# RSIC Newsletter

RADIATION SHIELDING INFORMATION CENTER

## OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION • FOR THE U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

POST OFFICE BOX X • OAK RIDGE, TENNESSEE 37830

*No. 150* *June 1977*

*He is wise who knows the sources of knowledge — who knows who has written and where it is to be found.* . . . *A. A. Hodge*

### RECON AND SEARCH ON DEMAND TO REPLACE RSIC SDI SERVICE

Beginning immediately, the routine Selective Dissemination of Information (SDI) service, initiated in the late 1960's, will be discontinued as a cost/time savings measure. The service was never heavily used, perhaps because it was not well publicized. The fact that it was not well known was apparent from responses concerning the service received from the User Evaluation of RSIC's Products and Services. However, those who knew about and used the service gave it a good rating. Retrospective on-line searching by ERDA/RECON and batch-mode search on demand will be offered in its place.

The SDI service was rendered routinely to those persons who requested the service and furnished a profile of their interests. When a current batch of reviewed and indexed material was entered into the RSIC Storage and Retrieval of Information System (SARIS), a match was made against the profiles and a mailing was made of the resulting drops. Currently, 242 people have profiles on file in RSIC. Of these people, 63% rated the service as outstanding or superior in the recent evaluation return, 34% rated it adequate for their purposes, 2% suggested improvements, and 1% said the service should be dropped.

The *Ad Hoc* Review Committee, following a study of all RSIC operations, suggested that, because of the RSIC Newsletter accession lists and the ability to request a special search on demand, the SDI service would not be missed, and that it might be dropped with consequent cost/time savings.

As announced in the May newsletter, the RSIC SARIS files have been placed on the ERDA/RECON system. A packet of information for accessing this information by RECON users is available upon request from RSIC. For those persons not having access to ERDA/RECON, a search on demand service will continue to be available. Requests for this service should be precisely worded (keywords, key phrases, etc.) so that the request may be routinely handled. A mailing of the RECON package of information, giving the list of subject category codes and keywords, will be made to those who request it, as the information will also be helpful in the preparation of requests. A general statement of the search question, followed by suggested subject category codes or keywords/key phrases will allow us to zero in to your specialized interests, and will expedite the process of filling your request.

Requests for information concerning the use of the ERDA/RECON system and the Search-on-Demand (SOD) service should be sent, preferably in writing, to the Radiation Shielding Information Center (RSIC), Oak Ridge National Laboratory (ORNL), Oak Ridge, TN 37830. A special form for this purpose is attached as the last page. Please detach and circle the desired form of output. RSIC staff member, Ms. Jane Gurney, coordinates these services.

### CONTINUING REPORT ON USER SURVEY OF RSIC

We continue to sift the data from the User Evaluation of RSIC's Products and Services into a meaningful pattern for making improvements now, and for planning for the future. The RSIC user community represents a wide spectrum of the world-wide scientific community: national laboratories, governmental agencies and their contractors, the nuclear power industry, universities, the private sector, and foreign installations. More than 1600 persons on the RSIC distribution were queried, with an 88% response. Many of those queried elected to give a combined response with their colleagues within a given installation

with the result that only 823 questionnaire results are in the sampling analyzed. No weighting was given to the combined responses as against that of individuals. The responses were overwhelmingly positive with many improvements suggested. In those cases where adverse criticism was given, the respondent invariably found excuses for RSIC's failure to perform well. We appreciate the sentiment.

Respondents rated only the RSIC products and services which they actually used. The following table shows the ranking of the products and services in the order of greatest number of responses received and largest number of highest rating received.

| A<br>Drawing<br>Most Response | NO. | B<br>Rated Highest<br>in Response | C<br>Ranking of Usage<br>Expressed in $ Savings |
|---|---|---|---|
| Newsletter | 1 | Staff Advice | Codes |
| RSIC Reports | 2 | Codes tied with Data | Data |
| Staff Advice | 3 | Data tied with Codes | Staff Advice |
| Codes | 4 | RSIC Reports | RSIC Reports |
| Data | 5 | SDI | Newsletter |
| SDI | 6 | Newsletter | SDI |

A check of the foreign respondents indicates that their responses followed the same pattern of A and B through No. 4. They reversed the orders of 5 and 6, in each instance, with more responses for SDI than Data and higher rating for Newsletter than for SDI. In statements of $ Savings, they agreed with above ranking (C) in numbers 1, 2, 5, and 6 and reversed 3 and 4. Not finding RSIC staff members easily accessible, they realized greater savings from access to the RSIC reports.

The July newsletter will continue the report, covering your further assessment of the products and services of your center.

## EXCLUSIVE CLUB MEMBERS!

The May 1977 newsletter item on the Fifth International Conference on Reactor Shielding cited the names of three people as having attended all five conferences: Pierre La Fore (France), John Butler (UK), Charles Clifford (USA). The question was asked, "Are there other members of this select group?" Herbert Goldstein of Columbia University (NYC, USA) has reported that he also was there: (1) Cambridge, England, (2) Studsvik, Sweden, (3) Harwell (Oxford), England, (4) Paris, France and (5) Knoxville, USA.

## OECD NEA HAS NEW DIRECTOR GENERAL

Emile van Lennep, Secretary-General of the Organisation for Economic Co-operation and Development (OECD), has announced the appointment of Ian Williams as Director General of the OECD Nuclear Energy Agency (NEA) in succession to Einar Saeland, who is retiring. Williams, Deputy Director General of the Agency since 1966, took over on 1st May, 1977.

Ian Williams was born at Portsmouth (United Kingdom) in 1921, is married with one daughter. He graduated as B.Sc. (Econ.) in 1951. After administrative service in various U.K. Government Departments, he joined the U.K. Atomic Energy Authority in 1955 and participated in the organization reviews after the October 1957–Windscale accident. In January 1958 he formed a new Health and Safety Branch in the Authority's London Office which later was merged as the Administrative Division into the Authority Health and Safety Branch. As Division Head, Williams was responsible for external relations on health and safety matters, with a particular interest in the international aspects. He was appointed Deputy Director General of the European Nuclear Energy Agency (ENEA) in 1966. ENEA was renamed the OECD Nuclear Energy Agency following the accession to full membership of Japan (1972), Australia (1973), Canada (1975) and Finland and the United States (1976).

## OECD NEA CONSIDERS MERGING CENTERS

Following extended discussions, the OECD NEA Steering Committee for Nuclear Energy approved a proposal for amalgamation at Saclay, France of the Neutron Data Compilation Centre now located at Saclay and the Computer Program Library presently located at Ispra (Varese), Italy. It is expected that the resulting center will be named the NEA Data Bank and that Johnny Rosen will be its first director while continuing as head of the NEA Nuclear Science Division.

The actual merger of the two centers must await consideration and approval by other NEA deliberative bodies and the completion of practical studies now underway.

## NEW PLAN INTENDED TO IMPROVE ANSI NUCLEAR PROGRAM

The American National Standards Institute (ANSI) is once again attempting to make its nuclear standards-writing program more effective and more responsive to the needs of the nuclear community. Rather than accepting one plan that would have added $100,000 to the nuclear standards budget and would have increased staffing, the ANSI board of directors at its March 31 meeting called for more "hard, objective data" before acting. The board directed ANSI president John Landis to appoint an independent group to audit the nuclear standards program, investigate four specific points, and report back within 30 days. The four points are: to establish a priority list of nuclear standards; to evaluate the performances of the organizations responsible for production of nuclear standards; to determine whether additional staff is needed; and to determine the budget necessary for carrying out an improved nuclear program.

## NRC REGULATORY GUIDE NOTED

The Nuclear Regulatory Commission has issued the following:

8.8 (Rev. 2), "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable." (May 13).

Regulatory guides are available from Director, Office of Standards Development, NRC. Comments should be sent to the Secretary of the Commission, USNRC, Washington, D.C. 20555. Attn.: Docketing and Service Section.

## ICRU REPORT ON NEUTRON DOSIMETRY

The publication of a new report on neutron dosimetry has been announced by the International Commission on Radiation Units and Measurements (ICRU). The report is ICRU Report 26, *Neutron Dosimetry for Biology and Medicine*. The document treats the currently available methods for determining absorbed dose and kerma of fast neutrons employed for radiobiological and medical application. The objective of neutron absorbed dose determinations is to describe the energy deposition in irradiated material in such detail that workers in biology and medicine may make unambiguous correlations with observed responses, or predictions of responses, of irradiated biological systems. This implies that the selection of methods employed for this dosimetry, and of the numerical data to be registered, will depend to a large extent on the object irradiated and on the end point observed. The new report is intended to give guidance in connection with the selection of an appropriate dosimetric method.

ICRU Report 26 is intended to cover the field of neutron dosimetry in biology and medicine in a comprehensive way. Basic concepts and definitions employed in neutron dosimetry are summarized, as are the principles of the experimental techniques employed. It includes descriptions of methods and instrumentation; and characteristics of instruments with reference to random and systematic uncertainties; energy dependence and sensitivity to gamma radiation. Appropriate techniques for monitoring the radiation conditions during dosimetry measurements or irradiations of biological objects are described. The report also treats specific features of different neutron sources and specific problems of neutron dosimetry in radiobiology and radiotherapy. Appendices to the new report provide quantitative information on mass energy transfer coefficients and atomic compositions of compounds and mixtures which is essential for the interpretation of measurements with specific dosimetry systems. Appended also is detailed information on two types of dosimetry systems: ionization chambers and activation and fission detectors. Other appendices give information on properties and fabrication techniques for tissue-equivalent plastics, ionization chamber construction and measurements, and cross-section data for selected threshold reactions.

In scope, the report has not been confined to a specific neutron energy range. The clinical use of neutrons generated

with accelerators implies that dosimetry may have to be carried out for neutron energies up to and beyond 50 MeV. It directs attention to dosimetry of the intermediate and thermal neutrons which accompany fast neutrons in extended media. Since the use of primary beams of thermal and intermediate neutrons for biology and medicine is limited, the dosimetry for neutrons with energies below 10 keV is reviewed only briefly.

Copies of ICRU Report 26 can be purchased at the following prices: 1 – 9, $7.50 each; 10 – 99, $7.00 each; 100 or more copies, $6.50 each. Individuals and organizations already on the ICRU Publications Standing Order List will receive copies of the new report automatically and be invoiced for their order. Others may purchase copies of the new report or place their name on the Standing Order List by directing their order to ICRU Publications, P. O. Box 30165, Washington, D.C., 20014, U.S.A.

## NEW NCRP REPORTS AVAILABLE

The publication of three new reports has been announced by the National Council on Radiation Protection and Measurements (NCRP): NCRP Report No. 51, *Radiation Protection Design Guidelines for 0.1-100 MeV Particle Accelerator Facilities;* NCRP Report No. 52, *Cesium-137 from the Environment to Man: Metabolism and Dose;* and NCRP Report No. 53, *Review of NCRP Radiation Dose Limit for Embryo and Fetus in Occupationally Exposed Women.*

NCRP Report No. 51 is intended to serve as a guide to good practice in radiation protection for all types of particle accelerators, taking into full consideration their broad application in research, medicine, and industry. It presents recommendations and guidelines for many accelerator designs, performance ratings, and applications. Included are recommendations concerning structural shielding and details of accelerator facility design as they pertain to radiation protection. The report is directed mainly to designers of accelerator facilities and is written from an engineering point of view. It is believed, however, that health and radiological physicists, research scientists, project engineers, technical administrators, and similar specialists also will find the information provided in the report useful.

NCRP Report No. 52 resulted from an examination of all phases of cesium-137 distribution, from its entrance into the food chain to its elimination from the human body. Metabolism and subsequent dose to man from exposure to the radiation from cesium-137 are of interest principally because the radionuclide is one of the long-lived fission products which may be readily metabolized by the human body. It outlines the environmental deposition of cesium-137 as fallout from atmospheric nuclear testing with the intent that information could be drawn from this experience that might be helpful in assessing the relative importance of various food chain pathways. The report explores the dosimetry rather fully to give not only an average dose to the total body, but also some idea of the departures from the average that might be expected. Maximum permissible concentrations or, equivalently, maximum permissible annual intakes of cesium-137 are derived for occupational exposure to soluble compounds.

Since the NCRP issued its dose limit for fetal irradiation in 1971 (NCRP Report No. 39), a number of reports have been published dealing with assessment of the teratogenic and carcinogenic effects of irradiation of the embryo and fetus. Also, various governmental agencies have been concerned with the possible need to consider more restrictive radiation protection guides for potentially pregnant female radiation workers, based on the NCRP's recommended dose limit to the fetus (0.5 rem during the entire gestation period) which is lower than that for occupationally exposed persons. As a result, the NCRP determined to (1) review the basis of the current dose limit to the fetus, (2) review the recently published reports pertinent to this question, and (3) decide whether the recent information warrants any change in the numerical dose limit. **NCRP Report No. 53** is the result of this study. In addition to the conclusions and recommendations, it includes a review of the historical background of the ICRP and NCRP dose limits and an evaluation of the status of our knowledge of teratogenic effects of embryonic and fetal irradiation, and the carcinogenic effects of prenatal irradiation. The basis for the Council's decision to make no change in the current recommendation of its dose limit to the unborn is set out fully in the new report.

Copies of the new reports can be purchased at the following prices: **NCRP Report No. 51,** *Radiation Protection Design Guidelines for 0.1-100 MeV Particle Accelerator Facilities,* 1 – 99, $5.00 each, 100 – 999, $4.75 each, and 1,000 or more copies, $4.50 each; **NCRP Report No. 52,** *Cesium-137 from the Environment to Man: Metabolism and Dose,*, 1 – 99, $3.00 each, 100 – 999, $2.75 each, and 1,000 or more copies, $2.50 each; **NCRP Report No. 53,** *Review of NCRP Radiation Dose Limit for Embryo and Fetus in Occupationally Exposed Women,* 1 – 99, $3.50 each, 100 – 999, $3.25 each, 1,000 or more copies, $3.00 each. Individuals and organizations already on the NCRP Standing Order List will receive copies of the new reports automatically and be invoiced for their order. Others may purchase copies of the new reports or place their names on the Standing Order List by directing their order to: NCRP Publications, P. O. Box 30175, Washington, D.C. 20014.

## NAME CHANGE FOR NSRDS NEWS

The format and name of *NSRDS News* have been changed to make the newly formatted newsletter

more effective as a communication medium of the National Standard Reference Data System and the NBS Office of Standard Reference Data. The name of the newsletter is now *Reference Data Report*. The contents will include short articles, guest editorials, OSRD activities, as well as news items and announcements of new publications.

Any comments on the new format, or suggestions for further improvements, may be addressed to: S. P. Fivozinsky, Special Assistant for Technical Liaison, Office of Standard Reference Data, National Bureau of Standards, Washington, D.C. 20234.

## ADVANCES IN COMBINATORIAL GEOMETRY

Combinatorial Geometry (CG), invented by Mathematical Applications Group, Inc. (MAGI), has been widely distributed and used in many different applications. It has been incorporated into several complex shielding codes packaged in RSIC. Advances continue to be made and MAGI has announced developments which have greatly increased its capabilities and convenience of use.

(1) The library of basic geometric bodies has been expanded from 10 to 21. The set now includes all possible planar and second degree surface bodies (some of which are non-convex) satisfying a need described on p. 59 of the "Survey of Radiation Protection, etc." (EPRI NP-155), prepared by RSIC. In addition, two kinds of elliptical torus are included.

(2) Region descriptions have been simplified by allowing a region to be described by combinations of bodies (as in prior GG versions) and previously described regions.

(3) Input simplifications for the description of piping systems have been added.

(4) A partially completed geometry pre-processor provides for the automatic checking of undefined and multiply defined regions of space.

(5) Many of the ray-tracing routines have been rewritten to reduce machine round-off (i.e., precision) problems; particularly important for IBM and DEC computers. In addition, it was found that Ferrari's (classical) method for the solution of the quartic equation (needed for the torus) had such severe precision problems as to render it useless. A Newton's method approach proved much better, and somewhat faster.

(6) Complex Combinatorial Geometry has been developed wherein a complex configuration, described in normal CG, can be made into a component of an overall lattice (described by Herbert A. Steinberg at the June 1976 ANS meeting). This lattice, itself, may be a component of a more complex lattice - a capability which exists up to a seven-fold hierarchy. At all levels, any number of "exception" sites may be entered into the lattice. This capability can be used, for example, to model realistically reactor cores with water holes, control rods, etc.

(7) Actual color photographs can be made of any CG configuration including shading and, as an option, shadowing.

Questions about these new capabilities, some of which are company proprietary, should be addressed to MAGI directly (914-592-4646); technical questions to Herbert Steinberg or Martin O. Cohen, acquisition questions to Leon Malin.

A non-proprietary version is being readied for dissemination by RSIC.

## NEW UPDATE TO SAM-CE EXPECTED

MAGI has announced a new version (Revision 5) in its series of SAM-CE codes. The new SAM-CE is designed for primary neutrons and gamma rays, as well as for secondary gamma rays and electrons. Revision 5 is said to be available in IBM, CDC and DEC versions.

Like MORSE, SAM-CE was selected several years ago for continuing support by an agency of the Department of Defense from the list of Monte Carlo radiation codes. Unlike MORSE, SAM-CE uses (ENDF/B-derived) point energy cross sections, with each nuclide being specified in its own unique and appropriate energy mesh. In addition, SAM-CE has a continuum of allowed scattering angles so that the well-known "ray effect problem" does not exist for SAM-CE. Revision 5 includes the latest version of

MAGI's Combinatorial Geometry and the ability to score at volume, special small volume and point detectors. In the latter estimation, a technique reported at the June 1976 ANS meeting, the estimator itself is bounded (and thus the variance as well). A recent development is the inclusion of *a priori* angle biasing in the scattering mechanics, which is particularly well suited for neutron streaming problems (another requirement mentioned in EPRI NP-155).

Plans are being made to update the CCC-187/SAM-CE code package in RSIC. An announcement of the completed update will appear in the newsletter. In the meantime, further information concerning Revision 5 may be secured from the code developers.

## CHANGES IN THE COMPUTER CODE COLLECTION

The following changes were made in the computer code collection during the month:

### CCC-254/ANISN

The multigroup one-dimensional discrete ordinates transport - anisotropic scattering - code package was updated to include a UNIVAC 1108 version (B) converted by the Nuclear Assurance Corporation, Atlanta, Georgia and contributed to the RSIC collection. This version includes all the provisions of the ORNL-developed IBM 360 version (A).

### CCC-161/NMTC and CCC-178/HETC

NMTA, the data analyzer which is used by CCC-161B/NMTC and CCC-178B/HETC was updated to correct an error called to RSIC attention by Luis Garcia de Viedma, OECD NEA CPL, and Tony Gabriel, Oak Ridge National Laboratory. Both code packages now reflect the changes made. Current users may secure details of the update from RSIC. Both code packages were contributed to the RSIC collection by the Oak Ridge National Laboratory.

### CCC-285/PEPIN

The fission product activity code package was updated to make corrections suggested by the code developer, C. Devillers, CEA/CEN, Saclay, France. Current users may update their working version by making these two changes in Subroutine SECEFF: (1) add DOUBLE PRECISION XNS, and (2) remove STOP at the end of the subroutine.

### CCC-293/TRIDENT

Both Version A (IBM) and Version B (CDC) of the two-dimensional multigroup discrete ordinates transport code package were updated to correct an error called to RSIC attention by Tom Seed and Forrest W. Brinkley, Jr. of the Los Alamos Scientific Laboratory. Current users may make the correction by inserting the following statement after statement number 360 in subroutine TESTS: T = T * T1. LASL contributed the code to the RSIC collection.

### CCC-299/REBEL 2

An adjoint Monte Carlo calculation of radiation in dwelling rooms was contributed by Central Research Institute of Physics, Budapest, Hungary. References: KFKI-76-57 and KFKI-76-65. FORTRAN; ICL 1905 computer.

### CCC-300/RADHEAT-V3

A modular code system which calculates neutron and gamma-ray transport and energy deposition in a nuclear reactor or shield was contributed by Japan Atomic Energy Research Institute (JAERI) through the OECD NEA Computer Program Library, Ispra, Italy. Reference: Informal, RADHEAT-V3. FORTRAN IV; IBM 370.

### PSR-3/ELIESE

A complete update was made to the code package with the latest version of the generator of cross sections for elastic and inelastic scattering of neutrons, protons, and alpha particles, contributed by Japan Atomic Energy Research Institute (JAERI) through the OECD NEA Computer Programme Library, Ispra (Varese), Italy. ELIESE was originally packaged by RSIC in 1969. The new package reflects JAERI interim developments, obsoleting all the original technology. The new version is reported in Reference: JAERI-1224. FORTRAN IV; IBM 370.

### PSR-63/AMPX

The code package containing the modular code system for generating coupled multigroup neutron-gamma-ray data libraries from ENDF/B was updated to include a new hardware version (UNIVAC 1108) contributed by Nuclear Assurance Corporation, Atlanta, Georgia. The UNIVAC version may be requested as PSR-63 D.

## CHANGES TO THE DATA LIBRARY COLLECTION

The following changes have been made to the data collection during May.

### DLC-45/SENPRO

The 126 Group Compilation of Sensitivity Profiles for Several Fast Reactor Benchmarks was contributed by the Oak Ridge National Laboratory. Reference: ORNL-5262 and Retrieval Code Users Manual now in publication.

## RPI OFFERS SUMMER NUCLEAR STUDIES

The Office of Continuing Studies, Rensselaer Polytechnic Institute, has announced its 1977 summer programs in Nuclear Reactor Design and Basic Nuclear Technology. The program is intended primarily for nuclear industry and utility power company engineers and managerial and technical staff personnel as well as educators desiring a review of the background material and the methods and procedures involved in the analysis and design of current nuclear power reactor systems. It will also be useful to the practicing engineer interested in improving his background in nuclear technology, reactor design or computer applications. A number of important topics in reactor engineering and design will be covered in depth, starting from the fundamentals of nuclear reactor technology to the state-of-art techniques and methods used in the integrated design analysis and evaluation of nuclear power plants, including computational approaches and methods, safety and fuel management. Computer programs and reactor design code packages typical of those in current use in the nuclear industry will be discussed and their operation demonstrated on the IBM 360/67 computer at RPI.

No special preparation in nuclear science is required for the course, although it would be helpful for the participants to have enough background in other technical areas to be able to follow the lectures in these courses. The Course fee is $375/week or $1,000 for the three week program. Registration material and other information may be secured from the office at RPI, Troy, N.Y. 12181, telephone 518/270–6442.

The overall program will comprise three separate, self-contained one-week course modules, organized and structured in a manner so as to permit adequate flexibility and optimum usefulness. Any one course module can be taken separately and independently — or all three sequentially.

The first week (July 11–15) will cover Basic Nuclear Reactor Technology: Reactor Physics & Engineering Fundamentals; Nuclear Power Systems; Reactor Types; Nuclear Energy Conversion and Heat Transport; Systems Analysis of Nuclear Power Plants; Safety, Controls and Nuclear Operations; Use and Operation of the Rensselaer Reactor; and Miscellaneous Topics.

The second week (July 18–22) will cover Nuclear Reactor Design: Design Considerations: Approaches and Methods; Nuclear Design; Thermal-Hydraulic Design; LWR Safety and Related Design Requirements; Nuclear Power Quality Assurance; Fuel Management; and Nuclear Power & Electric Utility Economics.

The third week (July 25–29) will cover Computer Applications and Reactor Design Codes: Fundamentals of Computing and Numerical Methods for Nuclear Engineering Applications; Programming Reactor Problems for Digital Computers; Computer Programs — Reactor Statics, Thermal Hydraulics, Fuel Management, Reactor System Dynamics, etc.; and Information Flow among Computer Programs.

## MEET ON LOW TEMPERATURE NUCLEAR HEAT

The Finnish Nuclear Society, the European Nuclear Society and the American Nuclear Society are organizing an international Topical Meeting on Low Temperature Nuclear Heat to be held August 21–24, 1977 in Otaniemi (near Helsinki), Finland. The 52 papers from twelve countries in Europe and North

America will give a good overview on today's situation and on the plans for the near future.

The Topical Meeting is arranged to promote the progress in applying nuclear energy for heat production in the low temperature (under about 300° C) range. This sector of energy consumption, which throughout the world possesses a big share of the final energy utilization, offers diversified possibilities to utilize nuclear energy in order to decrease our strong dependence on oil and coal. During the last few years the need for such nuclear applications has been recognized not only in most industrial countries but also in several developing countries.

The papers to be presented at the Topical Meeting will deal with various aspects of applying either large dual-purpose, power and heat supplying nuclear plants or small single-purpose, heat producing nuclear plants for district heating, process industry, desalination, agriculture and oil refineries. The focus is directed on those applications, which can be realized in the near future on the basis of available proven reactor technology. The papers will represent the viewpoints of heat producers, power companies, reactor manufacturers, energy administration authorities and research institutes.

Additional information may be secured from Risto Tarjanne, LTNH Program Chairman, Technical Research Centre of Finland, Nuclear Engineering Laboratory, Lonnrotinkatu 37, SF–00180 Helsinki 18, Finland.

## UPCOMING CONFERENCES

*July 12–15, 1977 – IEEE Annual Conference on Nuclear and Space Radiation Effects,* Williamsburg, VA; Conference Chairman: Harold Hughes, Naval Research Laboratory, Washington, D.C.; Local Arrangements Chairman: Mayrant Simons, Research Triangle Institute, Research Triangle, Park, N.C.

*August 15–19, 1977 – 4th International Conference on Structural Mechanics in Reactor Technology,* San Francisco, CA; Organization Chairman: Harvey F. Brush, Bechtel Power Corp., San Francisco, CA.

## VISITORS TO RSIC

The following persons came for an orientation visit and/or to use RSIC facilities during the month of May:

S. Robert Bernard, Health Physics Division, ORNL, Oak Ridge, Tennessee; Peter Bright, UCLA, Los Angeles, California; David L. Chapin, Westinghouse Corporation, Pittsburgh, Pennsylvania; L. Goldstein, S. M. Stoller Corporation, New York, New York; Edith Halbert, Physics Division, ORNL, Oak Ridge, Tennessee; R. E. Miles, Nuclear Science Center, LSU, Baton Rouge, Louisiana; Jerry Robinson, University of Tennessee, Knoxville, Tennessee.

## MAY 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.*

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

AE-509
Fast Reactor Blanket Experiments in FRO.
Anderson, T.L.; Haakansson, R.; Richmond, R.; Stevens, P.
May 1976
NTIS (U.S. Sales Only)

AECL-5180
Model for Estimating Flux Distributions in a (Thorium Fueled) Thermal Reactor.
Milgram, M.
January 1976
Atomic Energy of Canada Ltd., Chalk River, Ontario

AECL-5388
Reducing Radiation Exposure in CANDU Power Plants.
Legg, G.G.
January 1976
Atomic Energy of Canada Ltd., Chalk River, Ontario

AED-Conf-75-769-008; CONF-7509129-44
Radiation Protection Standards and Their Application.
Beninson, D.
1975
NTIS (U.S. Sales Only)

AEEW-R-1043
Radial Boundary Condition Using Two-Group Albedos.
Gibson, I.H.
January 1976
NTIS (U.S. Sales Only)

AERE-R-8164
Review of Available Data on the Release, Transport and Deposition of Corrosion Products in PWR, BWR and SGHWR Systems.
Taylor, N.K.
March 1976
ERDA, TIC, P.O. Box 62, Oak Ridge, Tenn. 37830

AFWL-TR-75-299
Application of Space-Angle Synthesis to Two-Dimensional Neutral-Particle Transport Problems of Weapon Physics - Final Report.
Roberds, R.M.
January 1976
NTIS

ANL-76-36
Experimental Study of the Neutronics of the First Gas Cooled Fast Reactor Benchmark Assembly (GCFR Phase I Assembly).
Bhattacharyya, S.K.
December 1976
Dep., NTIS $7.75

ANL/FPP/TM-74
Argonne National Laboratory Papers Presented at Second ANS Topical Meeting on the Technology of Controlled Nuclear Fusion.
Fusion Power Program, Argonne National Laboratory
November 1, 1976
NTIS

ANL/NDM-25
Determination of the Energy Scale for Neutron Cross Section Measurements Employing a Monoenergetic Accelerator.
Meadows, J.W.
January 1977
Dep., NTIS $4.00

ANS-19.1, ANSI N411-1975
Nuclear Data Sets for Reactor Design Calculations.
Dannels, R.A.(Chairman)
1975
American Nuclear Society, 244 East Ogden Avenue, Hinsdale, Illinois 60521

BARC-861
A Proposed Secondary Standard for Neutron Source Calibration.
Kamboj, B.K.; Shahani, M.G.; Phadnis, U.V.; Sharma, D.
1976
Bhabha Atomic Research Centre, Bombay, India

BMVg-FBWT-74-12 (In German)
Scalar Radiation Field of a Neutron-Source in Liquid Nitrogen.
Broecker, B.; Clausen, K.; Johnsen, P.; Schneider-Kuehnle, P.; Weinert, M.
1974
ZAED

BNWL-2019
Management of Nontritium Radioactive Wastes from Fusion Power Plants.
Kaser, J.D.; Postma, A.K.; Bradley, D.J.
September 1976
Dep., NTIS $4.50

BRL-MR-2738
Displacement Damage in Silicon Irradiated with 6- to 10-MeV Neutrons.
Youngblood, J.E.; Van Antwerp, W.R.; Tapphorn, R.M.
April 1977
NTIS

CEA-CONF-3132 (In French)
Damage Function Development and Application.
Genthon, J.P.; Lott, M.; Wright, S.B.
September 1975
INIS

CLM-R-151
Structural Design of Demountable Blanket Elements and Shield for a Fusion Reactor.
Carruthers, H.M.
1976
ERDA, TIC, P.O. Box 62, Oak Ridge, Tenn. 37830

CLM-R-152
Review of Irradiation Creep and Swelling in a Fusion Reactor Blanket Cell Structure.
Stanbridge, J.R.; Shotter, H.A.
1976
ERDA, TIC, P.O. Box 62, Oak Ridge, Tenn. 37830

CONF-741040-P1, pp.253-258
Atomic and Nuclear Cross Section Needs for the Controlled Thermonuclear Research Program.
Barnett, C.F.
Proceedings of the Third Conference on Application of Small Accelerators. Volume I. The Use of Small Accelerators in Research and Teaching.
1974
North Texas State University, Denton, Texas

CONF-741040-P1, pp.259-269
Radiation Damage Studies with Accelerators.
Saltmarsh, M.J.
1974
North Texas State University, Denton, Texas

CONF-760202-5
Health Physics Aspects of Activation Products from Fusion Reactors.
Shoup, R.L.; Poston, J.W.; Easterly, C.E.; Jacobs, D.G.
1975
NTIS

CONF-760202-9
Occupational Health Physics at a Fusion Reactor.
Shank, K.E.; Easterly, C.E.; Shoup, R.L.
1975
NTIS

CONF-760539, pp.51-54
Application of State-of-the-Art Monte Carlo Methods to Gamma-Ray (and Electron) Sources and Detectors.
Vagelatos, N.; Lurie, N.A.; Wondra, J.P.
May 1976
NTIS

CONF-761146-1
Damage Energy and Displacement Cross Sections: Survey and Sensitivity.
Doran, D.G.; Parking, D.M.; Robinson, M.T.
October 1976
NTIS

COO-2490-5
Differential Elastic Cross Sections of Neutrons Scattered from $10_B$ for $E_n$ from 4 MeV to 8 MeV.
Knox, H.D.; White, R.M.; Lane, R.O.
March 1977
Ohio University, Athens, Ohio 45701

DP-1447
Evaluation of Neutron Cross Sections for $^{244}$Cm, $^{246}$Cm, and 248-Cm.
Benjamin, R.W.; McCrosson, F.J.; Gettys, W.E.
January 1977
NTIS

ERDA 77-36
Second Workshop on Conceptual Design Studies of Experimental Power Reactor-1.
Murphy, M.(Ed.)
March 1977
NTIS $4.50

GA-A-14,080
EXTENDCHAIN: A Package of Computer Programs for Calculating the Buildup of Heavy Metals, Fission Products and Activation Products in Reactor Fuel Elements.
Robertson, M.W.
January 1977
NTIS

GA-A-14,211
Gas-Cooled Fast Breeder Reactor Shielding Benchmark Calculation.
Rouse, C.A.; Mathews, D.R.; Koch, P.K.
January 1977
NTIS

GEAP-14,144 (AT)
Inhalation Dose Conversion Factors for Various Radionuclides Associated with Liquid Metal Fast Breeder Reactors (LMFBR Program).
Teresi, J.D.; Boudreau, F.C.
September 1976
ERDA, TIC, P.O. Box 62, Oak Ridge, Tenn. 37830

IFA-DNBR-15-1975 (In Romanian)
Optical Model Neutron Cross Sections Calculations for $Cu^{63}$, $Cu^{65}$ and Natural Cu in the Energy Range 1-15 MeV.
Iliescu, N.
1974
INIS

INDC(NDS)-83/LN
Compilations and Evaluations of Nuclear Structure and Decay Data. Issue No.2.
Lorenze, A.(Comp.)
March 1977
IAEA Nuclear Data Section, Karntner Ring 11, A-1010 Vienna

IS-4052
Table of Fission Product Nuclides: Yields, Single Particle Model States, Observed Spins and Parities, Decay Modes and Half-Lives for Products of Thermal Neutron Fission of $^{235}U$.
Voigt, A.F.
December 1976
Dep., NTIS $4.00

JAERI-M-5984, pp.83-102
Some Remarks on the Use of Nuclear Models in the Evaluation Work.
Benzi, V.; Fabbri, F.; Reffo, G.
February 1975
INIS

JAERI-M-6072 (In Japanese)
Neutronic Calculation on Fusion Reactor Blanket by $S_n$ Approximation.
Maekawa, H.; Moriyama, M.
March 1975
INIS

JAERI-M-6928
Multi-Group Cross Section Sets for Shield Materials - 100 Neutron Groups and 20 Gamma-Ray Groups in $P_5$ Approximation.
Koyama, K.; Okumura, Y.; Furuta, K.; Miyasaka, S.
January 1977
Division of Technical Information, Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki-ken, Japan

JINR-R-11-8145 (In Russian)
Fast Method for Generating the Random Sequence with Poisson Distribution.
Ososkov, G.A.
1974
NTIS (U.S. Sales Only)

LA-6684-MS
Approximations to Summation Calculations of Delayed Energy and Spectra from Fission Products.
LaBauve, R.J.; England, T.R.; Stamatelatos, M.G.; George, D.C.
January 1977
Dep., NTIS $3.50

LA-NUREG-6622-MS
Multigroup Beta and Gamma Spectra of Individual ENDF/B-IV Fission-Product Nuclides.
England, T.R.; Stamatelatos, M.G.
November 1976
Dep., NTIS $7.50

LA-NUREG-6685-MS
Methods for Calculating Group Cross Sections for Doubly Heterogeneous Thermal Reactor Systems.
Stamatelatos, M.G.; LaBauve, R.J.
January 1977
Dep., NTIS $4.50

NASA-TN-D-8319
Design, Fabrication, and Structural Testing of a Light-Weight Shadow Shield for Deep-Space Application.
Miao, D.; Barber, J.R.; DeWitt, R.L.
March 1977
NTIS

ORNL-5188
Distribution of Radionuclides in the Peach Bottom HTGR Primary Circuit During Core 2 Operation.
Dyer, F.F.; Wichner, R.P.; Martin, W.J.; de Nordwall, H.J.
March 1977
NTIS $7.50

ORNL-5262; ENDF-234
Compilation of Sensitivity Profiles for Several CSEWG Fast Reactor Benchmarks.
Marable, J.H.; Lucius, J.L.; Weisbin, C.R.
March 1977
ERDA, TIC, P.O. Box 62, Oak Ridge, Tenn. 37830

ORNL-5263
CUMEX - A Cumulative Hazard Index for Assessing Limiting Exposures to Environmental Pollutants.
Walsh, P.J.; Killough, G.G.; Parzyck, D.C.; Rohwer, P.S.; Rupp, E.M.; Whitfield, B.L.; Booth, R.S.; Raridon, R.J.
April 1977
NTIS $5.00

ORNL/TM-5675
Secondary Gamma Ray Production in Iron and Natural Thorium from Californium Fission Spectrum Neutrons.
Makarious, A.S.
March 1977
Dep., NTIS $4.00

ORNL/TM-5813
ORNL Fusion Power Demonstration Study: Interim Report.
Steiner, D.; Bettis, E.S.; Huxford, T.J.; McAfee, W.J.; McCoy, H.E.; Mense, A.T.; Reid, R.L.; Scott, J.L.; Shannon, T.E.; Stoddart, W.C.T.; Watts, H.L.; Wells, W.M.; Werner, R.W.; Wiffen, F.W.
March 1977
NTIS $5.50

ORNL/TM-5815
Sensitivity Theory for General Non-Linear Algebraic Equations with Constraints.
Oblow, E.M.
April 1977
NTIS $4.00

ORNL/TM-5874
Monte Carlo Analysis of the Effects of a Blanket-Shield Penetration on the Performance of a Tokamak Fusion Reactor.
Santoro, R.T.; Tang, J.S.; Alsmiller, R.G.,Jr.; Barnes, J.M.
May 1977
NTIS $4.00

ORNL-tr-4333; INR 1563/IX/PR/B (In Polish)
Effect of Density Deviations of Concrete on Its Attenuation Efficiency.
Szymendera, L.; Wincel, K.; Blociszewski, S.; Kordyasz, D.; Sobolewska, I.
1975
NTIS

PPPL-1335
A Monte Carlo Algorithm for Calculating Neutral Gas Transport in Plasmas.
Hughes, M.H.; Post, D.E.
March 1977
NTIS

SAND-76-0254
Neutron Activation Analysis: Tabulation of Cross Sections, Q-Values, Decay Characteristics and Sensitivities.
Kenna, B.T.; Harrison, P.E.
July 1976
NTIS

SLAC-PUB-1804
Challenge of High Energy Radiation Dosimetry and Protection.
Nelson, W.R.; Jenkins, T.M.
August 1976
Dep., NTIS $3.50

TC-795
An Evaluation of the Target-Blanket Assembly of the Accelerator-Breeder System.
Schenter, R.E.; Mann, F.M.
February 1977
NTIS

TC-796
Application of Least-Squares Method to Decay Heat Evaluation.
Schmittroth, F.; Schenter, R.E.
1977
NTIS

UCRL-50400, Vol.17, Part A
Program LINEAR (Version 77-1): Linearize Data in the Evaluated Nuclear Data File/Version B (ENDF/B) Format.
Cullen, D.E.
January 12, 1977
NTIS

UCRL-50400, Vol.17, Part B
Program SIGMA1 (Version 77-1): Doppler Broaden Evaluated Cross Sections in the Evaluated Nuclear Data File/Version B (ENDF/B) Format.
Cullen, D.E.
January 12, 1977
NTIS

UWFDM-178; CONF-760935-P4, pp.1303-1318
Radioactivity and Associated Problems in Thermonuclear Reactors.
Vogelsang, W.F.
September 1976
Fusion Technology Program, Nuclear Engineering Depart., University of Wisconsin, Madison, Wisconsin

UWFDM-193
Comparative One - Dimensional Monte Carlo and Discrete Ordinates Neutronics and Photonics Analysis for a Laser Fusion Reactor Blanket with $Li_20$ Particles as Coolant and Breeder.
Ragheb, M.M.H.; Cheng, E.T.; Conn, R.W.
January 1977
Fusion Technology Program, Nuclear Engineering Depart., University of Wisconsin, Madison, Wisconsin

WIS-76/4-Ph
Angular Distributions of Specific Gamma Rays Emitted in the De-Excitation of Prompt Fission Products of $^{252}Cf$.
Wolf, A.; Cheifets, E.
1976
ERDA, TIC, P.O. Box 62, Oak Ridge, Tenn. 37830

Atomic Energy Rev., 14(4), 681-717
Simple Gamma-Spectrometric Technique for Measuring Isotopic Abundances in Nuclear-Materials. (Review or Bibliog.)
Kull, L.A.; Ginaven, R.O.; Glancy, J.E.
1976

J. Math. Phys., 18(2), 281-284
Conservative Neutron-Transport Theory.
Bowden, R.L.; Cameron, W.L.; Zweifel, P.F.
1977

Jad. Energ., 22(2), 47-49
Approximate Analytical Formulas for Total Cross Sections and for Mass Attenuation Coefficients of Narrow Gamma Beams for 3 to 100 MeV.
Simane, C.
February 1976

Konkurito Kogaku, 13(3), 18-32 (In Japanese)
Study on the Placing Method of Heavy Weight Concrete for Shielding.
Shimizu, K.; Hattori, T.; Okumura, T.; Yamashiro, K.
March 1975

Mater. Eval., 31(2), 27-32
Thickness Gauging by Gamma Ray Attenuation.
Clayton, J.D.
1973

Nucl. Eng. Design, 41(1), 135-143
Numerical Investigations of Concrete Attenuation Effectiveness in Various PWR Shield Configurations.
Szymendera, L.; Blociszewski, S.; Wincel, K.; Kordyasz, D.; Sobolewska, I.
March 1977

Nuclear Fusion, 16(1), 175-182
Radiation Effects and Tritium Technology for Fusion Reactors.
Wiffen, F.W.; Watson, J.S.
1976

Nucl. Instrum. Methods, 121(3), 499-504
A 6 MeV Gamma Photon Facility.
Bishop, G.B.
November 1, 1974

Nucl. Instrum. Methods, 130(2), 551-553 (In French)
Simulation of the Incoherent Scattering of Gamma Rays by Electrons.
Pingot, O.
December 15, 1975

Nucl. Instrum. Methods, 131(2), 259-261
Simplification of the Water Bath Method for Calibrating a Ra-Be Neutron Source.
Fujishiro, M.; Tabata, T.; Furuta, J.
December 24, 1975

Nucl. Instrum. Methods, 131(2), 315-321
Radioactive Neutron Source Spectra from $^{9}$Be(alpha, n) Cross Section Data.
Geiger, K.W.; Zwan, L. van der
December 24, 1975

Nucl. Instrum. Methods, 135(2), 337-352
A Compilation of n-p and n-C Cross Sections and Their Use in a Monte Carlo Program to Calculate the Neutron Detection Efficiency in Plastic Scintillator in the Energy Range 1-300 MeV.
Guerra, A.D.
June 1, 1976

Nucl. Instrum. Methods, 135(2), 395-399
An Absolute Recoil-Proton Photoneutron Spectrometer Using a Monte Carlo Calculated Efficiency.
Devos, J.; Van De Vyver, R.; Van Camp, E.
June 1, 1976

Nucl. Safety, 17(3), 327-343
Neutron Irradiation Embrittlement of Reactor Pressure-Vessel Steels.
Steele, L.E.
May-June 1976

Nucl. Safety, 17(3), 351-361
Radiation Doses and Effects Estimated for Aquatic Biota Exposed to Radioactive Releases from LWR Fuel-Cycle Facilities.
Blaylock, B.G.; Witherspoon, J.P.
May-June 1976

Nucl. Safety, 18(2), 203-215
Radiological and Environmental Aspects of Fusion Power.
Easterly, C.E.; Shank, K.E.; Shoup, R.L.
March-April 1977

Nucl. Sci. Eng., 63(1), 9-23
Monte Carlo Treatment of Fundamental-Mode Neutron Leakage in the Presence of Voids.
Gelbard, E.M.; Lell, R.
May 1977

Nucl. Sci. Eng., 63(1), 48-54
Neutron and Gamma Radiation from a Nitrogen Sphere Surrounding a D-T Neutron Source.
Sidhu, G.S.; Farley, W.E.; Hensen, L.F.; Komoto, T.; Pohl, B.; Wong, C.
May 1977

Nucl. Sci. Eng., 63(1), 91-95
Selection of Angular Quadrature for Anisotropic Transport Computations. (Tech. Note)
Mikols, W.J.; Shultis, J.K.
May 1977

Nucl. Sci. Eng., 63(1), 95-96
On the Inverse Problem for Multigroup Neutron Transport Theory. (Tech. Note) .
Siewert, C.E.; Ozisik, M.N.; Yener, Y.
May 1977

Nucl. Sci. Eng., 63(1), 96-101
Rapid Method of Calculating the Fluence and Spectrum of Neutrons from a Critical Assembly and the Resulting Dose. (Tech. Note)
Bessis, J.
May 1977

Nucl. Technology, 33(3), 264-274
Nuclear Heating in a Control Element of a Gas-Cooled Fast Breeder Reactor.
Razani, A.; Yee, S.; Nagel, M.
May 1977

Nucl. Technology, 33(3), 296-304
New Methods for Measuring Neutron Spectra with Energy from 0.4 eV to 10 MeV by Track and Activation Detectors.
Doroshenko, J.J.; Kraitor, S.N.; Kuznetsova, T.V.; Kushnereva, K.K.; Leonov, E.S.
May 1977

Nucl. Technology, 33(3), 305-313
Dual Gauging Utilizing Penetrating and Scattered Photon Fluxes.
Elias, E.; Segal, Y.; Notea, A.
May 1977

Math. of Computation, 31(137), 214-225
Approximations for Hand Calculators Using Small Integer Coefficients.
Derenzo, S.E.
1977

Radiation Res., 70(1), 58-81
Photon Mass Attenuation and Mass Energy-Absorption Coefficients for H, C, N, O, Ar, and Seven Mixtures from 0.1 keV to 20 MeV.
Hubbell, J.H.
April 1977

Z. Angew. Math. Phys., 26(6), 701-711
Exact Solution of $P_n$ Time-Dependent Equations with Time-Dependent Cross-Sections for Slab Geometry.
Lemanska, M.
November 25, 1975

BOOK
THE FINITE ELEMENT METHOD IN PARTIAL DIFFERENTIAL EQUATIONS.
Mitchell, A.R.
1977
Wiley, London, New York

## COMPUTER CODES LITERATURE

AFWL-TR-76-313 ..... SMAUG; DLC-31
Nuclear Radiation Dose Comparisons of SMAUG to Air Transport Results Based on the DLC-31 Cross Sections.
Burgio, J.J.
Air Force Weapons Laboratory, Kirtland Air Force Base, New Mexico
February 1977

Am. Inst. Phys. Conf. Proc., 33, 84-85
..... PIPIT
PIPIT: A Momentum Space Optical Potential Code for Pions.
Eisenstein, R.A.; Tabakin, F.
Carnegie-Mellon University, Pittsburgh
1976

BRL-R-1966 ..... DIRICHLET HEAT-TRANSFER
Continuous Surface-Density Monte Carlo Solution to the Dirichlet Heat-Transfer Problem.
Banks, N.E.; Hoffman, T.J.
Ballistic Research Laboratory, Aberdeen Proving Ground, Maryland
March 1977

CENPD-188-A ..... HERMITE
HERMITE: A Multi-Dimensional Space-Time Kinetics Code for for PWR Transients.
Rohan, P.E.; Wagner, S.G.; Ritterbusch, S.E.
Combustion Engineering, Inc., Windsor, Connecticut
July 1976

FRA-TM-62(Suppl.1) ..... REBUS-2
IBM/360 Stand-Alone Version of REBUS-2: Supplement to FRA-TM-62.
Hosteny, R.P.; Olson, A.P.
Argonne National Laboratory, Illinois
1976
IBM 360
AVAIL: NTIS

IA-1325(Vol.1+2) ..... KEDAK
Calculation of Cross Sections for Heavy Isotopes.
Caner, M.
Israel AEC, Yavne, Soreq Nuclear Research Center
April 1976

INIS-mf-3552 ..... MEPHISTO
The Program MEPHISTO for Microscopic Calculations of (p,p′) Reactions, D4.
Blok, H.P.
Vrije Universiteit Amsterdam, Netherlands, Natuurkundig Lab.
October 1976

ITN-109 ..... NERO; PARETE
NERO - Sistem de Calcul de Celula de Reactori de Tip PHWR Si Parametri Eterogeni.
Cristian, I.; Cirstoiu, B.; Slavnicu, S.
Institutul Pentru Tehnologii Nucleare, Pitesti, Romania
April 1976

JAERI-1224 ..... ELEISE-3
Program ELEISE-3; Program for Calculation of the Nuclear Cross Sections by Using Local and Non-Local Optical Models and Statistical Model.
Igarasi, S.
Japan Atomic Energy Research Institute, Tokai-Mura, Naka-Gun, Ibaraki-Ken, Japan
December 1972

Nucl. Mater. Manage., 5(3), 226-238
..... SAFEGUARDS SYSTEMS
Approach to the Evaluation of Safeguards Systems Effectiveness.
Kendrick, H.; Lofgren, E.; Rundquist, D.; Fullwood, R.
Science Applications, Inc., La Jolla, California
1976

Nucl. Sci. and Tech., 13(3), 144-146
..... CYGNUS; O5R
Neutron Transport Benchmark Calculations, (II) CYGNUS and O5R Calculations.
Hirayama, H.; Nakamura, T.; Miyasaka, S.
Department of Nuclear Engineering, Kyoto University, Japan
March 1976

NUREG-75/057 ..... TOODEE2
TOODEE2: A Two Dimensional Time Dependent Fuel Element Thermal Analysis Program.
Nuclear Regulatory Commission, Washington, D.C., Office of Nuclear Reactor Regulation
June 1975
FORTRAN IV
AVAIL: NTIS

ORNL/RSIC-40, 33-39 ..... FORIST
FORIST Unfolding Code.
Johnson, R.H.; Wehring, B.W.
University of Illinois, Urbana, Illinois
October 1976

ORNL/RSIC-40, 79-82 ..... DANTE
Unfolding Code "DANTE" and its Applications.
Petilli, M.
CSN, Rome
October 1976

ORNL/RSIC-40, 119-128
..... SPECTRA; SAND II; CRYSTAL BALL
Results of Intercomparisons of Unfolding Codes for Neutron Spectra Evaluation.
Dierckx, R.
EURATOM-CCR, Ispra, Italy
October 1976

ORNL/RSIC-40, 122 ..... FERD; FERDOR
FERD and FERDOR Type Unfolding Codes.
Burrus, W.R.
Oak Ridge National Laboratory, Oak Ridge, Tennessee
October 1976

PB-249624 ..... WAM-BAM
User's Guide for the WAM-BAM Computer Code.
Leverenz, F.L.; Kirch, H.
Science Applications, Inc., Palo Alto, California
January 1976
CDC 6600; CDC 7600
AVAIL: NTIS

PXNR-2399 ..... SHIELD; EXPREP; EXSECT
Data Preparation for the Monte Carlo Neutron Transport Code SHIELD.
Adams, R.J.; Lokan, K.H.
Physics Division, National Research Council, Ottawa, Ontario, Canada
April 1976

PXNR-2400 ..... SHIELD
SHIELD: A Monte Carlo Neutron Transport Shielding Code for the PDP-9(/L) Computer.
Adams, R.J.; Lokan, K.H.
Physics Division, National Research Council, Ottawa, Ontario, Canada
April 1976
PDP9; PDP9/L

PXNR-2417 ..... SHIELD
Monte Carlo Calculations on Ilmenite Concrete Shields.
Adams, R.J.; Lokan, K.H.
Physics Division, National Research Council, Ottawa, Ontario, Canada
October 1976

Tech. Report ESL-16
AVRGER; RESXBW; SECN3N; KRMCAL; ENGLK; RCTSPT

Neutronic and Photonic Analyses of Simulated Fusion Reactor Blankets Containing Thorium and Natural Uranium.

Parish, T.A.; Draper, E.L.

University of Texas at Austin, Texas

October 1973

Trans. Am. Nucl. Soc., 22, 39-40
..... CODE STANDARDIZATION

Implications to the CTR Community of Standardization in Nuclear Analysis Codes.

Bosler, G.E.

Los Alamos Scientific Laboratory, Los Alamos, New Mexico

November 1975

WAPD-TM-1249 ..... FLASH-6

FLASH-6: A FORTRAN IV Computer Program for Reactor Plant Loss-of-Coolant Accident Analysis (LWBR Development Program).

Beyer, J.; Peterson, W.D.; Prelewicz, D.A.; Swartele, G.W.

Bettis Atomic Power Lab., West Mifflin, Pa.; Westinghouse Electric Corporation, West Mifflin, Pa.

July 1976

AVAIL: NTIS

RADIATION SHIELDING INFORMATION CENTER

Retrospective Search Request

NAME _____ DATE _____

ADDRESS _____ TELEPHONE _____
Company/Institution (Area code)

_____

_____

_____

SEARCH QUESTIONS IN WORDS _____

_____

_____

_____

INFORMATION FILE:

- Space/Accelerator*
- Reactor/Weapons
- RSIC Code Collection
- Code Literature

Multisubject Bibliography

*Output type:*

Citation only (8 1/2 X 11 paper)

Retrospective Logical search:

Output type:

Citation only (8 1/2 X 11 paper)

Citation and abstracts (8 1/2 X 11 Paper)

Citation and abstracts (8 x 5 in. card)

LOGICAL QUERY EXAMPLES:

Subject

a. 010000

b. 010000 OR 111110

c. 010000 AND (111110 OR 111210) AND (511110 OR 511120) NOT (820000 OR 830000)

Author

d. Jones, P.D. OR Smith, S.P.

Corporate Author

e. ORNL OR Westinghouse

Journal or Document Identification

f. Nucl. Sci. Eng. OR ORNL-TM

| | AND→ | | | | | |
|---|---|---|---|---|---|---|
| | OR | | | | | NOT |
| Query | ↓ | A | B | C | D | E |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Return to: Radiation Shielding Information Center, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, TN 37830

*Not being updated