



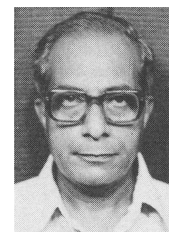
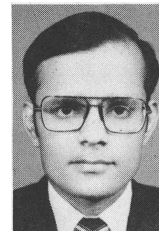
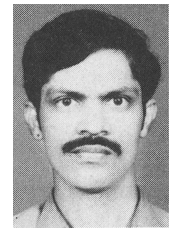
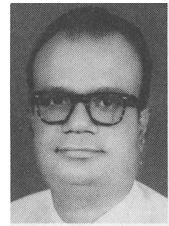
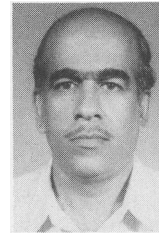
## AUTHORS — SEPTEMBER 1988

### FISSION REACTORS

#### REMOVAL OF ALUMINUM TURBIDITY FROM HEAVY WATER REACTORS BY PRECIPITATION ION EXCHANGE USING MAGNESIUM HYDROXIDE

**Kasibhatla Sri Venkateswarlu** (top right) (DSc., recoil chemistry, Andhra University, India, 1961; Dipl., nuclear science and engineering, Argonne National Laboratory, 1959) joined the Bhabha Atomic Research Centre (BARC) in 1955 and is currently head of the Water Chemistry Division. He has wide-ranging experience in fields such as recoil chemistry, solvent extraction, ion exchange, reactor chemistry, and water chemistry in nuclear and thermal power stations. **Ramendra Shanker** (top left) (PhD, inorganic chemistry, University of Bombay, India, 1968) joined the Water Chemistry Division of BARC in 1956. His fields of specialization are solvent extraction and ion exchange. **Sankaralingam Velmurugan** (center right) (MSc, chemistry, Madurai-Kamaraj University, India, 1981) served as assistant professor in chemistry at the American College, Madurai, India, for 2 years. He joined the Water Chemistry Division of BARC in 1985 after graduating from the BARC Training School. He is working in the field of reactor water chemistry. **Gopala Venkateswaran** (bottom left) (PhD, physical chemistry, University of Bombay, India, 1983) joined the Water Chemistry Division of BARC in 1971 after graduating from the BARC Training School. His fields of specialization are material compatibility studies in nuclear reactor applications, water reactor fuel performance evaluations, reactor water chemistry, and reactor safety. **Mysore Ranganatha Rao** (bottom right) (BSc, industrial chemistry, Banaras-Hindu University, India, 1950) was with BARC from 1956 to 1986 and was in charge of the research reactors as head of the Reactor Operations Division. He is currently a consultant to the Atomic Energy Regulatory Board on nuclear power plant safety.

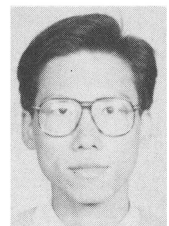
*Kasibhatla Sri Venkateswarlu  
Ramendra Shanker  
Sankaralingam Velmurugan  
Gopala Venkateswaran  
Mysore Ranganatha Rao*



#### DEVELOPMENT OF A FOUR-EQUATION REACTOR COOLANT SYSTEM MODEL FOR PRESSURIZED WATER REACTOR SIMULATION

**Mankit Ray Yeung** (top) [BS, engineering science, Texas, 1973; MS, nuclear engineering, Massachusetts Institute of Technology (MIT), 1975; ScD, nuclear engineering, MIT, 1978] was formerly associated with Babcock & Wilcox, Westinghouse Electric Corporation, and Gould, Inc. He joined the Department of Mechanical Engineering of the University of Hong Kong in 1984. His current research interest is in the area of pressurized water reactor (PWR) plant simulation. **Ping Lam Chan** (BS, mechanical engineering, University of Hong Kong, 1985) is currently a graduate

*Mankit Ray Yeung  
Ping Lam Chan*

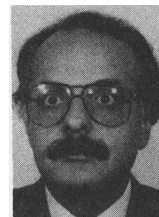


student at the Department of Mechanical Engineering of the University of Hong Kong. His research area is in PWR simulation modeling.

### CORE PHYSICS OF A SMALL BOILING WATER REACTOR FOR DISTRICT HEATING

**Alex Galperin** (top) (PhD, nuclear engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel, 1979) is a senior lecturer in the Department of Nuclear Engineering of Ben-Gurion University. His research interests are in nuclear fuel cycle analysis and plant engineering. **Constantine G. Foskolos** (center) (Dipl., mechanical engineering, National Technical University of Athens, Greece, 1972) works at the Paul-Scherrer-Institute (PSI) (formerly the Federal Institute for Reactor Research), Würenlingen, Switzerland, in the Laboratory for Reactor Physics and System Engineering. His main interests currently involve advanced light water reactors (LWRs) and small reactors for district heating. **Peter Grimm** (bottom) (Dipl., physics, Federal Institute of Technology, Zurich, Switzerland, 1978) works at PSI, Würenlingen, Switzerland, in neutronics calculations of LWR configurations.

*Alex Galperin  
Constantine G. Foskolos  
Peter Grimm*

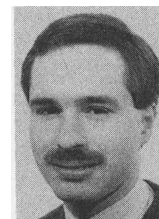


### FUEL CYCLES

### A POINT REACTIVITY MODEL FOR IN-CORE FUEL CYCLES

**Geoffrey Thomas Parks** (top) [BA, 1984, and MA, 1987, engineering, University of Cambridge (UC), United Kingdom] is completing work on a PhD in nuclear engineering, sponsored by the Central Electricity Generating Board, at UC. His research interests include fuel cycle dynamics, Monte Carlo optimization techniques, and neutron stochastic theory. **Jeffery David Lewins** (BA and MA, mechanical engineering, UC, 1956; MSc and PhD, nuclear engineering, Massachusetts Institute of Technology, 1959; PhD, engineering, UC; DSc, engineering, University of London, United Kingdom, 1979) has been the lecturer in charge of nuclear power engineering at UC since 1980 and is a fellow of Magdalene College. He was with the Royal Engineers until he joined the University of London in 1969. His main research interests are in perturbation theory and dynamics.

*Geoffrey Thomas Parks  
Jeffery David Lewins*



### NUCLEAR FUELS

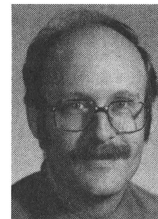
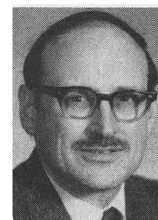
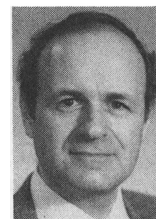
### A GAUGE FOR NONDESTRUCTIVE ASSAY OF IRRADIATED FUEL RODS

**George Tessler** (left) (PhD, physics, University of Pennsylvania, 1964) joined the Westinghouse Bettis Atomic Power Laboratory (W-BAPL) in 1963. He worked on the development and application of the nondestructive irradiated fuel assay gauge from 1975 to 1987. **Ben R. Beaudoin** (right) (BS, engineering physics, University of Maine, 1962) joined W-BAPL in 1963 and worked on nuclear design, manufacturing, power operation,

*George Tessler  
Ben R. Beaudoin  
William J. Beggs  
Louis B. Freeman  
Albert C. Kahler  
William C. Schick, Jr.*



physics testing, and proof-of-breeding phases of the light water breeder reactor (LWBR) program. He developed numerous design and data analysis computer programs and computer automation techniques during the history of the LWBR program. **William J. Beggs** (top right) (PhD, statistics, University of Wisconsin, 1969) is a fellow mathematician at W-BAPL providing statistical consultation for a wide range of laboratory activities. He was the primary statistician for the LWBR project and was responsible for the development of the mathematical model and sampling plan for the estimation of total core loading. **Louis B. Freeman** (top left) (PhD, applied mathematics, University of Pittsburgh, 1965) has worked at W-BAPL since 1958 on nuclear calculational methods development, nuclear design and core follow, physics testing and data analysis, criticality safety, and the LWBR fuel assay program. **Albert C. Kahler** (bottom right) (PhD, physics, University of Tennessee, 1978) joined W-BAPL in 1981 and worked with the LWBR proof-of-breeding group. **William C. Schick, Jr.** (bottom left) (PhD, physics, Massachusetts Institute of Technology, 1966) is a fellow scientist at W-BAPL and has worked in the LWBR proof-of-breeding program since 1977.

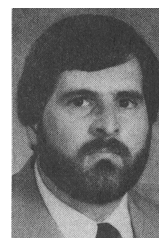


## MATERIALS

### FRACTURE TOUGHNESS OF IRRADIATED STAINLESS STEEL ALLOYS

*W. J. Mills*

**W. J. Mills** (BS, 1971; MS, 1973; and PhD, 1975, metallurgical engineering, Lehigh University) is an advisory engineer in the High Strength Materials Development Section at Westinghouse Bettis Atomic Power Laboratory. His technical interests include the study of stress corrosion cracking, fatigue and fracture responses for nickel-base superalloys, ferritic steels, and austenitic stainless steels. Previously, his work at Westinghouse Hanford Company focused on characterization of the fracture mechanics behavior for nuclear reactor structural materials.



## RADIOISOTOPES AND ISOTOPE SEPARATION

### DESCRIPTION AND ANALYSIS OF AN ACCELERATOR-BASED PRODUCTION METHOD OF THE BRACHYTHERAPY SOURCE $^{145}\text{Sm}$

*Thomas E. Blue*

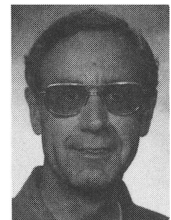
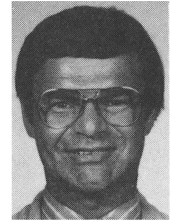
**Thomas E. Blue** (PhD, nuclear engineering, University of Michigan, 1978) is an assistant professor of nuclear and mechanical engineering at Ohio State University. His present research interests include radiation interaction, transport, and measurement in biology and medicine, especially in fast neutron radiation therapy, boron neutron capture therapy, and photon activation therapy. He is also interested in solid-state nuclear track detectors and automatic image analysis.



## DOSE ESTIMATES FROM THE CHERNOBYL ACCIDENT

**Rolf Lange** (top) (PhD, atmospheric sciences, University of California, Davis, 1985) is a senior scientist at the University of California Lawrence Livermore National Laboratory (LLNL). Since 1971 he has worked on the development of numerical transport and diffusion models for the atmosphere. He is presently working in the Atmospheric and Geophysical Sciences Division where his activities and interests lie in atmospheric dispersion in complex terrain, turbulent diffusion, and emergency response models. **Marvin H. Dickerson** (center) (PhD, meteorology, Florida State University, 1971) joined LLNL as a research scientist after graduation. In 1974 he became associate division leader of the newly formed Atmospheric and Geophysical Sciences Division. From 1978 to 1985, he was scientific director of the U.S. Department of Energy's Atmospheric Studies in Complex Terrain (ASCOT) program. Presently, he is deputy division leader of the Atmospheric and Geophysical Sciences Division. **Paul H. Gudiksen** (bottom) (PhD, chemistry, University of Washington, 1967) is a group leader in the Atmospheric and Geophysical Sciences Division at LLNL. His interests and activities are in atmospheric dispersion, nuclear studies, and emergency response.

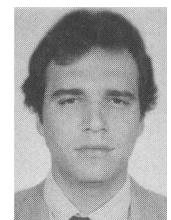
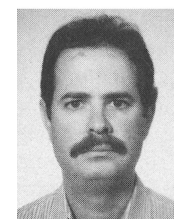
*Rolf Lange  
Marvin H. Dickerson  
Paul H. Gudiksen*



## A COMPUTERIZED SYSTEM FOR CONTINUOUS MONITORING OF THE CORE COOLING MARGIN

**Luiz Rogério Araujo de Araujo** (top right) [MSc, nuclear engineering, Universidade de Federal do Rio de Janeiro (UFRJ), Brazil, 1984] is an electrical engineer at COPPE/UFRJ. His research interests are in electronic design and thermohydraulics. He is currently involved with the validation and verification of the safety parameter display system (SPDS) for the Angra-1 nuclear power plant. **Aquilino Senra Martinez** (top left) (PhD, nuclear engineering, UFRJ, Brazil, 1983) is an associate professor at COPPE/UFRJ. His research interests include neutronics analysis, determination of energy-group constants in the presence of resonance absorbers, and computerized decision aids system development for nuclear power plant operation. He is manager of the nuclear area in the project for developing an SPDS for Angra-1. **Roberto Schirru** (bottom right) (MSc, nuclear engineering, UFRJ, Brazil, 1980) is an assistant professor at COPPE/UFRJ. Since 1983 he has worked as computer system manager in the project for developing an SPDS for Angra-1. He is interested in real-time methods to be applied in computerized systems for nuclear power plant operation. **Renato Kahn** (bottom left) (BS, electrical engineering, UFRJ, Brazil, 1971) is an engineer at Furnas-Centraís Eléctricas in the instrumentation and control design and technical support areas. He is presently involved in implementing the Three Mile Island requirements at Angra-1.

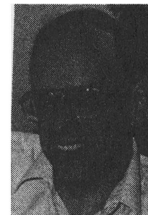
*Luiz Rogério Araujo de Araujo  
Aquilino Senra Martinez  
Roberto Schirru  
Renato Kahn*



**ONSET OF NUCLEATE BOILING IN RESEARCH REACTORS WITH THIN RECTANGULAR CHANNELS UNDER LOW-VELOCITY UPWARD-FLOW CONDITIONS**

**Mohamed Belhadj** (top) [BS, mechanical engineering, Michigan State University, 1985; MS, nuclear engineering, The Ohio State University (OSU), 1987] is currently a PhD student in the nuclear engineering program at OSU. **Tunc Aldemir** (center) (BS, mathematical physics, Istanbul University, Turkey, 1971; MS, 1975, and PhD, 1978, nuclear engineering, University of Illinois) is an assistant professor of nuclear and mechanical engineering at OSU. He has 8 years of experience with research reactor core design, analysis, and optimization. He has also served as an International Atomic Energy Agency expert on the low-enriched uranium conversion/upgrade of research reactors. **Richard N. Christensen** (bottom) (BS, physics, Brigham Young University, 1968; MS, mechanical engineering, and PhD, nuclear engineering, Stanford University) is currently an associate professor in the nuclear engineering program at OSU. His current research areas include enhanced heat transfer, two-phase flow and heat transfer, condensation in the presence of a noncondensable, heat transfer in nuclear waste repositories, and inherently safe reactors.

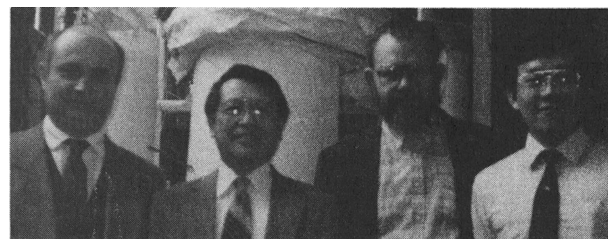
*Mohamed Belhadj  
Tunc Aldemir  
Richard N. Christensen*



**REPRODUCIBILITY IN A MULTILoop THERMAL-HYDRAULIC SYSTEM**

**Kazys K. Almenas** (group photo, second from right) (BS, University of Nebraska, 1957; PhD, University of Warsaw, Poland, 1968) is an associate professor at the University of Maryland (UM). His research interests include energy and mass transport in postaccident containment atmospheres and two-phase flow in integral facilities. **Yih-Yun Hsu** (group photo, second from left) (PhD, University of Illinois, 1958) is a professor at UM. He has worked in the area of boiling two-phase flow for nearly 30 years. His interests mainly include the application of thermal-hydraulic principles to nuclear reactor safety. **Marino DiMarzo** (group photo, left) (PhD, Catholic University, 1982) is an associate professor at UM. His interests include thermal hydraulics, transport phenomena, change of phase, and fire suppression mechanisms. **Zen-You Wang** (group photo, right) (PhD, UM, 1987) is a research associate at UM. His interests include thermal hydraulics, scaling analysis, code simulation, and energy transport in biosystems. **Gary A. Pertmer** (center) (PhD, University of Mississippi, 1978) is an associate professor at UM. His research interests are in the areas of fluid dynamics, heat transfer, reactor systems analysis, and laser Doppler anemometry. **Richard Lee** (bottom) (PhD, UM, 1982) is project manager with the Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission. He is currently responsible for most of the experimental thermal-hydraulic research related to the Babcock & Wilcox reactor design.

*Kazys K. Almenas  
Yih-Yun Hsu  
Marino DiMarzo  
Zen-You Wang  
Gary A. Pertmer  
Richard Lee*



**REAL-TIME NEUTRON RADIOGRAPHY SYSTEM PERFORMANCE – MEASUREMENTS AND METHODS**

**Mark F. Sulcoski** (top) [BS, physics, Florida Institute of Technology, 1974; MS, nuclear engineering, The Pennsylvania State University (PSU), 1979; PhD, engineering physics, University of Virginia (UV), 1985] is a physicist with the U.S. Army. His primary interests are in the applied mathematics of signal processing image processing, and optics. He has held positions in both industry and government in these areas. **Kenneth W. Tobin** (center) (BS, physics, 1983; MS, nuclear engineering, Virginia Tech, 1984; PhD, nuclear engineering, UV, 1987) works in the fields of nondestructive testing and measurement science. He is currently with the Enrichment Technology Applications Group for Advanced Technology Development, Oak Ridge National Laboratory. **Jack S. Brenizer, Jr.** (bottom) (BA, physics, Shippensburg State College, 1972; ME, engineering science, 1977; PhD, nuclear engineering, PSU, 1981) is on the engineering faculty at UV in Charlottesville, Virginia. He is actively involved in neutron radiography research and neutron activation analysis. He has developed a real-time neutron radiographic facility at the UV Reactor Facility and has been working primarily on neutron radiographic techniques.

*Mark F. Sulcoski  
Kenneth W. Tobin  
Jack S. Brenizer, Jr.*

