



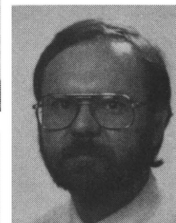
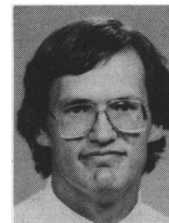
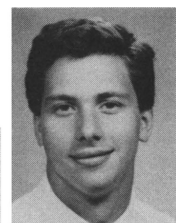
## AUTHORS — MARCH 1988

### FISSION REACTORS

#### INTEGRAL FUEL BURNABLE ABSORBERS WITH ZrB<sub>2</sub> IN PRESSURIZED WATER REACTORS

**Randy L. Simmons** (top right) (BS, nuclear engineering, Pennsylvania State University, 1984) works for the Westinghouse Electric Corporation Commercial Nuclear Fuel Division (CNFD) in the area of reactor core design. **Niel D. Jones** (top left) (BS, nuclear engineering, University of Cincinnati, 1985) is currently a nuclear engineer at Southern Company Services. Prior to 1987, he was a nuclear core designer with the Westinghouse CNFD and was involved in designing the first reactor core with a full loading of integral fuel burnable absorbers. **Frank D. Popa** (center right) (MS, nuclear engineering, University of Wisconsin, 1977) is a senior engineer at Westinghouse Electric Corporation with previous experience in reactor core design and is now responsible for neutronics modeling of nuclear power plant simulators. **Donald E. Mueller** (bottom left) (MS, nuclear engineering, University of Illinois, 1984) is currently working for the Westinghouse CNFD in nuclear core design and criticality safety. **James E. Pritchett** (bottom right) (MS, nuclear engineering, Howard University, 1977) is a senior engineer at the Westinghouse CNFD. He has lead reactor core design responsibility for Westinghouse two-loop 14 × 14 plants.

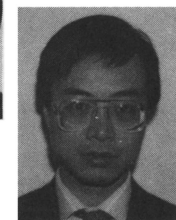
*Randy L. Simmons  
Niel D. Jones  
Frank D. Popa  
Donald E. Mueller  
James E. Pritchett*



#### ASSESSMENT OF THE SAFER03 COMPUTER CODE USING ADVANCED BOILING WATER REACTOR TEST DATA ON A LOSS-OF-COOLANT ACCIDENT

**Seihiro Itoya** (left) (BS, applied mathematics, Science University of Tokyo, Japan, 1972) has worked for 14 years at the Nippon Atomic Industry Group (NAIG) Research Laboratory where he is a manager of nuclear safety and transients. His current interests include analysis of boiling water reactor (BWR) loss-of-coolant accidents (LOCAs) and BWR plant simulators. **F. D. Shum** (right) (MS, nuclear engineering, Rensselaer Polytechnic Institute, 1978) joined General Electric Company in 1980 and has

*Seihiro Itoya  
F. D. Shum  
Jun-ichiro Otonari  
Hideo Nagasaka*



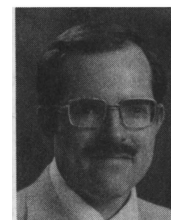
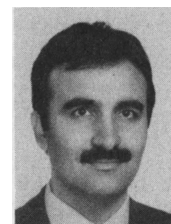
been working in the areas of thermal hydraulics and nuclear reactor safety. He is the major contributor in the development of the realistic BWR model for LOCA analysis, SAFER, and the successful licensing of SAFER in the United States and overseas using a statistical approach. **Jun-ichiro Otonari** (right) (BS, nuclear engineering, University of Kyushu, Japan, 1982) is a research engineer. He worked for 4 years at the NAIG Research Laboratory and has worked for 2 years in the Nuclear Safety Engineering Section at Toshiba Corporation. His current interests include analysis of LOCAs in BWRs. **Hideo Nagasaka** (left) (PhD, mechanical engineering, University of Keio, Japan, 1974) worked for 9 years at the Nuclear Engineering Laboratory at Toshiba Corporation and has worked for 3 years at Toshiba's Nuclear Energy Group, where he is a manager of nuclear safety research. His current interests include experiments and analysis of thermal-hydraulic behavior during a LOCA.



**A NONINVASIVE TECHNIQUE FOR THE EVALUATION OF DIVERSION CROSS FLOW AT THE INLET OF A SIMULATED FUEL ROD BUNDLE**

**Alireza Sedaghat** (top) [PhD, nuclear engineering, Columbia University (CU), 1984] joined CU in 1984 and is now an assistant professor in the Department of Applied Physics and Nuclear Engineering. His research interests include application of radioisotopes and digital computer imaging systems in engineering, thermal hydraulics, and safety analysis. **Frank S. Castellana** (photo not available) (EngScD, chemical engineering, CU, 1969; MD, Albert Einstein College of Medicine, 1976) was an associate professor in chemical engineering at CU until 1984. While there, his research interests included nuclear reactor heat and mass transfer and the use of radionuclide imaging in characterization of physical processes. He is now medical director of Squibb Convatec. **Robert H. Hsu** (center) (EngScD, chemical engineering, CU, 1984) is a project leader for E. I. Du Pont de Nemours and Company at the Savannah River Laboratory, responsible for safety and probabilistic risk analysis for a new project. His doctoral research involved characterization of mixing in a Koch-type static mixer. **Robert B. Macduff** (bottom) (PhD, mechanical engineering, Oregon State University, 1979) joined Advanced Nuclear Fuels Corporation in 1979. He has worked in spray heat transfer, reflood heat transfer, critical power measurements, and departure from nucleate boiling measurement programs. His interests include thermal-hydraulic measurements, safety, and fuels.

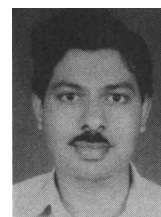
*Alireza Sedaghat  
Frank S. Castellana  
Robert H. Hsu  
Robert B. Macduff*



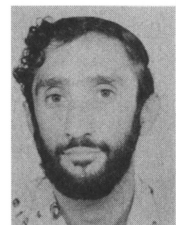
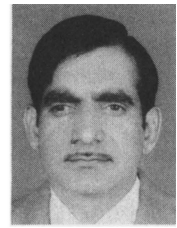
**A NEW APPROACH IN SIGNAL PROCESSING FOR SODIUM BOILING NOISE DETECTION BY PROBABILITY DENSITY FUNCTION ESTIMATES**

**C. P. Reddy** (right) [MSc, physics, University of Mysore, India, 1974; graduated from the Training School of Bhabha Atomic Research Centre (BARC), Bombay, India, 1975] has worked in the Reactor Physics Division (RPD) of the reactor group at Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakam, India, since August 1975. During this period he has worked on physics aspects of design and commissioning and is in charge of planning and execution of experiments of the fast breeder test reactor (FBTR) at IGCAR. He participated in the startup experiments of Madras Atomic Power Station and physics experiments at Purnima reactor at BARC. His other research interests are

*C. P. Reddy  
Om Pal Singh  
R. K. Vyjayanthi  
R. Prabhakar*



reactor noise, signal processing techniques, reactor operation, and fuel management. **Om Pal Singh** (top) (PhD, physics, Indian Institute of Technology, Delhi, India, 1971) has also worked in the RPD of the reactor group at IGCAR since 1973. He is in charge of the Safety and Noise Analysis Section of the RPD and is responsible for the studies on kinetics, safety, and noise analysis of the FBTR and the 500-MW(electric) prototype fast breeder reactor, which is under design at Kalpakkam. He is also responsible for dynamics and noise experiments on the FBTR. His research interests include reactor kinetics, neutron transport and diffusion theory, core-disruptive accident analysis, molten fuel coolant interaction and equation-of-state and theoretical and experimental power reactor noise analysis and its applications for parameter estimation and malfunction detection. **R. K. Vyjayanthi** (center) (Bachelor of Engineering, electronics engineering, Bangalore University, India, 1978; graduated from the training division of BARC, 1979) has worked in the Engineering Development Division (EDD) of the reactor group at IGCAR since 1979. She has been working in the area of acoustic and thermal noise analysis and related hardware and software development work. Her present interest is in developing new signal processing techniques for acoustic and thermal noise. **R. Prabhakar** (bottom) (Bachelor of Engineering, Electrical Engineering, Madras University, India, 1970; graduated from the BARC Training Division, 1971) has worked in the EDD of the reactor group at IGCAR since 1971. He is currently in charge of the Electromagnetic Devices and Noise Analysis Section and is responsible for development in these two areas. He was earlier responsible for the operation of sodium test facilities and related experiments and for research in sodium instrumentation. His current areas of interest include development of electromagnetic devices for liquid-metal fast breeder reactor (LMFBR) applications and experimental noise analysis techniques for detecting cavitation, boiling, leak, and vibrations in LMFBRs.



#### **A SEMIANALYTIC METHOD FOR THE SOLUTION OF THE STEADY-STATE STEAM GENERATOR EQUATIONS**

*Constantine P. Tzanos*

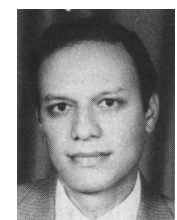
**Constantine P. Tzanos** (Dipl., chemical engineering, National Technical University of Athens, Greece, 1968; ScD, nuclear engineering, Massachusetts Institute of Technology, 1971) is manager of the Operational Safety Section of the Reactor Analysis and Safety Division at Argonne National Laboratory. His current research activities involve development of methods for on-line data validation, system state verification, and fault identification as well as development of system models that run faster than real time for the implementation of the methods.



#### **SELECTION OF A SUITABLE REACTOR TYPE FOR WATER DESALINATION AND POWER GENERATION IN SAUDI ARABIA**

*Fahmy M. Hussein*

**Fahmy M. Hussein** [BSc, nuclear engineering, 1970, and BSc, nuclear physics, 1972, Alexandria University, Egypt; MSc, atomic physics, 1974, and PhD, mechanical engineering, 1978, University of Western Ontario (UWO), Canada] worked as a demonstrator at UWO for 1 year and as a reactor safety engineer and reactor design and commissioning engineer at Atomic Energy of Canada from 1979 to 1984. Since 1984 he has been on

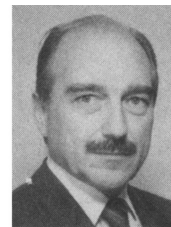


the staff of the College of Engineering, King Saud University, Saudi Arabia. His interests are nuclear engineering and heat and mass transfer, especially reactor safety, siting, and desalination.

### VIBRATION MONITORING OF KRAFTWERK UNION PRESSURIZED WATER REACTORS—REVIEW, PRESENT STATUS, AND FURTHER DEVELOPMENT

**Hans Stölben** (top) (Dipl.-Ing. FH, mechanical engineering, 1958) has been employed since 1959 in mechanical laboratories, first at Siemens AG, then at Kraftwerk Union (KWU) in Erlangen. He is at present senior advisor on vibration technology and head of the dynamic test instrumentation department. He has particular experience in experimental vibration testing of reactor components and circuits. **Hans-Jochen Wehling** (Dipl.-Ing., thermal and process engineering, Technical University of Hannover, FRG, 1963) was employed from 1964 to 1968 at Deutsche Babcock and Wilcox, Oberhausen, where he was concerned with thermodynamic and fluid dynamic relations. Since joining Siemens/KWU in 1969, he has been involved in experimental studies in the field of structural and fluid dynamics. A central aspect of his work as scientific advisor is the vibration monitoring of the reactor coolant systems of light water reactor power plants.

*Hans Stölben  
Hans-Jochen Wehling*



## FUEL CYCLES

### THE CHEMICAL STATE OF FISSION PRODUCTS IN OXIDE FUELS AT DIFFERENT STAGES OF THE NUCLEAR FUEL CYCLE

**Heiko Kleykamp** (Dipl., physics, 1964, and Dr. rer. nat., physical chemistry, 1967, University of Munich, Federal Republic of Germany) joined the Institut für Material- und Festkörperforschung of the Kernforschungszentrum Karlsruhe in 1967. His work involves postirradiation studies on nuclear fuels within the different stages of the fuel cycle and the constitution and thermodynamics of refractory systems.

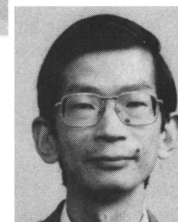
*Heiko Kleykamp*



### OPTIMAL AXIAL ENRICHMENT DISTRIBUTION OF THE BOILING WATER REACTOR FUEL UNDER THE HALING STRATEGY

**Kazuki Hida** (top) (BS, applied physics, 1978, and MS, nuclear engineering, 1980, Tokyo Institute of Technology, Japan) is a researcher in the reactor core department of the Nippon Atomic Industry Group Nuclear Research Laboratory, and is responsible for core and fuel management of the boiling water reactor (BWR). His current interests include the application of the mathematical programming to the design analysis. **Ritsuo Yoshioka** (MS, nuclear engineering, Osaka University, Japan, 1970) is a manager in the Core Design and Management Section, Nuclear Energy Division of Toshiba Corporation, and is responsible for the core design and core management of BWRs.

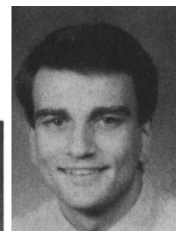
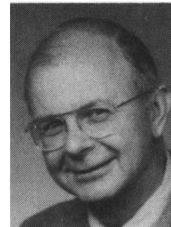
*Kazuki Hida  
Ritsuo Yoshioka*



### THE EFFECTS OF ORGANIC IMPURITIES ON THE PARTITIONING OF IODINE

**Jeffrey B. Lutz** (top) (BS, engineering physics, Grove City College, 1983; PhD, engineering physics, University of Virginia, 1987) is employed as a research analyst by the Center for Naval Analysis, Alexandria, Virginia. **James L. Kelly** (BS, chemical engineering, Tulane, 1954; MS, 1960, and PhD, 1962, chemical engineering, Louisiana State University) is a professor of nuclear engineering at the University of Virginia. His research interests include iodine chemistry, radiation-enhanced corrosion, and radiolytic degradation of polymers.

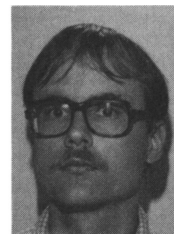
*Jeffrey B. Lutz  
James L. Kelly*



### APPLICATION OF TEXTURE IN PREDICTING NUCLEAR FUEL CLADDING CREEP

**William L. Daugherty** (top) [BS, nuclear engineering, North Carolina State University (NCSU), 1979] is completing work on a PhD in nuclear engineering at NCSU. He is a fellow with the U.S. Department of Energy's nuclear engineering fellowship program, working on materials science applications in the nuclear industry. **K. Linga Murty** (MSc, physics, Andhra University, India, 1963; MS, 1967, and PhD, 1970, materials science and engineering, Cornell University) is a professor in the nuclear engineering and materials engineering departments at NCSU and has been involved in research on the creep and mechanical anisotropy of Zircaloy and the embrittlement of nuclear pressure vessel steels. His other current research interests include the effects of aggressive environment and neutron exposure on the mechanical properties and fracture characteristics of metals.

*William L. Daugherty  
K. Linga Murty*



### THE FLASHCAL PROCESS FOR THE FABRICATION OF FUEL-METAL OXIDES USING THE WHITESHELL ROTOSPRAY CALCINER

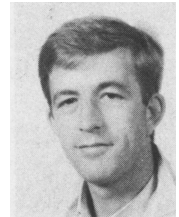
**T. Sampat Sridhar** (PhD, chemical engineering, University of New Brunswick, Canada, 1969) has been with Atomic Energy of Canada Limited (AECL) since 1974. Prior to joining AECL, he was an assistant professor of chemical engineering at the University of Sherbrooke. He had also worked as scientific officer at the Bhabha Atomic Research Centre. At AECL's Whiteshell Nuclear Research Establishment, he directed research and development programs on both product recovery and radwaste treatment related to nuclear fuel recycle as head of the Process Development Section. He is currently head of the Industrial Materials Section, involved in the development of advanced industrial materials for nuclear and nonnuclear applications as part of the ongoing business development efforts on spinoff technologies at Whiteshell.

*T. Sampat Sridhar*



**ON THE TIME-DEPENDENT BEHAVIOR OF A CYLINDRICAL  
SALT DOME WITH A HIGH-LEVEL WASTE REPOSITORY***Jan Prij*

**Jan Prij** (Ing., mechanical engineering, College of Advanced Technology, Groningen, Netherlands, 1966; mathematics, Free University of Amsterdam, Netherlands, 1976) is head of the Applied Mechanics Group of the Netherlands Energy Research Foundation. His current interests are applied mechanics and safety aspects of waste disposal.

**DESIGNING SHAFTS FOR HANDLING HIGH-LEVEL RADIO-  
ACTIVE WASTES IN MINED GEOLOGIC REPOSITORIES***Douglas F. Hambley  
John R. Morris*

**Douglas F. Hambley** (top) (BSc, mining engineering, Queen's University at Kingston, Canada, 1972; MBA, Lewis University, 1986) is a mining engineer with the Energy and Environmental Systems Division of Argonne National Laboratory (ANL). He is responsible for mining engineering and rock mechanics aspects of contractor documents undergoing peer review by ANL for the Salt Repository Project Office of the Civilian Radioactive Waste Management Program. His technical interests include the behavior of underground openings in salt rock and design of underground facilities. **John R. Morris** (BSc, mining engineering, University of Alberta, Canada, 1958) is a consulting engineer and manager, Mining Division, at V. B. Cook Company, Ltd. His consulting assignments have included evaluating and designing shaft and headframe facilities, including hoisting systems, for numerous mining companies. In addition to shafts and hoisting, he is a specialist in ventilation in salt mines.

