



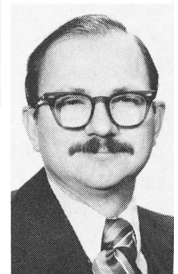
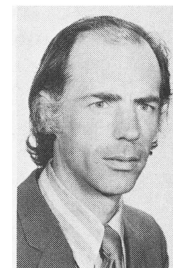
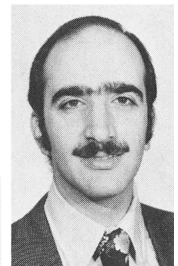
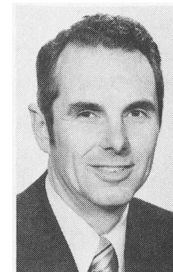
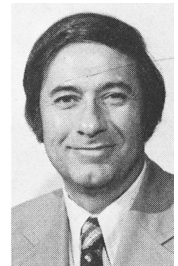
AUTHORS — JUNE 1979

NONCONVENTIONAL CORE DESIGNS OF LIQUID-METAL FAST BREEDER REACTORS

NUCLEAR DESIGN AND ECONOMIC COMPARISON OF A CONVENTIONAL AND BULLSEYE LIQUID-METAL FAST BREEDER REACTOR CORE

Joseph A. Vitti (top right) (BS, mechanical engineering, City College of New York, 1956; MS, University of California at Los Angeles, 1961; PE, nuclear engineering, California) is manager of reactor systems within the Liquid-Metal Fast Breeder Reactor (LMFBR) Programs Department at Atomic International (AI), a division of Rockwell International. He has had over 20 years experience in nuclear design, fuel cycle, and reactor core activities. **Loren D. Felten** (top left) (BS, chemical engineering, Purdue University; MS, nuclear engineering, 1959) is a member of the reactor systems staff for fast breeder reactor design at AI. Previously, he was involved in the design and safety analysis of liquid-metal-cooled compact nuclear reactor power sources. **N. Geoffrey Galluzzo** (center right) (BSc, mechanical engineering, Edinburgh University; PhD, Cambridge University, 1972) is a systems engineering specialist at AI. He has performed detailed core and system optimization studies and is currently involved in advanced fuel reactor system studies. **John M. Otter** (bottom left) (BS, physics; MS, engineering science, Stanford University, 1961) is a reactor physics and safety specialist at AI. He has been involved in reactor core nuclear design for 16 years. His current interests include aerosol behavior and meteorological dispersion in hypothetical accidents. **James C. Brittingham** (bottom right) (BS, MS, nuclear engineering, North Carolina State University, 1964, 1966; PhD, nuclear engineering, University of California at Berkeley, 1975) is a reactor physics specialist at AI. He has performed reactor physics calculations for a variety of LMFBR core designs and is presently involved in the nuclear design of proliferation-resistant LMFBRs.

*J. A. Vitti
L. D. Felten
N. G. Galluzzo
J. M. Otter
J. C. Brittingham*



PHYSICS STUDIES OF A HETEROGENEOUS LIQUID-METAL FAST BREEDER REACTOR

Michael J. Lineberry (top left) (PhD, engineering science, California Institute of Technology, 1972) is a nuclear engineer in the Applied Physics Division at Argonne National Laboratory (ANL), Idaho, and section head of Theory and Analysis, Zero Power Plutonium Reactor (ZPPR). His technical interests are in fast critical experiments. **Harold F. McFarlane** (bottom left) (PhD, engineering science, California Institute of Technology, 1971) is group leader for planning and evaluation in the Applied Physics Division of ANL, Idaho. He is currently interested in fast breeder reactor physics studies. **Peter J. Collins** (bottom right) (PhD, applied mathematics, University of Southampton, England, 1961) is an analyst of fast reactor physics programs for the U.K. Atomic Energy Authority-Winfrith and for ANL, Idaho. **Stuart G. Carpenter** (top right) (PhD, physics, Harvard University, 1958) is a section head for measurements in the Applied Physics Division of ANL, Idaho. He is involved in the study of the physics of the liquid-metal fast breeder reactor using the ZPPR critical facility.

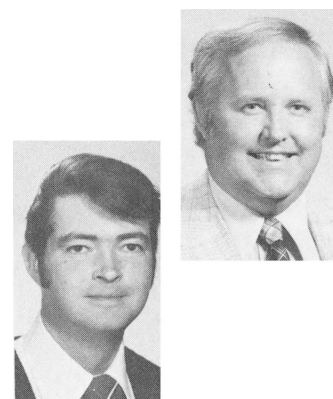
*Michael J. Lineberry
Harold F. McFarlane
Peter J. Collins
Stuart G. Carpenter*



PERFORMANCE CHARACTERISTICS OF HOMOGENEOUS VERSUS HETEROGENEOUS LIQUID-METAL FAST BREEDER REACTORS

Wolfgang P. Barthold (top) (BS, physics, University of Goettingen, Germany, 1958; Dr. rer. nat., theoretical physics, University of Kiel, Germany, 1961) is head of the Systems Design Section at Argonne National Laboratory (ANL). His interests include nuclear, mechanical, and thermal design and analysis of advanced reactor concepts as well as model and methods development for design analysis. **Jon C. Beitel** (BS, mathematics, Aurora College, 1966) has been on the staff of ANL's Applied Physics Division since 1968. He has worked in fast reactor analysis and methods development, and has been involved in systems design for the last four years.

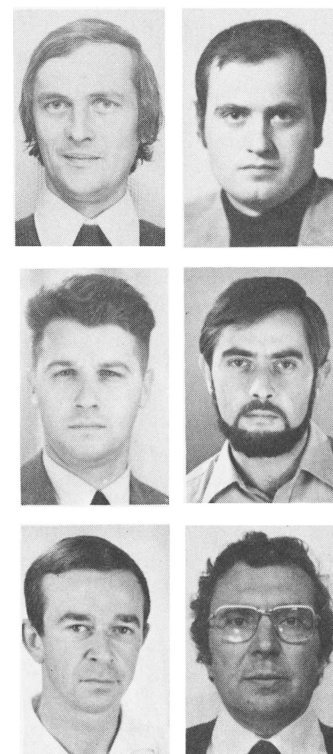
*W. P. Barthold
J. C. Beitel*



PHYSICS PERFORMANCES OF A HETEROGENEOUS FAST REACTOR CORE CONCEPT STUDIED IN MASURCA

Y. H. Bouget (top left) (PhD, University of Orsay, 1974) works at the Fast Neutron Physics Section (SPNR) of the Commissariat à l'Énergie Atomique (CEA) at Cadarache. He is mainly involved in control rod studies and heterogeneous core concept assessment. **M. Cosimi** (top right) is a technician who has worked since 1966 at the Comitato Nazionale per l'Energia Nucleare (CNEN) (Italy) on computer data management related to reactor physics. He is presently detached to CEA-Cadarache. **P. Hammer** (center left) (Ingénieur, Supelec, 1961) is assistant director of the SPNR at CEA-Cadarache. He has been involved since 1963 in fast integral experiment planning and analysis for the MASURCA reactor, control rod studies, physics method assessment, etc. **G. Humbert** (center right) (Ingénieur, Supelec, 1964) is instrumentation and measurement group leader at SPNR. His interests have been in integral experiment design and experimental techniques development. **F. Lyon** (bottom left) (Ingénieur, Supelec, 1960) is reactor physics group leader of SPNR. His present work is mainly related to sodium void reactivity coefficient analysis and experimental interpretation. **M. Martini** (bottom right) (PhD, University of Turin, 1962) works at CNEN, Casaccia (Italy). His main interest has been in experimental techniques related to fast reactors. He is presently detached to CEA-Cadarache for integral experiment analysis.

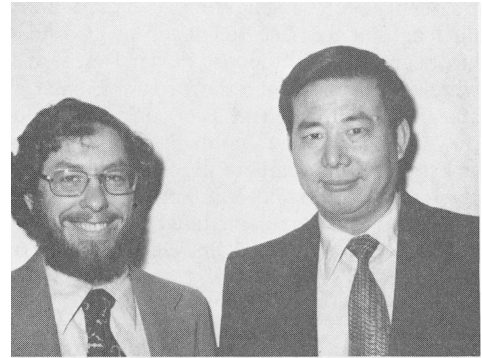
*Y. H. Bouget
M. Cosimi
P. Hammer
G. Humbert
F. Lyon
M. Martini*



NUCLEAR PERFORMANCE OF LIQUID-METAL FAST BREEDER REACTORS DESIGNED TO PRECLUDE ENERGETIC HYPOTHETICAL CORE DISRUPTIVE ACCIDENTS

*H. S. Bailey
Y. S. Lu*

H. S. Bailey (left) (BS, physics, University of California, Berkeley, 1964; MS, nuclear engineering, Stanford University, 1969; PhD, nuclear engineering, Stanford University, expected 1979) is manager of the Reactor Engineering Subsection in the General Electric (GE) Advanced Reactor Systems Department. The work within the Reactor Engineering Subsection consists of reactor fuel pin and assembly design, development, and analysis; reactor system design and optimization; control assembly and drive design and development; and reactor and plant instrumentation and control. He has 14 years experience with GE performing and supervising design and analysis of nuclear reactors. **Y. S. Lu** (PhD, nuclear engineering, University of Maryland, 1968) is a senior engineer with the GE Advanced Reactor Systems Department. He has worked in the fields of electrical engineering, nuclear instrumentation, reactor experiments, and reactor design and analysis. His current interests include analysis and applications of critical experiments.

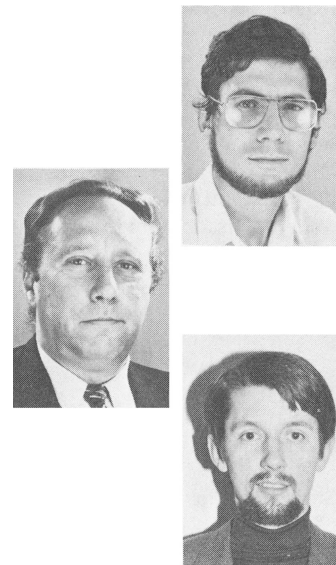


OCCUPATIONAL RADIATION EXPOSURE AT NUCLEAR POWER PLANTS

OCCUPATIONAL RADIATION EXPOSURE AT FRENCH POWER PLANTS: MEASUREMENT AND PREDICTION

Pierre Beslu (top) (Licence de Physique, Université Aix-Marseille, 1966) is in charge in the Commissariat à l'Énergie Atomique (CEA) laboratory group working on the contamination of the pressurized water reactor (PWR) primary circuit. Since 1971, he has developed physical models and calculation codes to predict corrosion and fission product migration and deposit. **Gérard Frejaville** (center) (Engineer, Docteur es Sciences, Université de Paris XI, 1966) is in charge of the laboratory studying problems related to power reactor operation. This laboratory is a part of the Water Reactor Department at CEA. Since 1971, he has worked on the contamination of the PWR primary circuit by corrosion and fission products. **Pierre Jeanson** (bottom) (Engineer, Ecole Nationale des Arts et Métiers, 1965) is an engineer in the Health Physics Department of Electricité de France. His work is directed toward reducing doses to personnel resulting from operation and maintenance of the PWR, especially by appropriate design and location of equipment.

*P. Beslu
G. Frejaville
P. Jeanson*



QUANTIFYING PLANT AVAILABILITY, ALARA, AND OCCUPATIONAL RADIATION EXPOSURE RELATIONSHIPS

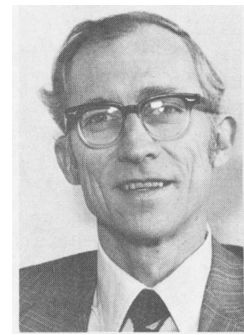
Philip M. Garrett (Doctor, environmental science and engineering, University of California, Los Angeles, 1977) is manager of the Atomic Industrial Forum's National Environmental Studies Project (NESP). The investigations that have been recently sponsored by NESP include topics in occupational radiation protection in nuclear power facilities, low-level radwaste management practices and alternatives, decommissioning of commercial nuclear power reactors, and transportation of spent reactor fuel by barge.

Philip M. Garrett



GETTING AT THE SOURCE: REDUCING RADIATION FIELDS

Robert A. Shaw



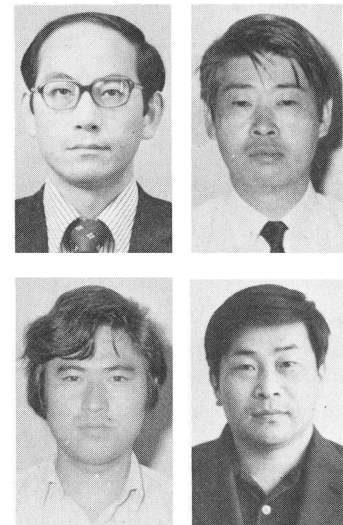
Robert A. Shaw (BS, engineering science, Pennsylvania State University; MS, engineering science, Stanford University; PhD, nuclear science and engineering, Cornell University, 1967) has been with the Electric Power Research Institute since 1975, where he is presently the program manager for the Chemistry and Radiation Control Program. His present interests include power plant radiation control, corrosion product generation and transport, high-temperature filtration, decontamination, low-level radwaste treatment, and radiation exposure control. His previous experiences included teaching at Clarkson College of Technology and work in General Electric's Nuclear Energy Division.

REACTORS

DEVELOPMENT OF A DIAGNOSIS SYSTEM FOR A BOILING WATER REACTOR

Fumio Murata (top left) (MS, electrical engineering, Kyoto University, 1971) is an engineer in the Power Plant Electric and Control Engineering Division of Hitachi Ltd. His current interests are in diagnosis and control techniques for boiling water reactors (BWRs). **Kanji Kato** (top right) (MS, nuclear engineering, University of Tokyo, 1968) is a researcher at the Energy Research Laboratory (ERL) at Hitachi Ltd. His current interests are in reactor noise analysis and a diagnosis system for a BWR plant. **Fumio Tomizawa** (bottom left) (BS, electrical engineering, Waseda University, 1972) is a member of the BWR Diagnosis Group at ERL. His current research interest is the development of a remote inspection system for BWR components. **Isao Sumida** (bottom right) (MS, physics, University of Tokyo, 1964) is a senior researcher at ERL. His current research interests are in heat transfer phenomena and two-phase flow dynamics in BWRs.

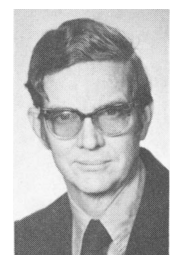
*Fumio Murata
Kanji Kato
Fumio Tomizawa
Isao Sumida*



ANALYSIS OF THE INTERACTION OF FUEL CHANNELS WITH THE END SHIELDS IN CANDU REACTORS

Stuart R. MacEwen (top) (BASc, 1965, PhD, 1969, University of Toronto) is a research scientist in the Materials Science Branch of the Atomic Energy of Canada Chalk River Nuclear Laboratory (CRNL). He is primarily concerned with the effects of fast neutron flux and irradiation damage on deformation mechanisms in zirconium. Recent work includes a study of high-temperature creep in zirconium, measurements of irradiation creep in single crystals of zirconium, and calculations of the kinetics of point defect production and annihilation in irradiated alloys. The latter are currently being used to develop mechanistic models for irradiation-enhanced creep and growth in zirconium alloys. **Allan R. Causey** (BASc, engineering physics, 1958, PhD, metallurgical engineering, 1967, University of British Columbia) has worked in the Metallurgical Engineering Branch of CRNL since 1971. His work involves conducting in-reactor creep and stress relaxation experiments to evaluate irradiation-induced deformation of zirconium alloys used in power reactors.

*S. R. MacEwen
A. R. Causey*



MITIGATING COMMUNITY IMPACTS OF ENERGY DEVELOPMENT: SOME EXAMPLES FOR COAL AND NUCLEAR GENERATING PLANTS IN THE U.S.

Elizabeth Peelle (MA, University of Tennessee, 1964) is a chemist-turned-sociologist who initiated the development of social impact assessment at Oak Ridge National Laboratory. She is a research staff member and former group leader of the Social Impact Assessments Group. Her current interests are the comparative social costs of coal and nuclear fuel cycles and community mitigation planning.

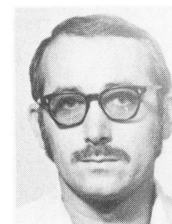
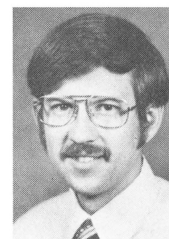
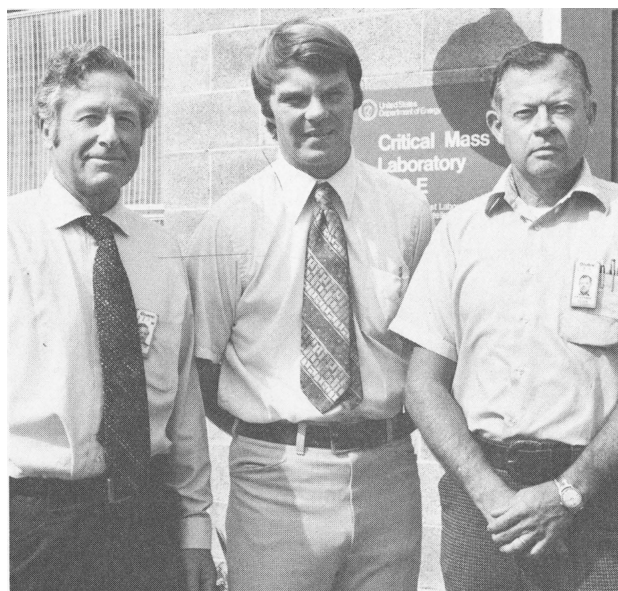
Elizabeth Peelle



CRITICAL EXPERIMENTS WITH FAST TEST REACTOR FUEL PINS IN WATER

S. R. Bierman (right) (BS, chemical engineering, Texas Technological University, 1956; MS, nuclear engineering, University of Washington, 1963) has been involved both in the chemical processing industry and in criticality research and analysis. He is currently a staff scientist at the Critical Mass Laboratory at Battelle-Pacific Northwest Laboratories (PNL), where he has been active in both the generation of basic experimental criticality data and the utilization of these data in performing criticality analyses of production plant systems. He is currently vice chairman of the Nuclear Criticality Safety Division of the American Nuclear Society (ANS). **B. M. Durst** (center) (BS, physics, University of Washington, 1971; MS, nuclear engineering, Louisiana State University, 1974) is a research scientist at PNL, where he has been actively involved in the generation of basic experimental and computational criticality data. **E. Duane Clayton** (left) (PhD, physics, University of Oregon, 1952) is currently associate manager of criticality analysis at PNL, and is a research associate professor in the University of Washington's Department of Nuclear Engineering. He is a pioneer in criticality studies with plutonium and, since its inception in 1961, has been director of the Plutonium Critical Mass Laboratory of PNL. He is currently chairman of Work Groups 12 and 15 within Subcommittee ANS-8 (Fissionable Materials Outside Reactors) of the ANS Standards Committees. His current technical interests include most aspects of criticality measurements and studies. **R. I. Scherpelz** (bottom right) (MS, nuclear engineering, Oregon State University, 1978) is employed at PNL. Among his current interests are neutronics calculations applicable to criticality safety and calculational techniques in dosimetry. **H. T. Kerr** (bottom left) (BS, nuclear engineering, University of Tennessee, 1964) is a research staff member of the Engineering Technology Division of Oak Ridge National Laboratory (ORNL). He was heavily involved in the neutronic analyses of various molten-salt reactor designs and was responsible for the neutronic design and dosimetry of several high-temperature gas-cooled reactor irradiation experiments in the Oak Ridge Reactor and the high flux isotope reactor. He presently serves as the task leader for nuclear engineering on the Consolidated Fuel Reprocessing Program at ORNL, with principal responsibility for criticality safety considerations in the fuel reprocessing facilities.

*S. R. Bierman
B. M. Durst
E. D. Clayton
R. I. Scherpelz
Howard T Kerr*

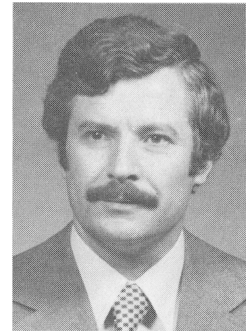


ECONOMICS

ECONOMIC PERFORMANCE OF LIQUID-METAL FAST BREEDER REACTOR AND GAS-COOLED FAST REACTOR RADIAL BLANKETS

*Nicholas Tsoulfanidis
M. Hossein Jankhah*

Nick Tsoulfanidis (right) (BS, physics, University of Athens, Greece, 1960; MS, nuclear engineering University of Illinois, 1965; PhD, nuclear engineering, University of Illinois, 1968) is associate professor of nuclear engineering at the University of Missouri-Rolla. In addition to his teaching duties, he conducts research in the areas of radiation transport and nuclear fuel cycle. **Mohammad Hossein Jankhah** (photo not available) (BS, physics, Pahlavi University, 1967; MS, physics, St. Louis University, 1973; MS, nuclear engineering, University of Missouri-Rolla, 1975; PhD, nuclear engineering, University of Missouri-Rolla, 1978) is now an assistant professor of nuclear engineering at Pahlavi University, Shiraz, Iran.

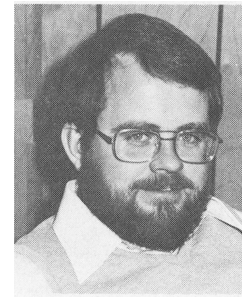


MATERIALS

MULTIAXIAL CREEP EQUATIONS FOR NONLINEAR AND VOLUME-NONCONSERVATIVE IN-REACTOR CREEP

M. M. Hall, Jr.

M. M. Hall, Jr. (PhD, materials engineering, Purdue University, 1974) is a metallurgist assigned to the Experimental Breeder Reactor II Project at Argonne National Laboratory (ANL). Since joining ANL in 1975, his work has been in the area of radiation effects on mechanical properties of reactor core and structural materials.

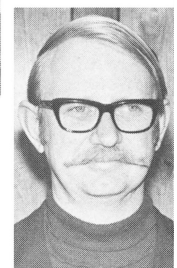
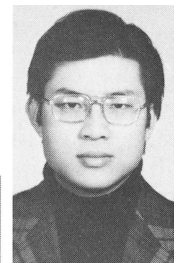
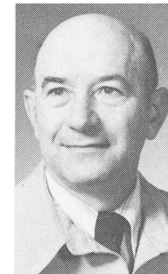


RADIOISOTOPES

STUDY OF AN OPTIMUM DESIGN FOR SUBCRITICAL NEUTRON MULTIPLIERS USING CALIFORNIUM-252 NEUTRON SOURCES

*B. Wei-Teh Lee
S. H. Levine
W. A. Jester*

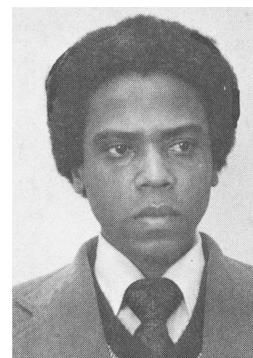
B. Wei-Teh Lee (top) (PhD, nuclear engineering, The Pennsylvania State University, 1975) is a senior engineer in the Nuclear Technology Department at General Electric Company. His work has been in the areas of analysis for zero-power plutonium reactor critical experiments and method qualification for neutron and gamma-ray shielding and for gamma-tip applications. **Samuel H. Levine** (center) (PhD, nuclear physics, University of Pittsburgh, 1954) is professor of nuclear engineering and director of the Breazeale Nuclear Reactor at The Pennsylvania State University. His technical interests currently are in fuel management, neutron spectrum measurements, research with radiation sources, and TRIGA reactors. **William A. Jester** (bottom) (PhD, chemical engineering, The Pennsylvania State University, 1965) is associate professor of nuclear engineering at The Pennsylvania State University. His current research interest is in the application of radiation and radioisotopes, especially neutron activation analysis, groundwater tracing, and environmental monitoring.



APPLICATION OF THE SELF-POWERED DETECTOR CONCEPT IN THE DESIGN OF A THRESHOLD GAMMA-RAY DETECTOR

Francis E. LeVert (PhD, nuclear engineering, The Pennsylvania State University, 1971) has worked in the Applied Physics Division at Argonne National Laboratory since 1974. He has recently been involved in the development of in-core anisotropic neutron and gamma-ray detectors.

F. E. LeVert



PLUTONIUM ISOTOPIC CALCULATIONS FOR A MODERN LIGHT WATER REACTOR

R. D. Mosteller (top right) (PhD, nuclear science, University of Michigan, 1973) is a scientist on the staff of Science Applications, Inc. in McLean, Virginia. He is a reactor physicist whose principal work has been in the areas of software development and applications. His other current interests include reactor operations support for utilities and nonproliferation aspects of nuclear power. For the past several years, he has been deeply involved in the development and benchmarking of the Advanced Recycle Methodology Program (ARMP) system. **Warren M. Andrews** (top left) [BS, engineering physics, Auburn University, 1954; MS, physics, Vanderbilt University, 1955; MS (1957), PhD (1960), nuclear engineering, University of California] is a senior core analysis engineer for Southern Company Services in Birmingham, Alabama. His work there is concerned with all aspects of nuclear fuel design and operation, especially coordinated establishment of a data link system between the plant and the central computer to allow automated running of core analysis programs. **Odelli Ozer** (bottom right) (DESc, Columbia University, 1968) is project manager in the Department of Nuclear Safety and Analysis at the Electric Power Research Institute (EPRI). His responsibilities include management of projects relating to the development and utilization of nuclear data. Prior to joining EPRI, he was responsible for ENDF/B development at the National Neutron Cross Section Center at Brookhaven National Laboratory. **W. J. Eich** (bottom left) (MS, physics, Rutgers University, 1955) is a program engineer in the Nuclear Power Division of EPRI. He is a nuclear engineer with over 20 years of experience in the commercial reactor area. He has been principally involved in critical experiment analysis and generalized development directed toward core modeling. He has been project manager on the contractor side for the ARMP (and its precursor) since 1971.

*R. D. Mosteller
Warren M. Andrews
Odelli Ozer
W. J. Eich*

