. advisor, and finally my collaborator on research projects. All of his work is characterized by honesty, consistency, thoroughness, and completeness, and his teaching of these principles has been a strong influence on the radiation protection and shielding discipline of nuclear science and engineering.*

RSIC is pleased to salute **Arthur B. Chilton**, who has provided leadership in the field of radiation protection throughout his career.

### DOT User Follow Up (R-θ Option)

Richard Maerker of the ORNL Engineering Physics Division has studied the impact of the error in Subroutine PCON (see August 1983 *RSIC Newsletter*) on R-θ pressure vessel dosimetry calculations for an operating reactor (ANO-1) by repeating calculations with the corrected version. He provides the following summary.

1. For four ex-core locations (i.e., the core barrel, the inside surface of the pressure vessel, one-quarter depth into the pressure vessel, and inside the reactor cavity behind the pressure vessel) the effect of the bug was investigated in depth and found to exhibit no significant trend in energy; values of group scalar fluxes calculated without the bug to those calculated with the bug at the above four locations averaged 1.009, 1.002, 1.005 and 0.998, respectively. At both the second and last of these locations there occurred slight scalar flux increases and decreases depending on the energy; at the other two locations, the effect of the bug was to systematically decrease all the group fluxes by slightly different energy dependent factors. Since these four locations include the most important positions in dosimetry analysis, the conclusion can be drawn that existing R- $\theta$  runs with the bug present produce group fluxes accurate to within 2% for any group, with weighted

integrals involving the group fluxes considerably more accurate than this. Hence, existing accuracies are more than adequate for pressure vessel dosimetry applications.

2. For several in-core locations where the fuel loading is such as to cause backward components of the angular flux to predominate, the effect of the bug can be considerable, i.e., up to  $\pm 50\%$  depending on the source density distributions. This ramification is of little importance in ex-core dosimetry because the effects are local and are not propagated beyond the core to any noticeable extent. However, in any reactor physics applications where R- $\theta$  geometry might be used to mock up the core, the effect should not be neglected *a priori*, and significant errors in the core fluxes are possible.

As announced in the October 1983 *RSIC Newsletter* all versions of DOT have been updated to correct PCON.

## CHANGES TO THE COMPUTER CODES COLLECTION

During the month there were six changes made to the RSIC Computer Codes Collection. Two existing code packages were extended with new hardware versions and four existing code packages were updated with software enhancements and corrections.

### CCC-254/ANISN-ORNL

The (A) version (IBM 360/370) and the (C) version (CDC 6600/7600) of this multigroup, one-dimensional, discrete ordinates transport code package with anisotropic scattering was updated to correct an error in Subroutine GUTS that was called to RSIC attention by Frej Wasastjerna, Technical Research Center of Finland and verified by Ward W. Engle, Jr., Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee. A problem will arise only when fluxes and moments are stored on an external device and less than full downscatter is specified. Details of the correction are available upon request. The (B) version (UNIVAC 1108) of the package was not affected by this update.

### CCC-266/ONETRAN

This one-dimensional, multigroup, discrete ordinates, finite-element transport code package was extended to include a CRAY version (C), contributed by Los Alamos National Laboratory, Los Alamos, New Mexico. FORTRAN IV; CDC 7600 (A), IBM 360/370 (B), and CRAY (C).

### CCC-371/ORIGEN-2 82

This isotope generation and depletion code package (matrix exponential method) was updated to correct sample problem data in file 2. Only those persons who received the code after June 27 are affected by the change. Those persons should contact RSIC for details of the data update.

### CCC-447/TACT III

This atmospheric transport code package was updated to add numerical software routines EISPACK and LINPACK. Persons who have this code package should send a reel of tape and request the newly updated version. The need for this

update was reported to RSIC by the University Computing Company, Dallas, Texas, and ORNL.

### CCC-450/SCALE2

The SCALE2 modular code package for performing standardized analysis for licensing evaluation was updated with changes and corrections supplied by the ORNL Computer Sciences Division. The changes and corrections involve the following routines: KNIGHT, MARS, MORSE, BONAMI, and COMPOZ.DATA. We urge all persons now using CCC-450/SCALE2 package to send one reel of magnetic tape to RSIC and request the modified files.

### PSR-124/GIFT

The CDC version of the combinatorial geometry code system with model testing routines was replaced by a new CDC CYBER 76 version. The new version, designated (B) was contributed by the Department of the Army, Aberdeen Proving Ground, Maryland. New documentation is included with the new version. FORTRAN IV; UNIVAC (A), CDC CYBER 76 (B), and VAX (D).

### CHANGES TO THE DATA LIBRARY COLLECTION

During the month there were two changes to the data library collection. An existing data library was replaced with a new expanded version and a new data library was added to the collection.

### DLC-69/ACTL82

An updated and expanded version (B) of ACTL82, an evaluated neutron activation cross-section library covering incident neutron energies from  $10^{-10}$  to 20 MeV, was contributed by Lawrence Livermore Laboratory, Livermore, California. The evaluations have been done for specific first-order reactions (where the targets are stable isotopes of an element) and for the related second-order reactions (where the targets are the immediate activation products from reactions to these stable isotopes). Consequently, a large number of cross sections are provided for unstable targets. Cross sections are usually included for the following reactions:  $(n,\gamma)$ ,  $(n,2n)$ ,  $(n,3n)$ ,  $(n,p)$ ,  $(n,n'p)$ ,  $(n,pn)$ ,  $(n,\alpha)$ ,  $(n,n'\alpha)$ , and  $(n,\alpha n)$ . Some  $(n,d)$ ,  $(n,t)$ ,  $(n,^3\text{He})$ ,  $(n,n'd)$ , and  $(n,n't)$  cross sections are also provided. On the average, about five reactions per target isotope have been evaluated. Cross sections for reactions leading to isomeric products are included where appropriate. No retrieval program is provided. Reference: UCRL-50400, Vol. 4, Rev. 1, App. A and Vol. 18.

### DLC-106/ECPL82

An evaluated charged-particle data library, ECPL82, was contributed by Lawrence Livermore National Laboratory, California. The package contains evaluated cross section data for incident p, d, t,  $^3\text{He}$ , and  $^4\text{He}$  particles. The format of the data is described in the reference listed below. No retrieval program is provided. Reference: UCRL-50400, Vol. 4, Rev. 1.

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### OECD NEA CELEBRATES 25TH

The Organization for Economic Co-Operation and Development (OECD) Nuclear Energy Agency is celebrating 25 years in research and development, coordination, and information exchange. The present NEA was established in 1972, successor to the European Nuclear Energy Agency (ENEA) created in 1958 within the framework of the Organization for European Economic Cooperation (OEEC). Membership includes 19 European members of the OECD and Australia, Canada, Japan, and the United States. Both the Commission of the European Communities (CEC) and the International Atomic Energy Agency (IAEA) take part in the agency's

activities. The NEA is perhaps best known — at least in the U.S. — for its role in the safety area through its Committee on the Safety of Nuclear Installations (CSNI).

### Correction Note

In our eagerness to let our colleagues know of the availability of the proceedings for the 6th ICRS meeting held in May 1983, we prematurely announced that the proceedings are available from T. Asaoka in Tokyo (see November *RSIC Newsletter*). Please note that the proceedings are available from

M. Kato  
International Congress Service, Inc.

2-7-4, Nihombashi, Chuo-ku, Tokyo  
103, Japan

The cost of the publication is ¥10,000 and a postal fee will be charged according to the mailing device of your order (sea or air mail). Upon request, an invoice for the total amount will be sent. Payment should be made by bank transfer to the following in Japanese yen: International Congress Service (Ref. No. CS05-7002-58) A/C No. 0292591, The Bank of Tokyo, Ltd. Marunouchi Office, Marunouchi, 1-4-2, Chiyoda-ku, Tokyo, Japan 100.

## ANS NEWS OF INTEREST TO SHIELDING

### ANS Membership Directory Survey

ANS News, December issue, includes a survey form (page 8) for the use of ANS members to express interest, or lack of it, in a directory of members. Since several RSIC participants have in the past expressed such an interest, we call it to your attention. The deadline for response is **January 15, 1984**.

### RP&S Chairman Moves

**E. Thomas Boulette**, Chairman of the ANS Radiation Protection and Shielding Division, has a new address: Maine Yankee Atomic Power Company, Edison Drive, Augusta, Maine 04336 (phone 207-623-3521, ext. 2781). Tom, formerly with Stone & Webster, is Director, Operational Support of the power company.

### Kallfelz New NS&E Editor

**John M. Kallfelz**, professor in the School of Nuclear Engineering, Georgia Institute of Technology, has been named editor of the ANS journal *Nuclear Science and Engineering*. His appointment by ANS president *Milton Levenson*, as of November 1, 1983, concludes the search for a successor to *Dixon Callihan*, who had held the position since 1965.

Kallfelz holds an under-graduate degree from the U.S. Military Academy and graduate degrees from the California Institute of Technology and the University of Karlsruhe in West Germany. In addition to his Georgia Tech duties, he has served as consultant to several nuclear institutions.

### Maskewitz on ANS 1984 Ballot

The name of **Betty F. Maskewitz**, well known in the shielding community via RSIC, will be added to the 1984 ANS election ballot as a candidate for the Vice-President/President Elect office in 1984-85. Nominated by a petition signed by 71 ANS members, she provides an alternate candidate to **E. Linn Draper** who was selected by the Nominating Committee of the Society.

Draper, a vice president of Gulf States Utilities Company, was an RSIC participant as associate professor and director of the nuclear engineering program (1971-79) at the University of Texas at Austin.

Maskewitz is with Oak Ridge National Laboratory, where she serves as director of the Engineering Physics Information Centers, which include, among others, the Radiation Shielding Information Center, and the NRC Technical Data Management Center. She has been active in ANS affairs for many years, recently completing a term (1980-83) on the Board of Directors and Executive Committee (1981-83). Named a Fellow of the Society in 1982, she has also served on the Honors and Awards, Membership, NEED, Nominating, Planning, and Publications Committees. She is a member of the Radiation Protection and Shielding Division and, in fact, won that division's award for outstanding service in 1975. She is also a member of the Mathematics and Computation Division, serving as general chairwoman and editor of proceedings of the division's 1969 topical meeting. She has been a member of the ANS-10 Standards Subcommittee since its inception.

## STANDARDS ACTIONS

The following standards activities have recently taken place.

### Approved

ANSI N323 1978(R1983) Radiation Protection Instrumentation Test and Calibration (reaffirmation) (IEEE)

ANSI/IEEE 301-1976 (R1983) Test Procedures for Amplifiers and Preamplifiers for Semiconductor Radiation Detectors for Ionizing Radiation (reaffirmation)

ANSI/IEEE 645-1977 (R1983) Test Procedures for High-Purity Germanium Detectors for Ionizing Radiation (reaffirmation)

### Withdrawn

ANSI N16.9-1975(ANS-8.11) Validation of Calculational Methods for Nuclear Criticality Safety; date, October 7, 1983 (criteria now in ANS-8.1-1983).

### Newly Published

The following three standards may be obtained from ANS.

ANSI/ANS-8.6-1983 Safety in Conducting Subcritical Neutron-Multiplication Measurements in Situ (revision of N16.3-1975); \$10.00

ANSI/ANS-19.1-1983 Nuclear Data Sets for Reactor Design Calculation (revision of N411-1975); \$20.00

ANSI/ANS-19.3-1983 The Determination of Neutron Reaction Rate Distributions and Reactivity of Nuclear Reactors (revision of N412-1975); \$30.00.

The following standards are available from ASTM for \$4.00 each; to order by phone call 212-299-5450.

ASTM E 942-83 Guide for the Simulation of Helium Effects in Irradiated Metals

ASTM E 944-83 Practice for Application of Neutron Spectrum Adjustment Methods in Reactor Surveillance.

#### RSIC Notes Death of K. Rooney

We note with regret the death of **Kevin L. Rooney** on November 25 at the age of 50. An employee of Sargent and Lundy Engineers since 1971, he had made contributions to the field of radiation protection and shielding for 30 years. Having an AEC Health Physics fellowship, he completed his M.S. in Radiation Biology at the University of Rochester in 1956. In the period 1956-60 he was involved in radiation protection with Curtiss Wright. In 1960 he joined Atomics International where he worked on shielding problems of systems for nuclear auxiliary power for space vehicles.

Kevin was highly respected by his colleagues, who also enjoyed his bubbling personality. We will miss him.

#### PERSONAL ITEMS

**Thomas E. Murley** was selected as Regional Administrator of the NRC's Region 1 office in King of Prussia, Pennsylvania. Region 1 is responsible for NRC inspection, licensing, investigation, and enforcement programs in the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the District of Columbia.

#### Visitors to RSIC

During the month of November the following persons came for an orientation visit and/or to use RSIC facilities: *Michihisa Ikeda*, and *Masahito Igarashi*, from Century Research Center Corp., Tokyo, Japan; *Gianfranco Gualdrini*, and *Sergio Mancinoppi*, from ENEA, Rome and Bologna, Italy; *Walter Zobel*, TVA, Knoxville, Tennessee; and *David Gilai*, Israel Atomic Energy Commission, Beer Sheva, Israel.

#### LITERARY NOTES

##### New Inventory of RSIC Products Publication Imminent

RSIC announces the publication of an updated version of the *RSIC Computer Code & Data Collections*, *A Capsule Review of the Computer Code Collection (CCC)*, *Peripheral Shielding Routines (PSR)*, and *Data Library Collection (DLC)*. The new version brings the RSIC collection to date as of November 1983. It is available to those persons who request it from RSIC.

#### New Publications Available

*Preparedness and Response in Radiation Accidents*, by Bernard Shleien, is a compilation by the National Center for Devices and Radiological Health which covers all aspects of preparedness and response currently recognized as necessary for effective public protection in a radiation accident. The book is divided into three sections — Radiation Accident Emergency Planning, Organization and Response in a Radiation Accident, and Skill and Knowledge Areas for Preparedness and Response — and will be of value to managers, health physicists, emergency personnel, and state and local public health officials who would need to respond to a nuclear accident. Order GPO stock number 017-015-00213-6 from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; cost is \$6.00.

*1983-1984 International Directory of Nuclear Utilities*, edited by Joseph H. Bach, is a compilation of information on worldwide utilities having nuclear power plants. Information on each utility listed includes utility address, phone number, and Telex number; head officers of the utility; nuclear plants and their addresses and chief operating personnel; and the MWe rating and type of nuclear plant, and projected dates of operation. The directory is also indexed by utility, nuclear power stations, and personnel listed in the directory; a list of abbreviations is also included. It is available from Lotte, Ltd., Box 237, Contract Station 27, Lakewood, CO 80215, for \$235.00.

*Advanced Nuclear Systems for Portable Power in Space*, prepared by the Committee on Advanced Nuclear Systems of the National Research Council's Energy Engineering Board, is a report that provides an assessment of "the state of the art of advanced nuclear systems for portable thermal and electrical power systems with possible aerospace propulsion applications." Requirements, safety strategy, and management of the technical effort, as well as the status of advanced compact nuclear reactor technology, are addressed in looking toward mounting a space nuclear reactor research and development program. It is available for \$13.50 from National Academy Press, 2101 Constitution Ave., N.W., Washington, DC 20418; ask for ISBN No. 0-309-034237-2.

#### UPCOMING MEETINGS, CONFERENCES, AND SYMPOSIA

Attention is directed to the following announcements and calls for papers.

##### Calls for Papers

##### 21st Nuclear & Space Radiation Effects

The 21st annual conference on "Nuclear and Space Radiation Effects" will be held July 22-25, 1984, in Colo-

rado Springs, Colorado. It is sponsored by the Institute of Electrical and Electronics Engineers (IEEE) and cosponsored by the Defense Nuclear Agency, Jet Propulsion Laboratory, and Sandia National Laboratories. The program, to be held July 23-25, will consist of eight to ten sessions of contributed and invited papers and a poster session; a short course will be offered on July 22.

The conference will cover nuclear and space radiation effects and electromagnetic pulse effects on electronic devices, materials, circuits, and systems, as well as semiconductor processing technology and techniques for producing radiation-tolerant (hardened) devices, integrated circuits, and memories. **Papers in the following subject areas are solicited:** Basic Radiation Effects Mechanisms for Materials and Devices; Radiation Effects and Spacecraft Charging in Satellites; Radiation Transport, Energy Deposition, Dosimetry, and Radiation Facilities; Radiation Effects, Methods of Design and Manufacturing for Radiation-Hardened Electronic Devices, Integrated Circuits, and Systems; Electromagnetic Pulse Phenomena, Assessment of Coupling, and Measurement Technology (IEMP, SGEMP, SREMP); Single-Event, Upset, and Latchup Phenomena; Hardness Assurance Technology and Testing Techniques; Radiation Effects on the Materials and Electronics of Nuclear Reactors (Power and Space); and New Developments and New Technologies of Interest to the Nuclear and Space Radiation Effects Community.

Authors must submit the original and eight copies of a 35-word factual abstract and an informative summary suitable for a 10-15-minute presentation (two to four pages, including figures) to A. H. Kalma, 1984 NSRE Technical Program Chairman, Northrop Research and Technology Center, One Research Park, Palos Verdes Peninsula, CA 90275 (phone 213-377-4811 ext. 255). The summary must be received by the Technical Program Chairman no later than **March 1, 1984**. A paper accepted for presentation at the conference will be considered for publication in the conference issue of the *IEEE Transactions on Nuclear Science*, subject to review of the full paper.

Additional information may be obtained from the conference chairman, E. P. Wenaas, JAYCOR, P.O. Box 85154, San Diego, CA 92138 (phone 619-453-6850 ext. 227) or B. D. Shafer, Div. 2115, 1984 NSRE Publicity Chairman, Sandia National Laboratories, Albuquerque, NM 87185 (phone 505-846-0629).

### **Fuel Reprocessing & Waste Management Topical Meeting Planned**

An international meeting on "Fuel Reprocessing and Waste Management," will be held August 26-29, 1984, at Jackson Hole, Wyoming. Sponsors include the ANS Idaho Section and the Fuel Cycle and Waste Management, Reactor Operations, and Remote Systems Tech-

nology Divisions of the ANS; the Atomic Energy Society of Japan; the European Nuclear Society, and the Canadian Nuclear Society.

The technical program will cover three and one-half days of invited lectures, contributed papers, and panel discussions on all aspects of fuel reprocessing and the management of associated wastes. The major topics will include: fuel handling and preparation; alternatives to conventional reprocessing; monitored retrievable storage; solvent extraction; low activity high level waste treatment and storage; criticality safety; safeguards; off-gas treatment; and international reprocessing and waste handling experience.

The deadline for three copies of 900-word summaries in English is **January 1, 1984**; author notification will be **March 1, 1984**; abstract (100-word) deadline is **May 1, 1984**; and final paper deadline is **July 15, 1984**. Send summaries to L. W. McClure, Technical Program Chairman, P.O. Box 3807, Idaho Falls, Idaho 83401.

Additional information on the meeting may also be obtained from Kunihiko Uematsu, Nuclear Fuels Development Corporation, 1-9-13, Akasaka, Minato-ku, Tokyo, Japan 107; Reinhard Kroebel, KFK, P.O. Box 3640, D-7500 Karlsruhe 1, West Germany; or Eva L. J. Rosinger, Whiteshell Nuclear Research Establishment, Atomic Energy of Canada, Pinawa, Manitoba, Canada ROE1LO.

### **Personnel Radiation Dosimetry Symposium**

A first announcement and call for papers has been issued for a symposium on external personnel radiation dosimetry to be held at the Hyatt Regency Hotel in Knoxville, Tennessee, October 15-18, 1984. The program will consist of invited and contributed presentations concerning experience and advances in gamma, neutron and beta personnel radiation dosimetry at utility, military, laboratory, university, regulatory, medical, and vendor agencies. Special sessions on neutron and beta dosimetry will also be included with technical exhibits.

Abstracts are solicited in topics related to but not limited to the following areas in gamma, neutron, and beta personnel dosimetry: Dosimetry Requirements at Various Facilities; Regulatory Standards; Performance Testing Programs and Results; Characterization of Radiation Environments; Field Monitoring and Spectrometry; Instrumentation; Dosimeter Design; Research Results; Dose Equivalent Estimation; Calibration; Occupational Monitoring Experience and Problems; Quality Control; Data Recording; and Education and Training Requirements.

Each abstract should be accompanied by a separate sheet of paper with the abstract title and principal author's name, address, and telephone number. Abstract

deadline is **April 13, 1984**. Authors will be notified of acceptance by **June 15, 1984**. Abstracts of papers to be presented at the conference will be collected and distributed to participants at registration.

For additional information or placement on the symposium mailing list, contact R. T. Greene, Oak Ridge National Laboratory, Building 7710, Oak Ridge, TN 37831-2008, phone 615-574-5851 or FTS 624-5851.

### 1985 Fast Reactor Safety Topical Planned

An announcement has been received for an international topical meeting on "Fast Reactor Safety," to be convened April 21-24, 1985, in Knoxville, Tennessee. Emphasis will be on practical safety application. Sessions will include: Man-Machine Interface Considerations; In-Service Inspection, Testing and Maintenance; Safety-Related Aspects of Plant Operation; Probabilistic Risk Assessment; and Development of Plant Technical Specifications.

**Phillip Bradbury** is the General Chairman (615-576-1601) and **Donald R. Ferguson** is Technical Program Chairman (312-972-8338). The meeting is sponsored by the ANS Nuclear Reactor Safety Division with the following co-sponsors: European Nuclear Society, Japanese Nuclear Society, Breeder Reactor Corp., Department of Energy/ORO, Nuclear Regulatory Commission, Oak Ridge Associated Universities, ORNL, Tennessee Valley Authority, and the University of Tennessee. Other supporters include EG & G, General Electric Company, and Westinghouse Electric Corp.

### Calendar

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

#### January 1984

*Symposium on Space Nuclear Power Systems*, January 10-13, 1984, Albuquerque, New Mexico, sponsored by the University of New Mexico. Contact: Carlota Klimas, New Mexico Engr. Research Inst., Campus P.O. Box 25, Univ. of New Mexico, Albuquerque, NM 87131, USA.

*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).

*General Meeting of the American Physical Society*, January 30-February 2, 1984, San Antonio, Texas. Contact: The American Physical Society, 335 East 45th St., New York, NY 10017, USA.

#### February 1984

*17th Midyear Topical Meeting of the Health Physics Society*, February 5-9, 1984, Pasco, Washington. Contact: Edwin C. Watson, Columbia Chapter, Health Physics Society, P.O. Box 564, Richland, Washington 99352 (phone 509-375-6919).

*11th Annual Conference of the Indian Association for Radiation Protection*, February 13-16, 1984, Jodhpur, Rajasthan,

India. Contact: J. V. Ramana Rao, (Secretary, Organising Committee, XI IARP Conf.), Deputy Director, Ratanada Palace, Jodhpur, Rajasthan 324 001, India.

#### March 1984

*General Meeting of the American Physical Society*, March 26-30, 1984, Detroit, Michigan. Contact: American Physical Society, 335 East 45th St., New York, NY 10017, USA.

#### April 1984

*5th International Conference on Nuclear Methods in Environmental and Energy Research*, April 2-6, 1984, Mayaguez, Puerto Rico, USA, sponsored by the ANS; American Chemical Society; U.S.-DOE; Univ. of Puerto Rico-Recinto; Univ. of Mayaguez; and the Univ. of Missouri. Contact: James R. Vogt, Univ. of Missouri, 214 Research Reactor, Columbia, Missouri 65211, USA (phone 314-882-4211).

*20th Annual Meeting of the National Council on Radiation Protection and Measurements*, April 4-5, 1984, Washington, sponsored by the National Council on Radiation Protection and Measurements. Contact: NCRP, 7910 Woodmont Ave., Suite 1016, Bethesda, Maryland 20814.

*Financial and Economic Bases for Nuclear Power Topical Meeting*, April 8-11, 1984, Washington, D. C., sponsored by the ANS. Contact: James Phelps, Registration Chairman, 819 Sycamore Court, Herndon, VA 22070.

*Annual Meeting of the Radiation Research Society*, April 8-12, 1984, Orlando, Florida. Contact: American College of Radiology, 925 Chestnut St., Philadelphia, Pennsylvania 19107, USA.

*5th Annual Conference of the Canadian Radiation Protection Association*, April 30-May 3, 1984, Banff, Alberta, Canada. Contact: Stuart E. H. Hunt, Local Arrangements Chairman, C-7 Civil Electrical Engr. Bldg., Univ. of Alberta, Edmonton, Alberta, Canada T6G 2G7 (phone 403-432-5655).

#### 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), Unter den Eichen 87, D-1000 Berlin 45.

*Nuclear Technology Exhibit*, May 11-19, 1984, Beijing, China, sponsored by the ANS. Contact: P. Pollock, Exhibit Manager, ANS, 555 N. Kensington Ave., La Grange Park, Illinois 60525 USA (phone 800-323-3044).

*6th Annual Symposium on Safeguards and Nuclear Material Management*, May 14-18, 1984, Venice, Italy, sponsored by the European Safeguards Research and Development Association (ESARDA) and the Commission of the European Communities. Last date for abstracts and summaries is November 30, 1983. Contact: L. Stanchi, Commission of the European Communities Joint Research Centre, I-21020 Ispra (Varese), Italy.

#### June 1984

*24th Annual International Conference of the Canadian Nuclear Association*, June 3-6, 1984, Saskatoon, Saskatchewan, 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.

#### July 1984

*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).

#### September 1984

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

*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).

*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. Rottger, Joint Research Centre, Petten Establishment, HFR Div., Postbus 2, 1755 ZG Petten (N. H.), Netherlands (all other authors). Last date for abstracts is December 1, 1983.

#### October 1984

*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. Last date for abstracts is January 1, 1984. Contact: Internatl. Conf. on Occupational Radiation Safety in Mining, Canadian Nuclear Assoc., 111 Elizabeth St., 11th Floor, Toronto, Ontario, Canada M5G 1P7 (general information) and R. D. Gillespie, c/o MacLaren Engr., Inc., 33 Yonge St., Toronto, Ontario, Canada M5E 1E7 (for abstracts).

*Symposium on Radiation Dosimetry*, October 15-18, 1984, Knoxville, Tennessee, sponsored by Oak Ridge National Laboratory. 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.

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#### November 1984

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