# 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. 149* *May 1977*

*Even if you're on the right track, you'll get run over if you just sit there. . . . Will Rogers*

### A QUOTE ON A QUOTE!

The user evaluation indicated general interest in and satisfaction with the RSIC Newsletter monthly quotation. We are pleased to have tangible evidence of reader's notice. Our long-time friend, John L. Kamphouse of Gilbert Associates, Inc., Reading, Pennsylvania writes as follows.

> While I have a great deal of respect for Marie Curie, I must take issue with her quote which you used in the April 1977 RSIC Newsletter: "Nothing in life is to be feared. It is only to be understood." I respectfully submit that the Bible says: "The fear of the Lord is the beginning of wisdom: and the knowledge of the holy is understanding." Proverbs 9:10.

### CLARIFICATION TO FEBRUARY NRC ARTICLE

The Measured Data Repository to be established in FY 1978 by the Technology Resource Group (the administrative umbrella under which RSIC operates), Neutron Physics Division, Oak Ridge National Laboratory, is one unit of the Data Bank System of the LOCA Thermal Hydraulics program of Water Reactor Safety Research (WRSR), Division of Reactor Safety Research (RSR), Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission. Other units of the system are expected to be located at Idaho Nuclear Engineering Laboratory, Argonne National Laboratory, and other sites. Further information on the Data Bank System should soon be available.

### STANDARDS EFFORT NEEDS HELP

The ANS-10 Standards Subcommittee of the American Nuclear Society Standards Committee is currently reviewing and revising the ANS-Std. 3–1971, "Recommended Programming Practices to Facilitate the Interchange of Digital Computer Programs" and would like your comments and suggestions. A series of questions relevant to yourself and your use of computers has been posed and are appended to this issue of the RSIC Newsletter. You are urged to remove the form, answer the questions, and mail the completed form immediately. The response is needed by June 3 for consideration at the committee meeting on June 24.

RSIC has distributed the above standard since 1971. The rapidly changing technology requires frequent review and update. Your needs will be considered if ANS-10 has your information. Since the RSIC user community is so heavily involved in using computers and in exchanging computing technology through RSIC, we feel this query merits your priority attention. An RSIC staff member has been a member of this effort since its inception and urges your support of the review.

### FIFTH INTERNATIONAL CONFERENCE ON REACTOR SHIELDING—IN RETROSPECT

The Fifth International Conference on Reactor Shielding, held in Knoxville, Tennessee April 18–23, attracted a total of 273 participants from 33 nations. More than 100 invited and contributed papers were given in the forum and poster sessions. The latter proved to be a success as speakers discussed their papers informally and at length with all those who were interested. The Hyatt Regency lobby was the scene of about 25 commercial and educational exhibits and an international flag display.

The weather cooperated, and all scheduled events took place as planned, although the dogwood blooms reached their peak prior to the conference. A total of about 75 stayed through the conference to join the ORNL tour on Friday and the TVA tour on Saturday. Already participants were asking about the next such conference.

On Wednesday, approximately 250 area high school students and others attended a public conference on radiation in the human environment sponsored by the American Nuclear Society (Oak Ridge Section) and the Health Physics Society (East Tennessee Chapter). This was held as an auxiliary event of the ICRS.

We have been able to identify three people who have attended all five conferences. They are Pierre Lafore (Saclay, France), John Butler (Winfrith, UK), and Charles Clifford (ORNL, USA). Are there any other members of this select group?

Copies of the printed abstracts which were submitted in August 1976 are available upon request from RSIC.

The proceedings will be published by Science Press, 8 Brookstone Drive, Princeton, NJ 08540. An announcement will be made in this newsletter when they are available. The invited papers and about 10 others will also appear in a future issue of *Atomkernenergie*.

## RSIC INFORMATION FILES AVAILABLE ON RECON

The computer-based information files developed by RSIC have been reformatted for on-line searching by the ERDA interactive computer system known as RECON.

Two files are now available. The first, named RSI, is the SARIS (Storage and Retrieval Information System) data consisting of indexed abstracts of reactor and weapons radiation shielding literature collected over a period of about 14 years. The second, named RSC, consists of literature citations of computer code literature published in the RSIC Newsletter over the past several years. This file is indexed by keywords using a controlled vocabulary. Further information for those having access to RECON and planning to do their own searching is available upon request.

## ESIS NEWSLETTER - A NEW LOOK

We congratulate the ESIS Newsletter on its new professional look and content. The new editor is Mr. H. W. M. Braun. The ESIS Newsletter is published quarterly, and it provides especially good coverage of European shielding work. It is a product of the European Shielding Information Service at the EURATOM Joint Nuclear Research Centre, Ispra Establishment, 21020 Ispra (Va), Italy. Requests for subscriptions should be addressed there. The new director of ESIS is Dr. H. Rief.

The following article is taken from the newsletter.

### CONCERNING BIOLOGICAL SHIELDING OF NUCLEAR REACTORS AND HOT CELLS AND THEIR DECOMMISSIONING**by *H. W. M. Braun, Ispra*

The biological shielding of nuclear reactors and the shielding of hot-cells are usually the most solid components of nuclear installations. Their decommissioning is thus very expensive. When the construction of these objects began no architect considered that they would some day have to be removed. It is not just that we don't want to leave nuclear junk lying about for millenia which must be continuously watched and forms a costly inheritance for following generations; sites where the construction of nuclear installations is permitted are valuable. The junk must give place to new ones. One can't build over it as once churches and cathedrals arose over the rubble of their predecessors, which is why many religious buildings stand on hillocks, e.g. Cologne Cathedral, or St. Maria Sopra Minerva in Rome.

Why for instance aren't the metres-thick shields constructed sandwich-wise, asks the layman. Why are the shields not provided with blastholes during construction, which can be sealed with plugs? The financial expense of this must be negligible in comparison with the work necessary later. The discipline of Terotechnology* is certainly only relatively young, but should slowly spread especially among industrial architects. It maintains among others the principle that a component, whether a cogwheel or a building, should only last as long as it is expected to be useful. Afterwards the object, which must disappear, should be adapted to being disposed of in the most economical way. The quality should thus not be as good as possible, but only as good as is necessary to fulfill the purpose desired. This principle is now only applied to a few objects. The contrary, namely less than the lifespan hoped for, is the rule – we need only think of our cars!

ESIS invites everyone who plans to build bulk shielding and who works with industrial architects to think about the application to his construction work of the cited postulate of Terotechnology.

We will be pleased to publish contributions on this topic in the ESIS Newsletter.

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* Terotechnology is "a combination of management, financial, engineering and other practices applied to physical assets in pursuit of economic life-cycle costs; it is concerned with the specification and design for reliability and maintainability of plant, machinery, equipment, buildings and structures, with their installation, commissioning, maintenance, modification replacement and decommissioning and with feedback of information on design, performance and costs."

** Reprinted from ESIS Newsletter No. 21 (April 1977).

## FEEDBACK ON WORK IN PROGRESS

Several respondents to the user evaluation of RSIC products and services asked for newsletter coverage of current work and problems reported by the RSIC user community. We will be pleased to do so when you furnish the information and give permission to print it. We welcome all feedback and are pleased when you are willing to share news of your work through the newsletter. We share with you the following.

Ya-chang Chiu, assistant scientist in the Institute of Nuclear Energy Research (INER), Lung-Tan, Taiwan (R.O.C.) writes that his group is cooperating with the National Tsing-Hua University to perform a series of shielding programs. The work includes: shielding calculations of reactor (CANDU type) end shields; investigation of shielding properties of materials used in INER; determination of neutron and gamma-ray distribution in the through tube and beam port of a heavy water research reactor (TRR) in INER (experiment and theoretical calculations); and penetration of radiation through shields containing distributed voids, through filled inhomogeneities in shields, through multibend ducts, etc.

Richard E. Malenfant, Los Alamos Scientific Laboratory, developer of the QAD kernel integration code system, has returned to work on theoretical and experimental analyses of the neutronics and shielding of nuclear systems with the LASL Critical Experiments Group (Q-14), with which he was associated during the development of QAD, 1961 to 1973. In the interim, he was assigned to the Energy Systems Group, LASL Energy Division, concerned with neutronics and shielding analyses of systems, including fuel cycle analysis, burnup analysis of graphite-based power reactors, and energy modeling. He was most recently program manager of the LASL part of the ERDA/DTO Regional Studies Program and Group Leader of the Energy Systems Studies Group. *Dr. Malenfant has agreed to review the QAD code system, including documentation, and if deemed advisable, to update the system. If any current QAD users have comments and/or suggestions on the state-of-the-art of your version of QAD, call him directly or notify RSIC and we will relay them to Dr. Malenfant for his review.*

Robin Curtis, The University of Birmingham, Department of Physics, United Kingdom, writes that about fifteen people are working on various aspects of fusion, the group being equally split between experimentalists and theoreticians. The former are involved in various aspects of a lithium fluoride integral experiment, including the development of miniature scintillation detectors. The theoretical side is concerned with laser fusion, and with blanket design. To look at fluxes, tritium production, cross section sensitivities, and heating rates, they maintain two fully working "computing systems": one based on Monte Carlo methods and the U.K. Nuclear Data Library, and the other on discrete ordinates and the ENDF/B-IV library. For a small university group they represent a significant proportion of the U.K. effort on the neutronics and photonics of fusion reactor blankets, having close liaison with A.E.R.E., Harwell and the Culham laboratory.

Dr. Miriam Lemanska, Soreq Nuclear Research Center, Israel and Dr. J. Menning, Institute for Reactor Research - Wuerenlingen, Switzerland are collaborating in work on the problem of the improvement of the $S_n$ method using the two-point Hermite integration formula. They will compare the numerical results obtaned by the above method with those obtained by ANISN.

## CALCUTTA CONFERENCE PROCEEDINGS AVAILABLE

The volume "Radiation Physics–Proceedings of the International Symposium on Radiation Physics, held at Bose Institute, Calcutta, India, November 30– December 4, 1974" was published in January 1977 as NBS special publication 461, by U.S. Department of Commerce/National Bureau of Standards. The editors (A.M. Ghose and S.C. Roy from the Bose Institute, J.H. Hubbell from NBS, Washington D.C., and D.V. Gopinath from the Reactor Research Centre, Kalpakkam, India) "regret the inordinate delay" (preface). On 268 pages, about 50 papers are given. They treat basic cross sections (sessions A,B,C), radiation transport (session D), radiation scattering in bulk media (session E), shielding (session F), and dosimetry and instrumentations (sessions G,H,I).

The document is available from Supt. of Documents, U.S. Government Printing Office, Washington, D.C. 20402, $3.25 U.S., $4.07 foreign.

## NEW "TECHNICAL BOOKS AND MONOGRAPHS" CATALOG

*Technical Books and Monographs*, a bibliography of books and monographs sponsored by the Energy Research and Development Administration (ERDA) and by the organizations brought together to form ERDA, is published to help meet the information needs of scientists and engineers working in energy-related fields. This catalog provides access to a large body of knowledge generated by many programs–programs as diverse as the field of nuclear medicine, the exploration of physical mechanisms at work in the environment, and the varied technologies required to realize the potential of the country's energy sources.

*Technical Books and Monographs* provides a brief descriptive statement, lists or describes the contents for the most recent publications, and indicates the availability. The more than 675 publications are grouped under the following subject categories: general reference, biology and medicine, chemistry, computers and mathematics, energy, engineering and instrumentation, environment, health and safety, isotope separation, metallurgy and materials, physics, reactors, and vacuum technology. Included in the catalog are the titles from monograph series prepared in cooperation with the American Chemical Society, American Industrial Hygiene Association, American Institute of Biological Sciences, American Nuclear Society, and American Society for Metals. In addition to the technical books and monographs, separate sections at the end of each subject category list approximately 175 recent published symposiums from ERDA projects and recent and relevant bibliographies. Title, author, and series indexes are provided.

*Technical Books and Monographs* is available as TID-4582-R12 without charge from ERDA Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

## UPCOMING CONFERENCES

*SEVENTH SYMPOSIUM ON ENGINEERING PROBLEMS OF FUSION RESEARCH*, October 25–28, 1977, Hyatt Regency Hotel, Knoxville, Tennessee; M. S. Lubell, Chairman.

*ALTERNATIVE ENERGY SOURCES: A NATIONAL SYMPOSIUM*, December 5–7, 1977, Miami Beach, Florida, sponsored by Clean Energy Research Institute, University of Miami. Papers will be presented on Nuclear Breeders, Nuclear Fusion, Solar Energy, Geo-Thermal Energy, Ocean Thermal Energy, Wind Energy, Hydro-Power, Tide Power, Wave Energy, Salinity Gradient Power, Coal Gasification and Liquefaction, Synthetic Fuels, Hydrogen Energy, Economics and Policy, and Miscellaneous Topics. Contact Dr. T. Nejat Veziroglu, Director, Clean Energy Research Institute, University of Miami, P. O. Box 248294, Coral Gables, Fla. 33124.

*15TH INTERNATIONAL THERMAL CONDUCTIVITY CONFERENCE*, August 24–26, 1977, Ottawa, Ontario, Canada (Holiday Inn, Ottawa-Centre). Sponsors: Canada Centre for Mineral and Energy Technology (CANMET) and the Thermophysical and Electronic Properties Information Center, Purdue University. The Conference topics will deal with all aspects, at all temperatures, of heat conduction in solids, liquids and gases, theory of thermal conductivity and transport mechanisms, experimental techniques for measurement of thermal conductivity and thermal diffusivity, new data on all substances, thermal contact conductance, reference materials. Further information may be secured from Dr. V. V. Mirkovich, Chairman, 15th International Thermal Conductivity Conference, Department of Energy, Mines and Resources, 405 Rochester Street, Ottawa, Ontario, Canada, K1A 0G1.

*ENERGY AND THE LAW: PROBLEMS AND CHALLENGES OF THE LATE 70s*, May 6–7, 1977, at the Fairmont Hotel in San Francisco, will begin with an overview of the energy crisis and of the status of reorganization of government energy functions. The regulation of energy matters, state power siting, and the commercialization and financing of a new energy technology will be analyzed by a faculty of present and former government officials and lawyers with extensive experience in energy law practice. The legal climate for solar, wind, and ocean energy and energy conservation regulations will also be examined. Sponsor: American Law Institute-American Bar Association Committee on Continuing Professional Education, 4025 Chester Street, Philadelphia, PA 19104. Contact Alexander Hart for further information.

## PERSONAL MENTION

G. P. De Beer of the South African Atomic Energy Board is spending the month of May with RSIC to work on benchmark problems.

The following changes of address have been noted: A. A. Abagyan from PPEI, Obninsk to the Scientific-Industrial Combine Energia, Moscow, USSR; Leon West from ORTEC, Oak Ridge to Los Alamos Scientific Laboratory; Y. Gohar from University of Wisconsin to the Applied Physics Division, Argonne National Laboratory; and Hsin H. Hsu from United Engineers & Constructors to Bechtel, Philadelphia.

## VISITORS TO RSIC

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

Shigehiro An, University of Tokyo, Tokyo, Japan; E. H. Brehm, BBC-Mannheim, Mannheim, Germany; Bonifilis F. Chamany, Bhabha Atomic Research Centre, Bombay, India; Gerhardus P. De Beer, South African Atomic Energy Board, Pretoria, South Africa; Herbert C. Benhardt, University of Kentucky, Lexington, Kentucky; Thomas E. Eaton, University of Kentucky, Lexington, Kentucky; Katherine Goldsmith, Carnegie-Mellon Research Institute, Pittsburgh, Pennsylvania; Ottfried J. Hahn, University of Kentucky, Lexington, Kentucky; William Cornelius Hall, Chemtree Corporation, Central Valley, New York; Tomonori Hyodo, Kyoto University, Kyoto, Japan; H. Harry Isakari, Kaiser Engineers, Oakland, California; Masayoshi Kawai, Nippon Atomic Industry Group Co., Ltd., Kawasaki, Japan; Tomas Lefvert, Research Institute of National Defence, Stockholm, Sweden; Peretz Levin, Nuclear Research Center - Negev, Beer-Sheva, Israel; Shunichi Miyasaka, Japan Atomic Energy Research Institute, Tokaimura, Japan; Carl A. McIntire, Computer Systems, Armed Forces Radiobiological Research Institute, Bethesda, Maryland; Tatsuo Nishimura, Mitsubishi Atomic Power Industries, Inc., Saitama, Japan; Y. Oka, University of Tokyo, Tokyo, Japan; Eric Ottewitte, EG&G, Idaho Falls, Idaho; Odelli Ozer, Electric Power Research Institute, Palo Alto, California; Kendall Preston, Carnegie-Mellon University, Pittsburgh, Pennsylvania; Ronald R. Price, Vanderbilt University, Nashville, Tennessee; Frank Sweeney, ORNL I & C Division, Oak Ridge, Tennessee; Kohtaro Ueki, University of Tennessee, Knoxville, Tennessee; R. K. Zoellner, University of Kiel, Kiel, Federal Republic of Germany.

## CHANGES IN THE COMPUTER CODE COLLECTION

The following changes were made during April.

### CCC-285/PEPIN

The fission product activity code package was updated to correct an error called to RSIC's attention by C. Devillers, CEA/CEN/Saclay, France, contributor of PEPIN. The error was corrected by removing the following 3 cards which are located after LABEL 14 in Subroutine SECEFF:

```
      PRINT 404,JJ, . . . . . .
  404 FORMAT ( . . . . .)
      PRINT 411,IK1 . . . . .
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### CCC-292/TIMED

Calculation of cumulated activity of a radionuclide in the organs of the human body at a given time after deposition, contributed by Oak Ridge National Laboratory. Reference: ORNL/CSD/TM-17 (December 1976). FORTRAN IV; IBM 360/370.

CCC-297/ARMYL-G

Calculation of gamma radiation transport in air by the invariant embedding method, contributed by the Department of Theoretical Studies, Central Armaments Laboratory, Arcueil, French Ministry of Defense through the OECD Nuclear Energy Agency's Computer Programme Library, Ispra (Varese), Italy. ARMYL-G is designed to calculate the variation of gamma-ray dose transmission factor as a function of thickness of flat shields of concrete, steel, and earth for radiation coming from nuclear explosions. Reference: L.C.A. 74 R 126 (ORNL-tr-4281; October 1974). FORTRAN IV; UNIVAC 1106.

CCC-298/ARMYL-N

Calculation of neutron radiation transport in air by the invariant embedding method, contributed by the Department of Theoretical Studies, Central Armaments Laboratory, Arcueil, French Ministry of Defense through the OECD Nuclear Energy Agency's Computer Programme Library, Ispra (Varese), Italy. ARMYL-N is designed to calculate the variation of neutron dose transmission factor as a function of thickness of flat shields of concrete, steel, and earth for radiation coming from nuclear explosions. Reference: L.C.A. 74 R 126 (ORNL-tr-4281; October 1974). FORTRAN IV; UNIVAC 1106.

PSR-105A/MINX

Multigroup interpretation of nuclear X-sections from ENDF/B (standard CCCC-III interface format), contributed by Los Alamos Scientific Laboratory, Los Alamos, New Mexico. Reference: LA-6486-MS (September 1976). FORTRAN IV; IBM 360. Conversion from the original CDC version and further validation was performed by members of the Computer Sciences and Neutron Physics divisions, Oak Ridge National Laboratory in conjunction with the ERDA-DMFE/DRDD cross section library generation activity. MINX generates pseudo-composition independent multigroup averaged infinitely dilute cross sections, self-shielding factors, and group-to-group transfer matrices from ENDF/B-IV data. The LASL CDC version is packaged as PSR-105B.

## CHANGES TO THE DATA LIBRARY COLLECTION

The following changes were made in April.

DLC-45/SENPRO

126 group compilation of sensitivity profiles for several fast reactor benchmarks, contributed by Oak Ridge National Laboratory. Sensitivity profiles for the multiplication factor and several central reaction rate ratios for five CSEWG fast reactor benchmarks are provided in SENPRO format, a trial format which follows the standards established by the Committee on Computer Code Coordination (CCCC). Computer codes are provided for BCD-to-Binary conversion and for assessing the impact on performance parameters of proposed percentage changes in designated reaction cross sections over specified energy ranges. A full reel of magnetic tape should accompany a request. Reference ORNL- 5262 (ENDF-234). IBM 360/91.

## APRIL ACCESSION OF LITERATURE

The following literature cited has been ordered for review, and that selected as suitable will be placed in the RSIC Information Storage and Retrieval Information System (SARIS). This early announcement is made as a service to the shielding community. Copies of the literature are not distributed by RSIC. They may generally be obtained from the author or from a documentation center such as the National Technical Information Service (NTIS), Department of Commerce, Springfield, Virginia 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

AD-A-023777
The New Nuclear Radiation Casualty Criteria.
Warshawsky, A.S.
May 1975
NTIS $3.50

AERE-R-8152
Chain and Independent Fission Product Yields Adjusted to Conform with Physical Conservation Laws. Part 2.
Crouch, E.A.C.
January 1976
INIS

AFWL-TR-76-313
Nuclear Radiation Dose Comparisons of SMAUG to Air Transport Results Based on the DLC-31 Cross Sections.
Burgio, J.J.
February 1977
NTIS

BMVG-FBWT-74-13; N-75-31868
Scalar Radiation Field of a Neutron Source in Liquid Air.
Broecker, B.; Clausen, K.; Johnson, P.; Schneider-Kuehnle, P.; Weinert, M.
1974
NTIS $3.75

BMVG-FBWT-75-1; N-76-16913
Gamma Radiation and Gamma Protection Factors on Board Ships During Radioactive Fallout.
Brehm, E.H.; Holst, T.
1975
NTIS $4.50

CEA-CONF-3386; CONF-751152-3
Approximate Solutions of the Two-Dimensional Integral Transport Equation by Collision Probability Methods.
Sanchez, R.
1975
INIS

CNEN-RT/FIMA-74-2
SHREDI, a Removal Diffusion Shielding Code for X-Y and R-Z Geometries.
Daneri, A.; Toselli, G.
1974
INIS

CONF-760715-P2
International Conference on the Interactions of Neutrons with Nuclei. Vol.II.(Joint, Parallel and Papers Sessions)
Sheldon, E. (Ed.)
1976
NTIS $21.25

CONF-761146-1
Damage Energy and Displacement Cross Sections: Survey and Sensitivity.
Doran, D.G.; Parkin, D.M.; Robinson, M.T.
October 1976
Dep., NTIS $3.50

ERDA-tr-250
Translations of Soviet Reports on Radioactivity in Building Materials and Bone Dosimetry.
November 1976
Dep., NTIS $5.00

EGG-1183-1670
Structure Shielding from Cloud and Fallout Gamma Ray Sources for Assessing the Consequences of Reactor Accidents.
Burson, Z.G.; Profio, A.E.
December 1975
Dep., NTIS $4.00

EURFNR-1316; KFK-2211 (In German)
Measurement of the Energy Distribution of the Gamma Field in a Fast Reactor.
Horn, H.E.
November 1975
Dep., NTIS $5.00

EURFNR-1317; KFK-2219 (In German)
Measurement and Calculation of the Neutron Leakage Spectra of Iron Spheres with a $^{252}Cf$ Source at the Center.
Werle, H.; Bluhm, H.; Fieg, G.; Kappler, F.; Kuhn, D.; Lalovic, M.
November 1975
Dep., NTIS $4.00

INDC(CCP)-83/LN
(Gamma, n) Reactions near the Threshold and the Radiative Capture of Neutrons.
Abramov, A.I.
April 1976
INIS

INDC(NDS)-73/L+Sp); CONF-751220-(Summ.)
IAEA Consultants Meeting on the Use of Nuclear Theory in Neutron Nuclear Data Evaluation, International Centre for Theoretical Physics, Trieste, 8-11 December 1975. Summary Report.
Schmidt, J.J. (Ed.)
March 1976
*INIS*

INDC(SEC)-51/L
Consolidated Progress Report for 1975 on Nuclear Data Activities Outside the NDS Service Area: Austria, Belgium, Greece, Spain, Switzerland, Turkey.
December 1975
INIS

JUEL-1261
Neutronic and Photonic Studies on Fusion Reactor Blankets with Low Lithium and Tritium Inventories.
Verschuur, K.A.; Brockmann, H.
December 1975
INIS

NBS Spec. Pub. 461
Radiation Physics.
Ghose, A.M.; Gopinath, D.V.; Hubbell, J.H.; Roy, S.C.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402 $3.25

NBS Spec. Pub. 461, pp.3-16
Present Status of Photon Cross Section Data 100 eV to 100 Gev.
Hubbell, J.H.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.17-19
Semiempirical Formulation of Coherent Scattering of Gamma Rays.
Roy, S.C.; Ghose, A.M.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.20-22
Experimental Photoionization Cross Section of Gamma Ray Photons for Low, Medium and High Z Atoms.
Sinha (Goswami), B.; Chaudhuri, N.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.23-25
Inner Bremsstrahlung Accompanying Electron Capture in $^{7}Be$ and $^{51}Cr$.
Sanjeevaiah, H.; Sanjeevaiah, B.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.26-28
Inelastic Scattering of 279 keV Gamma Rays by Bound Electrons in Heavy Atoms.
Murty, D.S.R.; Reddy, V.G.; Narasimhacharyulu, E.; Swamy, S.T.P.V.J.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.29-31
Gamma Ray Attenuation Coefficient Measurements at 1115, 1173 and 1332 keV.
Gopal, S.; Sanjeevaiah, B.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.32-40
Radiation Physics and Nuclear Technology.
Iyengar, P.K.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.41-43
Variation of Total to K-Shell Photoelectric Cross Section Ratios with Atomic Number and Photon Energy.
Gowda, R.; Sanjeevaiah, B.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.44-46
Optical Model Analysis of Non-Elastic Interaction of 14.2 MeV Neutrons.
Pal, B.; Chatterjee, A.; Ghose, A.M.
January 1977
Supt. of Documents, GPO. Washington, D.C. 20402

NBS Spec. Pub. 461, pp.47-54
Geometric Factors in Radiation Physics Measurements.
Ghose, A.M.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.55-56
Measurement of Angular Distribution of Incoherently Scattered Gamma Rays from Atoms.
Sinha (Goswami), B.; Chaudhuri, N.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.57-59
Measurement and Analysis of a Few 14 MeV Neutron Capture Cross Sections.
Majumdar, M.; Mitra, B.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.60-63
Intermediate Energy Approximation of B-H Formula for the Bremsstrahlung Cross Sections.
Gopala, K.; Sanjeevaiah, B.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.64-66
A New Method for the Measurement of Differential Elastic Scattering Cross Sections of Fast Neutrons.
Nath, S.; Chatterjee, A.; Ghose, A.M.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.67-69
Compton Scattering of 1.12 MeV Gamma Rays by K-Shell Electrons.
Prasad, P.N.B.; Basavaraju, G.; Kane, P.P.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.70-73
Nuclear Theory Based Cross Sections of Th-232, Th-233 and U-233 and Their Applications in Reactor Technology.
Garg, S.B.; Kumar, A.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.74-78
Development of Radiation Shielding Standards in USA.
Trubey, D.K.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.79-86
Integral Equation Methods in Radiation Transport.
Gopinath, D.V.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.87-90
Neutron Transport Problems in Spherical Geometry.
Sahni, D.C.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.91-93
Transport of Neutrons During Reactor Transients.
Kapil, S.K.
January 1977
Supt. of Documents, GPO, Washington, D.C. 20402

NBS Spec. Pub. 461, pp.94-96
Criticality Calculations by Source-Collision Iteration Technique for Cylindrical Systems.
Sundaram, V.K.; Gopinath, D.V.
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# AMERICAN NUCLEAR SOCIETY

MATHEMATICS AND COMPUTATION DIVISION

SURVEY
ON PROGRAMMING PRACTICES

Return By 6/3/77 To:

J. E. Olhoeft, ANS-10
Westinghouse-NES
P. O. Box 355
Pittsburgh, Pa. 15230

The ANS-10 Subcommittee is currently reviewing and revising the ANS-Std. 3-1971 "Recommended Programming Practices To Facilitate the Interchange Of Digital Computer Programs" and would like your comments and suggestions. Please complete those questions relevant to your situation or pass on to a colleague, and return to Jack Olhoeft. Your participation in this survey is essential to the development of a meaningful standard. You may remain anonymous if you like.

1. Name:_____ Phone:_____

   Organization:_____

   Address:_____

2. I am responding as who software.

   _____ scientist
   _____ engineer
   _____ system analyst
   _____ programmer
   _____ manager

   _____ uses
   _____ develops
   _____ converts
   _____ modifies
   _____ maintains
   _____ contracts for

   other, please specify:_____

3. Principal programming languages used:

   FORTRAN _____ BASIC _____ COBOL _____
   PL/1 _____ ASSEMBLER _____ OTHER _____
   (please specify)

4. Approximate number of programs developed, converted or modified during the past year by size: (medium size: 300-5000 source statements)

   small_____ medium _____ large _____

5. Do you implement programs developed at other installations? Yes____ No____

6. Are you aware of ANS-STD. 3-1971, "Recommended Programming Practices To Facilitate the Interchange of Digital Computer Programs"?

   a. Heard of it? _____ c. Use it as an individual? _____

   b. Read it? _____ d. Recommended it to others? _____

   e. Used throughout my installation? _____

7. Which recommended features of the standard are most important?

a. reasonable size of subroutine? _____

**3.1 Program Structure.** A program should be a carefully structured collection of subprograms, each of which performs a specific well-defined function. The structuring should permit algorithms to be easily changed without disrupting large portions of the program. Subprograms should be of reasonable size; one containing 300 executable statements is generally too large, while very small ones may cause inefficient execution. The overall program control should be contained in a single routine.

b. dynamic storage allocation techniques? ____

_____

**3.2 Storage Allocation.** The use of adjustable dimension statements or dynamic storage allocation techniques is desirable to simplify implementation on computers with different memory sizes. The allocation of dynamic storage should be localized rather than spread through many routines.

c. localization of data transfer processing (I/O, scratch) _____

**3.3 Data Management.** It is recognized that advanced techniques are used to achieve efficient data management. A minimum number of different routines should be used for data *Input/Output (I/O), preferably those in common* use which allow easy replacement for conversion to other machines; they should be used to transfer data in blocks and their use localized.

d. limited use of unique machine features? _____

_____

**3.4 Machine Independence.** The use of features peculiar to a particular compiler and/or operating system should be avoided. The Appendix gives a partial list of such features. Although tricks of a particular system can prove helpful and be interesting, their use causes great difficulty in interpretation and conversion and should be avoided.

e. limited use and extensive documentation of assembly language routines? _____

**3.5 Assembly Language.** The use of assembly language should be *minimized*. A higher level language should be used unless execution time can be greatly reduced, as for inner-loop calculation or buffered I/O, or where the equivalent operation is not available or easily programmed. Assembly language routines should be extensively documented, with the logic explained, as by a higher level language version of the routine.

f. adherence to ANSI programming language standards?

_____

**3.6 Language Extension.** Programming should be done within the ANSI Standard* for a higher level language except where extension adds flexibility or efficiency; e.g., ENCODE, DECODE, BUFFER IN, BUFFER OUT, and NTRAN. Such use should be documented and localized within the program. *Convenience in* programming is not considered to be justification for programming outside of the standard; significant gains in the computational capability and improving computer efficiency are adequate justification.

g. consolidation of COMMON, DIMENSION, EQUIVALENCE, BLOCK DATA, TYPE statements? _____

**3.7 Specification Statements.** The number of specification statements should be minimized. For example, in FORTRAN, appropriate variables should be dimensioned in COMMON or "type" statements to reduce the number of source cards and make it easier to find the variable's attributes.

*Standard FORTRAN is described in American National Standard ANSI X3.9-1966.

h. meaningful and consistent usage of program symbols? _____

i. unique identification and sequencing of subroutine statements? _____

j. discernible pattern of statement numbering? _____

k. use of COMMENT statements for clarification? _____

l. understandable input and output information? _____

m. internal checking and meaningful error messages? _____

n. differences in computer implementation? _____

**3.8 Program Symbols.** Program symbols in COMMON should be the same in all routines or any deviation thoroughly described. These should be dimensioned and used in only one way.

Meaningful symbols should be used, and their use be consistent. It is very difficult to work with a program in which integers, for example, cannot be easily recognized. Variable names do convey useful information when carefully selected.

Symbolic unit references should be used in all I/O statements and assignments localized. Constants other than simple integers should be symbolic with assignments of values localized.

**3.9 Identification of Source Decks.** A scheme for the unique identification of each card is desirable; e.g., a four-character alphabetic field with sequence numbering within each subprogram, or sequence numbering of the entire program. Sequencing by 10's is suggested to allow for the insertion of changes. Sequencing permits verification that the cards are in order, and it also enables specific cards to be referenced when making corrections or changes.

**3.10 Statement Numbers.** Numbers assigned to executable statements should be in ascending order. Programs are available to renumber FORTRAN source statements. Statement numbers added in revisions should have a discernible pattern.

**3.11 Comment Cards.** Comment cards are needed for clarification, as follows:

(1) Include a table to define global program symbols and relate them to the mathematical symbols or definitions used in the documentation.

(2) Explain the function of each subprogram and define its arguments.

(3) Explain the major decision branches and the functions of major blocks of program within subprograms.

(4) Describe deviations from ANSI standard FORTRAN.

(5) Describe changes in the program from descriptions in the documentation.

(6) Describe adjustable dimensions and explain storage allocation requirements.

**3.12 Input/Output.** The program should be designed so that input data are easy to prepare and output information can be readily identified. At the user's option, input information should appear as a part of the program output to document calculations.

**3.13 Error Detection and Stops.** Checks should be programmed to prevent nonsensical calculations such as would be caused by inconsistent data or incompatible instructions. The user should be informed when a problem is outside the reliable range of the program. Error stops should be accompanied by diagnostic information.

8. Is the standard useful? _____

_____

9. What features of ANS-Std. 3-1971 would you like to see changed, what corrections or extensions should be made? _____

_____

_____

10. Identify any standards or guidelines governing programming practices used at your installation (professional, company, or individual): _____

_____

_____

11. What do you consider the most important and desirable programming practices in your environment? _____

_____

_____

_____

12. Do you think standards or guidelines are desirable in this area? _____

_____

PLEASE MAIL COMPLETED FORM TO:

Mr. Jack E. Olhoeft
ANS-10 Subcommittee
Westinghouse Electric Corporation
MNC - Bay 174
P. O. Box 355
Pittsburgh, Pa. 15230
U.S.A.

Thank you,

The ANS-10 Subcommittee
Mathematics & Computations Div.

ACKNOWLEDGEMENT: The paragraphs in question eight have been extracted from ANS-STD. 3-1971, with permission of the publisher, the American Nuclear Society, for purposes of this survey.