RSIC Newsletter

RADIATION SHIELDING INFORMATION CENTER

OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION

For the U. S. Energy Research & Development Administration

POST OFFICE BOX X •
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By a fiction as remarkable as any to be found in law, what has once been published, even though it be in the Russian language, is spoken of as known, and it is too often forgotten that the rediscovery in the library may be a more difficult and uncertain process than the first discovery in the laboratory.

...Lord Rayleigh (1884)

NEW RSIC CROSS SECTION ACTIVITIES ON BEHALF OF DCTR

RSIC has been selected by the ERDA Division of Controlled Thermonuclear Research (DCTR) to serve as the **Cross Section Data Center** (evaluated and processed nuclear data) for the CTR research and development community. During FY 1975, plans were outlined and implementation initiated for establishing an evaluated cross section library at RSIC similar to that used for the Defense Nuclear Agency (DNA) Working Cross Section Library. The current version of ENDF/B serves as the starting base for the CTR library. New and revised evaluated data will be made available through RSIC as new measurements and model calculations pertinent to CTR needs are completed. Efforts are also underway to collect and/or generate, test, package, document, and distribute processed data libraries developed in the CTR community that are of general interest and utility to others.

A major project of RSIC as the **DCTR Cross Section Data Center** is the generation of a multigroup cross section library for use in CTR neutronics studies. This library will likely find useful application outside the CTR neutronics community and will be generally available through the RSIC Data Library Collection.

Conversations and correspondence with an informal CTR advisory committee were utilized by RSIC in defining the specifications of the library. It was decided to use the Bondarenko[1] formalism to treat temperature dependence and resonance self-shielding effects for neutron interaction processes. There will be considerable detail in the high energy neutron group structure, particularly above 2 MeV and with particular emphasis on the 14 MeV region. The library will also include gamma-ray production and interaction cross-sections so that detailed primary and secondary radiation transport problems can be studied. In addition to providing cross sections for performing the radiation transport calculations, the library will contain the reaction cross sections necessary for calculating reaction rates, helium production, heating, etc.

The library will be generated under RSIC direction at ORNL by personnel in the Neutron Physics and Computer Sciences Divisions. The neutron cross sections will be processed using the MINX[2] processer which calculates infinitely dilute multigroup cross sections and appropriate Bondarenko factors for each material. The output will be AMPX[3] interface format which allows the retention of all partial scattering matrices and reaction cross sections. The LAPHNGAS and SMUG modules of AMPX will be used to generate the gamma-ray production and interaction cross sections. The CHOX and MALOCS modules will be available for coupling and group-collapsing the library. A new module will be developed for performing interpolation and iteration of the Bondarenko factors to produce problem-dependent cross sections in the homogeneous approximation. The NITAWL module will be available for converting from AMPX interface format into a working format such as for the ANISN program. The library will also be available in the standard CCCC interface format[4].

There will be 156 neutron and 23 gamma-ray groups, both of which group structures are subsets of the standards 02[5,6]. The library will be P_5 expansion. Bondarenko factors will be generated for temperatures of 300°, 900°, and 2100°K and various values of σ_0 depending upon the material. The materials to be

processed will include the majority of ENDF/B-IV such that currently proposed fusion and fusion-fission systems can be studied. The weighting function will have a fusion peak at 14 MeV, a fission spectrum, and a Maxwellian thermal spectrum with 1/E slowing down regions between these prominent features.

The generation of data will begin in April. Testing, verification, and documentation will proceed along with the generation process. It is anticipated that data will be available for release by the end of FY 1975. Further testing and upgrading will continue into FY 1976 as we collect the results of user experience.

Progress will be announced in the RSIC Newsletter.

References:

1. I. I. Bondarenko, Ed., **Group Constants for Nuclear Reactor Calculations,** Consultants Bureau, New York (1964).
2. C. R. Weisbin, P. D. Soran, D. R. Harris, R. J. La Bauve and J. S. Hendrix, "MINX—A Multigroup Interpretation of Nuclear X-Sections," *Transactions, American Nuclear Society* **16**, 127 (June, 1974).
3. N. M. Greene, J. L. Lucius, L M. Petrie, W E. Ford, III, J. E. White, and R. Q. Wright, *AMPX: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Libraries from ENDF/B*, ORNL-TM-3706 to be published.
4. B. M. Carmichael, *Standard Interface Files and Procedures for Reactor Physics Codes, Version III,* LA-5486-MS (1974).
5. C. R. Weisbin and R. J. La Bauve, *Specification of a Generally Useful Multigroup Structure for Neutron Transport,* LA-5277-MS (1973).
6. E. A. Straker, *Suggested Energy Group Bounds for a General Purpose Photon Multigroup Cross Section Set,* SAI-74-566-HU.

PROPOSAL FOR NEW INTERNATIONAL RADIATION PHYSICS SOCIETY

Dr. A. K. Ganguly, Dr. D. V. Gopinath (Bhabha Atomic Research Center, Bombay–85) and Prof. A. M. Ghose (Bose Institute, Calcutta) have proposed the formation of an International Radiation Physics Society. They desire the reaction of specialists in the field and would be pleased to receive your comments. Readers may send them to Dr. Ganguly directly or via RSIC. This proposal, slightly condensed, follows:

Radiation Physics

Radiation physics is involved in all aspects of interaction of radiation with matter, quite a few of which are now being dealt with as basic aspects of separate disciplines. In the present proposal, radiation physics is taken to deal primarily with the interaction of *ionizing radiation* (electro-magnetic and particulate) with matter as distinct from interactions of optical radiations with matter.

Interaction of radiation with matter takes place in three different stages. The first stage is the transfer of energy to matter. This is essentially a physical process, and it is this part which forms the subject of radiation physics. The energy thus imparted could lead to chemical change in the medium. Investigation into the possibilities of different chemical changes, their kinetics, etc., is already well classified as radiation chemistry. Finally, the chemical changes thus introduced can lead to biological effects in living systems and this forms radiation biology. It is well recognized that there are overlapping areas, especially in the primary processes amongst radiation chemistry, radiation biology and radiation physics.

The following topics, which are not covered under any one discipline at present, form constituent parts of radiation physics: 1) basic interaction process of energy transfer and storage, measurements, processing and computation of cross-sections: 2) physical and mathematical theory of radiation transport, transport equations, computer codes and their applications (e.g., to reactor physics, reactor technology and health physics); 3) measurements and computation of spatial, angular and time-dependent spectral distribution of scattered radiations; 4) energy deposition from radiation into matter, structural changes thereof, spatial distribution and modes of transfer of energy and radiation dosimetry; and 5) instrumentation and experimental techniques for detection measurements and monitoring different types of radiation and energy distribution.

A Case for International Radiation Physics Society:

It is to be kept in view then, that though radiation physics as a discipline overlaps and interacts both in basic and in applied aspects with a number of other well established disciplines, it still retains a core of scientific topics discernible as distinct from others.

Persons working in radiation physics have been scattered and often have been working as supports to various disciplines. Results of investigation of radiation physicists are distributed in a large variety of journals of different disciplines. This *ad hoc* situation has so far led to the significant progress that has been accomplished in this field. It is felt for quite some time that in the process the topic has also evolved as a subject matter which needs consolidation, systemization and promotion as a coherent scientific discipline. It will be well worth an effort to bring workers in this field to a focal point for better interaction in the interest of systematic growth of the field.

It is with these objects in view we would like to propose the formation of an International Radiation Physics Society. Possible activities for such an organization would be: 1) organization of study of the field, conferences and symposia; 2) co-ordination of the work amongst the different laboratories in different countries; 3) intercomparison, standardization and identification of benchmark problems; 4) publication of a newsletter and 5) publication of a journal on radiation physics.

As to the structure of such an international organization, we are yet to formulate our ideas, and we feel that it should evolve on the basis of the consensus and comments we may receive from the workers in this field from all over the world.

HOW DO YOU WRITE YOUR TAPES?

When you send tapes to RSIC for us to read (e.g., when you contribute a code), it is important for us to know whether it is written 7- or 9-track, the bit density, and whether it is labelled. Otherwise, we spin our wheels trying to find out or guess this information. Please try to supply this information when you send us a tape.

AMERICAN NUCLEAR SOCIETY TO MEET IN NEW ORLEANS

The American Nuclear Society will meet at the Marriott Hotel, New Orleans, June 8–13, 1975. The Shielding and Dosimetry Division technical program is scheduled as follows:

Mon. a.m.	Plant and Equipment Design Features for Radiation Protection*
Mon. p.m.	Methods & Data for Analysis of Delayed & Induced Radioactivity*
Tues. a.m.	Atmospheric Dispersion & Nuclear Power Plant Assessment—I*
Tues. p.m.	Atmospheric Dispersion & Nuclear Power Plant Assessment—II* (A panel discussion)
Tues. p.m.	Power Reactor Shielding (a short, 4-paper session—the S&D Div. business meeting will be held after this session)
Thurs. a.m.	Cross Sections for Radiation Transport
Thurs. p.m.	Dosimetry and Spectrometry
Fri. a.m.	Shielding and Radiation Transport Applications
Fri. p.m.	Radiation Transport (Analytical)

*Special Session.

NASA SCIENTIFIC AND TECHNICAL INFORMATION FACILITY MOVING LOCATION

The NASA Scientific and Technical Information Facility is moving from College Park, Maryland to a location approximately 34 miles northeast of the District of Columbia and adjacent to the Baltimore/Washington International Airport. The new mailing address, effective March 24, 1975, is P.O. Box 8757, Baltimore/Washington International Airport, Maryland 21240, phone (301)796-5300. The new facility is a modern one-story building containing approximately 96,000 square feet and ideally suited for the Facility operations. All of the functional areas inside the Facility, i.e., computer operations, reprography, etc., have been enlarged and modernized to provide a more efficient operating environment. The building is convenient to reach from the District of Columbia via the Washington-Baltimore Parkway and the Airport turnoff.

PERSONAL ITEMS

Dr. Mojtaba Taherzadeh, an employee of the Jet Propulsion Laboratory in the Nuclear Power Sources Group for five years, has accepted a position as Technical Advisor to the Atomic Energy Organization (IAEO) of Iran. Dr. Taherzadeh, a naturalized U. S. citizen, has a PhD in physics from UCLA. He will assume his duties in Iran in the near future.

Larry Noon was recently elected a Fellow of the Institute for the Advancement of Engineering for his work over a period of several years with the Los Angeles chapter of the IEEE. Larry is involved in gamma-ray and neutron transport research in the Nuclear Power Sources Group, Jet Propulsion Laboratory.

At Sargent & Lundy in Chicago, the following administrative changes in the Nuclear Safeguards & Licensing Division have been announced: **O. A. Hrynewych, R. M. Crawford,** and **R. K. Rooney,** assistant heads of the division; **R. L. Olson** and **G. T. Seeley,** supervisors in the nuclear licensing section; **N. Weber,** supervisor of the safeguards systems section; and **G. P. Lahti,** supervisor of the shielding and radiological safety section.

Joe Mack, formerly with Martin-Marietta, is now with the Los Alamos Scientific Laboratory, Los Alamos, New Mexico.

CHANGES TO THE DATA COLLECTION

The DLC-2/ 100-Group Neutron Cross Section Library has been updated by adding data sets for ^{233}U and Zr. The new data were generated from ENDF/B-IV using SUPERTOG. The majority of DLC-2 is based on ENDF/B-III. The updated version is designated DLC-2F. The entire library can be contained on one 9-track blocked tape or five 7-track unblocked tapes, or users may request only the updated materials which can be transmitted on a single 7-track unblocked tape.

CHANGES TO THE COMPUTER CODE COLLECTION

CCC-82/ANISN

The ANISN packages have undergone major reorganization to remove obsolete versions. The following packages are now considered obsolete: CCC-82A (IBM 7090), CCC-82B (CDC 1604), CCC-82E (B5500), CCC-82F (UNIVAC 1100), and CCC-82G (IBM 360). The only version of ANISN left in the CCC-82 package slot is that contributed by CEA/CEN/Saclay, France's Radiation Shielding Group through the OECD-NEA Computer Programme Library. The packaged versions representing development at Princeton, ORNL, and Westinghouse are renumbered as follows: CCC-253/ PPL ANISN (which follows); CCC-254/ANISN-ORNL, IBM 360 (formerly CCC-82C); and CCC-255/ANISN-W, CDC 6600 (formerly CCC-82D).

CCC-123/XSDRN

A. Hronjak, Atomics International, Canoga Park, California and Maurice Greene, Union Carbide Computer Sciences Division, Oak Ridge, have called to our attention a problem in the JUANITA program of XSDRN which came to light with usage on IBM-370 machines. Fission yield data (not used in XSDRN) was improperly converted to BCD form by JUANITA. The error occurs only with the library distributed with XSDRN. A statement of the corrections needed and/or the package may be obtained upon request.

CCC-203A/MORSE-CG

The UNIVAC-1108 version of this General Purpose Monte Carlo Multigroup Neutron and Gamma-Ray Transport Code System has been altered according to suggestion made by Vic Cain, Bechtel Power, Gaithersburg, Md. and verified by Peggy Emmett, Union Carbide Computer Sciences Division, Oak Ridge. Vic found that subroutine FLUXST gave an error return if called with an energy group outside the limits requested for the problem. Requesters may ask for a statement of the corrections or for the complete package. CCC-203A is operable on the UNIVAC 1108.

CCC-203C/MORSE-CG (1975)

The General Purpose Monte Carlo Multigroup Neutron and Gamma-Ray Transport Code (combinatorial geometry) has been updated and a new documentation (ORNL-4972) issued. Both the new code package and/or the documentation are available upon request. CCC-203C is operable on the IBM 360.

CCC-252/DOT(LSU)

This Two-Dimensional Discrete Ordinates Transport Code was contributed by Louisiana State University, Baton Rouge, Louisiana. FORTRAN IV; IBM 360.

CCC-253/PPL-ANISN

This Multigroup One-Dimensional Discrete Ordinates Transport Code with Anisotropic Scattering and Provision for Binary Output was contributed by Princeton Plasma Physics Laboratory, Princeton University, Princeton, New Jersey. FORTRAN IV; IBM 360. Reference: MATT-1035.

PSR-87/LIBMAK

This ANISN-type Binary Data Processing (Create, Revise, Combine, List, Punch) Code was contributed by Princeton Plasma Physics Laboratory, Princeton University, Princeton, New Jersey. FORTRAN IV; IBM 360. Reference: MATT-1036

PSR-88/AREAD

Input Data Processing Routine was contributed by Princeton Plasma Physics Laboratory, Princeton University, Princeton, N. J. FORTRAN IV; IBM 360. Reference: MATT-1034.

PSR-89/SKEWGAUS

Skewed-Gaussian Line Peak Fitting Code—Multichannel Analyzer (MCA) Spectra—Ge(Li) and Si(Li) Semiconductor Detectors was contributed by Ames Laboratory, USERDA, Iowa State University, Ames, Iowa. Keywords are GAMMA-RAY and UNFOLDING. FORTRAN IV; IBM 360/65. Reference: IS-3460.

VISITORS TO RSIC

Visitors to RSIC during the month of March were: Johansson Per Ivar, AB Atomenergi, Nykoping, Sweden; Jacob Celnik and C. M. Kim, Burns & Roe, Oradell, New Jersey; Norman Schaeffer, Radiation Research Associates, Ft. Worth, Texas; John Ridihalgh, Ridihalgh and Associates, Columbus, Ohio; Richard S. Denning, Battelle Memorial Institute, Columbus, Ohio; D. O. Harton, Control Data Corporation, Oak Ridge, Tenn.; Charles D. Swanson, Control Data Corp., Minneapolis, Minnesota; Dr. Arun Kumar Chatterjee, Bose Institute, Calcutta, India; Kazusuke Sugiyama and Toru Yamamoto, Tohoku University, Sendai, Japan; Jean C. Lachkar and Jean P. Sigaud, French AEC, Paris, France; A. J. Armini, Simulation Physics, Inc., Burlington, Mass.; G. E. Bosler, Los Alamos Scientific Laboratory, Los Alamos, New Mexico; Hans Lemmel, IAEA Nuclear Data Section, Vienna, Austria; and Judy Stroud, Clemson University, Clemson, South Carolina.

MARCH 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 22151.

> *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.*

Special bibliographies and selected computer-printed abstracts of the literature in the RSIC system are available upon request. The Selective Dissemination of Information (SDI) Service is available by submitting a list of subject categories defining the recipient's interests.

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

REACTOR AND WEAPONS RADIATION SHIELDING LITERATURE

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Neutron and Gamma-Ray Production *Cross-Sections for Nickel.*
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Evaluated Neutron Cross Sections of 197-Au.
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