



## AUTHORS — NOVEMBER 1986

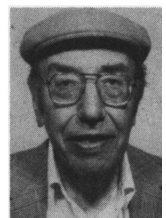
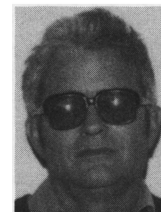
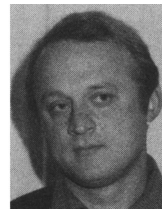
### FISSION REACTORS

#### THE EFFECT OF BORON AND GADOLINIUM BURNABLE POISONS ON THE HOT-TO-COLD REACTIVITY SWING OF A PRESSURIZED WATER REACTOR ASSEMBLY

*Alex Galperin  
Meir Segev  
Alvin Radkowsky*

#### SUBSTITUTION OF THE SOLUBLE BORON REACTIVITY CONTROL SYSTEM OF A PRESSURIZED WATER REACTOR BY GADOLINIUM BURNABLE POISONS

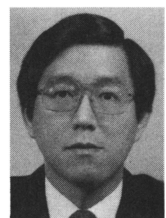
**Alex Galperin** (top) (PhD, nuclear engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel, 1979) is a senior lecturer in the Department of Nuclear Engineering of Ben-Gurion University. His research interests are in nuclear fuel cycle analysis and plant engineering. **Meir Segev** (center) (PhD, nuclear engineering, Technion, Haifa, Israel, 1968) is a professor in the Department of Nuclear Engineering of Ben-Gurion University. His research activities include reactor physics, resonance absorption, and fast neutron physics. **Alvin Radkowsky** (bottom) (PhD, Catholic University of America, 1947) is a professor of nuclear engineering at Tel-Aviv University and Ben-Gurion University of the Negev. Until his retirement from the U.S. government in 1972, he was a chief scientist for naval reactors from the inception of the program. His principal interests are in reactor physics and advanced reactor concepts.



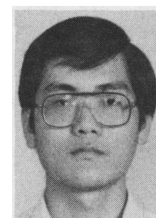
#### EVALUATIONS AND MODIFICATIONS OF THE EPRI-1 CORRELATION ON PWR CRITICAL HEAT FLUX PREDICTIONS UNDER NORMAL AND ABNORMAL FUEL CONDITIONS

*B. S. Pei  
Y. B. Chen  
Chunkuan Shih  
W. S. Lin*

**B. S. Pei** (top) (BS, nuclear engineering, National Tsing-Hua University, Taiwan, 1975; MS, 1980, and PhD, 1981, nuclear engineering, University of Cincinnati) is an associate professor of the Department of Nuclear Engineering, National Tsing-Hua University. His research interests include two-phase flow and heat transfer, reactor safety analysis, and severe core damaging study. **Y. B. Chen** (bottom) [BS, nuclear engineering, National Tsing-Hua University, Taiwan, 1971; MS, 1975, and PhD, 1977,



nuclear engineering, Massachusetts Institute of Technology (MIT)] is a senior scientist and head of the Reactor Technology Division at the Institute of Nuclear Energy Research (INER). His research interests include safety and thermal-hydraulic analyses of light water reactors. **Chunkuan Shih** (top) (BS, nuclear engineering, National Tsing-Hua University, Taiwan, 1971; MS, 1975, and PhD, 1978, nuclear engineering, University of Wisconsin-Madison) is a professor in the Department of Nuclear Engineering, National Tsing-Hua University. He is currently visiting the Department of Nuclear Engineering, MIT. His main research interests include various aspects of two-phase flow and boiling heat transfer, nuclear reactor severe accident analysis, and steam explosion. **W. S. Lin** (bottom) (BS, 1983, and MS, 1985, nuclear engineering, National Tsing-Hua University, Taiwan) is now a PhD student in the Department of Nuclear Engineering, National Tsing-Hua University. His research interests include two-phase flow and boiling heat transfer, reactor accident analysis, and currently concentrated on critical heat flux experiments at INER.

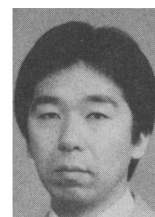


## FUEL CYCLES

### SIMULTANEOUS EVALUATION OF THE EFFECTS OF $^{232}\text{U}$ AND $^{236}\text{U}$ ON URANIUM RECYCLING IN BOILING WATER REACTORS

**Kazuki Hida** (top) (MS, nuclear engineering, Tokyo Institute of Technology, Japan, 1980) is a researcher in the reactor core department of NAIG Nuclear Research Laboratory and is responsible for the nuclear fuel cycle. He has also been a member of the Japanese Nuclear Data Committee since 1982. His current interest is core and fuel management of boiling water reactors. **Sadao Kusuno** (center) (BS, physics, Waseda University, Japan, 1964; PhD, nuclear physics, Osaka University, Japan, 1969) joined the Institute of Physical and Chemical Research, Japan, in 1969. He was a visiting researcher at Kernforschungsanlage Jülich from 1971 to 1973 and at the Technical University of Munich from 1973 to 1974. Since 1974 he has been a member of NAIG, responsible for analysis of reactor core and fuel cycle systems. **Takeshi Seino** (bottom) (BS, nuclear engineering, Tohoku University, Japan, 1969) is a deputy manager of the reactor design engineering department, Nuclear Energy Group of Toshiba Corporation, and responsible for research and development of the nuclear fuel cycle.

*Kazuki Hida  
Sadao Kusuno  
Takeshi Seino*

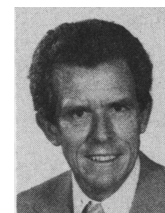


## CHEMICAL PROCESSING

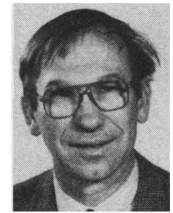
### PUMA — A NEW MATHEMATICAL MODEL FOR THE RAPID CALCULATION OF STEADY-STATE CONCENTRATION PROFILES IN MIXER-SETTLER EXTRACTION, PARTITIONING, AND STRIPPING CONTACTORS USING THE PUREX PROCESS

**John F. Geldard** (right) (BSc, chemistry, 1958; MSc, 1959, and PhD, 1964, organic chemistry, University of Sydney) is on sabbatical leave from Clemson University (CU) and currently is a

*John F. Geldard  
Adolph L. Beyerlein  
Houn-Lin Chiu*



visiting staff member at Los Alamos National Laboratory. His research interests include chelate chemistry, transition metal chemistry, the mathematical modeling of nuclear reprocessing, and the dynamics of inorganic molecules. **Adolph L. Beyerlein** (top) (BS, chemistry, Fort Hays Kansas State College, 1960; PhD, physical chemistry, University of Kansas, 1966) is currently a professor of chemistry at CU. Before joining the CU faculty in 1967, he was a Welch Foundation postdoctoral fellow at Rice University for one year. His areas of interest lie in theoretical chemistry, transport phenomena, thermal diffusion, and nuclear reprocessing. **Houn-Lin Chiu** (bottom) (BS, chemistry, Tam Kang University, 1979; MS, National Taiwan Normal University, 1982) is a graduate student in the PhD curriculum in the Department of Chemistry and Geology, CU.

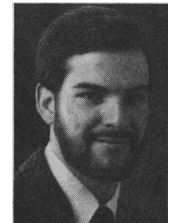


RADIOACTIVE WASTE  
MANAGEMENT

**WASTE PACKAGE COMPONENT INTERACTIONS WITH SAVANNAH RIVER DEFENSE WASTE GLASS IN A LOW-MAGNESIUM SALT BRINE**

*B. P. McGrail*

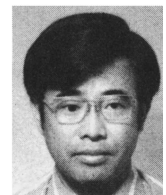
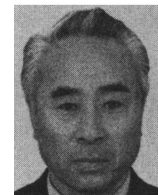
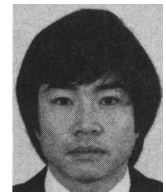
**B. P. McGrail** (BS, 1981, and MS, 1983, nuclear engineering, University of Missouri-Rolla) is a research scientist in the materials science and technology department at Pacific Northwest Laboratory (PNL), Richland, Washington. He is a task leader in the waste package program at PNL, which is researching the radionuclide release behavior of waste packages to be emplaced in geologic salt formations. His current areas of interest include corrosion studies of glass/water interactions, the formation and transport of colloids in aqueous media, and the development and validation of mathematical models for predicting radionuclide release rates from nuclear waste repositories.



**DECOMPOSITION OF ION EXCHANGE RESINS BY PYROLYSIS**

*Masami Matsuda  
Kiyomi Funabashi  
Takashi Nishi  
Hideo Yusa  
Makoto Kikuchi*

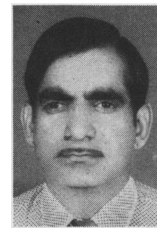
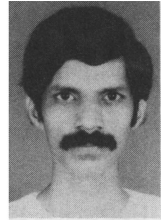
**Masami Matsuda** (top left) (BS, 1977, and MS, 1979, electronics, Osaka University, Japan) is a researcher at the Energy Research Laboratory (ERL), Hitachi, Ltd. His primary areas of interest are radioactive waste management and reactor water chemistry. **Kiyomi Funabashi** (top right) (Hitachi Technical College, Japan, 1974) is a researcher at ERL and works in the field of radioactive waste treatment. **Takashi Nishi** (center left) (BS, 1982, and MS, 1984, environmental engineering, Kyoto University, Japan) is a researcher at ERL where he is involved in radioactive waste treatment and spent-fuel reprocessing. **Hideo Yusa** (bottom right) (BS, physics, Tohoku University, Japan, 1959; Dr. Eng., Osaka University, Japan, 1969) is a chief researcher at ERL. He is responsible for the research and development (R&D) of radioactive waste management and spent-fuel reprocessing. **Makoto Kikuchi** (bottom left) (BS, chemistry, Tohoku University, Japan, 1968; PhD, chemistry, University of New York at Buffalo, 1973) is a senior engineer at Hitachi Works, Hitachi, Ltd., and is responsible for radioactive waste treatment systems R&D.



### ON THE DYNAMICS OF FUEL VAPOR PRESSURE BUILDUP IN VOIDED LIQUID-METAL FAST BREEDER REACTOR CORES DURING TRANSIENT HEATING

*P. Bhaskar Rao  
Om Pal Singh*

**P. Bhaskar Rao** (top) (MSc, physics, Ranchi University, India, 1972; PhD, physics, Indian Institute of Technology, Madras, India, 1981) has worked in the Safety and Noise Analysis Section of the Reactor Physics Division at Indira Gandhi Centre for Atomic Research, Kalpakkam, India, since 1971. He is engaged in safety analysis studies of the fast reactors such as the 40-MW(thermal) fast breeder test reactor, which achieved criticality on October 18, 1985, and the 500-MW(electric) prototype fast breeder reactor, which is under design at Kalpakkam. His research activities and interests include reactor kinetics, thermal-hydraulic safety analysis, core disruptive accidents, fuel/coolant (thermal) interaction, equation of state at high temperature, and shock/structure interaction. **Om Pal Singh** (MSc, physics, Allahabad University, U.P., India, 1968; PhD, physics, Indian Institute of Technology, Delhi, India, 1971) has worked in the Reactor Physics Division of the reactor group at Indira Gandhi Centre for Atomic Research, India, since 1973. He is head of the Safety and Noise Analysis Section and is responsible for studies on kinetics, safety, and noise analysis of fast reactors at the Centre. He was an Alexander Humboldt Research Fellow at the Institute for Kerntechnik, Technical University of Hannover, Federal Republic of Germany, in 1976-1977. His areas of research interest include reactor kinetics, neutron transport and diffusion theory, core disruptive accident analysis, molten fuel/coolant interaction, equations of state, and power reactor noise analysis.



### A RADIATION HEAT TRANSFER MODEL FOR THE SCDAP CODE

*Manohar S. Sohal*

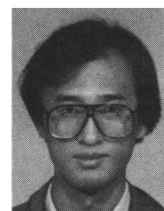
**Manohar S. Sohal** (BS, 1965, and MS, 1967, Birla Institute of Technology and Science, Pilani, India; PhD, mechanical engineering, University of Houston, 1972) has been with EG&G Idaho, Inc., Idaho Falls, Idaho, since 1980. From 1972 to 1976 he held research positions with universities in Holland, the United Kingdom, and the United States. From 1976 to 1980 he worked at the research and development center of M. W. Kellogg, Houston, Texas. His work has been in the areas of heat transfer, two-phase flow, model development, and numerical analysis. His current duties include monitoring research projects for industrial energy conservation sponsored by the U.S. Department of Energy.



### THREE-DIMENSIONAL TWO-FLUID CODE FOR U-TUBE STEAM GENERATOR THERMAL DESIGN ANALYSIS

*Jae Young Lee  
Hee Cheon No*

**Jae Young Lee** (right) [BS, nuclear engineering, Han Yang University, Korea, 1984; MS, nuclear engineering, Korea Advanced Institute of Science and Technology (KAIST), 1986] is currently a PhD student at KAIST. His research areas include the development of new numerical logic in thermal-hydraulic analysis and



the analysis of steam generators. **Hee Cheon No** (right) (BS, nuclear engineering, Seoul National University, Korea, 1976; PhD, nuclear engineering, Massachusetts Institute of Technology, 1983) is an assistant professor in the Department of Nuclear Engineering at KAIST. His current research areas include thermal-hydraulic analysis of light water reactors, mechanical analysis of fuel elements, and application of modern control theory to nuclear power plants.



## TECHNIQUES

### CHARACTERISTICS OF A FOIL-TYPE ELECTRET DOSIMETER FOR A SURFACE ALPHA CONTAMINATION MONITOR

**Tatsuhiko Uda** (top) (BS, pharmacology, 1970, and MS, agricultural technology, 1972, Kyoto University, Japan) has worked at Energy Research Laboratory (ERL), Hitachi, Ltd., on uranium handling and measurement studies. His current interests include measurement instruments and systems in reprocessing plants. **Hisao Otsuka** (center) (MS, mechanical engineering, Gunma University, Japan, 1973) is a researcher at ERL. His current interests are in model development for radionuclide transport in fuel reprocessing systems. **Yoshihiro Ozawa** (bottom) (MS, nuclear engineering, 1970; PhD, nuclear engineering, Tokyo University, Japan, 1981) is a senior researcher at ERL. His current interests are in radioactive waste management, particularly radioactive iodine removal with absorbents.

*Tatsuhiko Uda  
Hisao Otsuka  
Yoshihiro Ozawa*

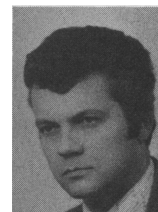


## CHEMICAL PROCESSING

### COMPARATIVE STUDY ON THE HYDROCYCLONE AND THE CENTRIFUGE AS EMULSION SEPARATORS IN THE HNO<sub>3</sub>-H<sub>2</sub>O-TBP-MEPASINE SYSTEM

**Romuald Sulima** (MS, 1969, and Dr. Eng., 1977, chemical technology and engineering, Warsaw Technical University, Poland) has worked in the field of spent fuel reprocessing and off-gas cleaning since 1969 at the Institute of Nuclear Research, Warsaw. He is currently interested in the management of radioactive wastes (mainly gaseous) in nuclear facilities.

*Romuald Sulima*



## CRITICALITY SAFETY

### BASIS FOR EXTENDING LIMITS IN ANSI STANDARD FOR MIXED OXIDES TO HETEROGENEOUS SYSTEMS

**Eugene D. Clayton** (right) (PhD, physics, University of Oregon, 1952) is a senior staff scientist at the Pacific Northwest Laboratory (PNL). Dr. Clayton has 35 years' experience in the nuclear field at Hanford, which includes experimental reactor physics, critical experiment work, criticality research and analysis, and nuclear criticality safety. He placed the Critical Mass Laboratory

*Eugene D. Clayton  
Hugh K. Clark  
Gordon Walker  
Richard A. Libby*



of PNL in operation in 1961 and was manager of this facility until 1984. He now serves as technical coordinator for criticality research programs at PNL. **Hugh K. Clark** (top) (AB, chemistry, Oberlin College, 1939; PhD, physical chemistry, Cornell University, 1943) is a research associate at the Savannah River Laboratory operated by E. I. duPont de Nemours and Company under contract to the U.S. Department of Energy. He has long been active in the field of nuclear criticality safety. **Gordon Walker** (center) (BSc, chemistry, University of Sheffield, 1949) joined the U.K. Atomic Energy Authority in 1959 and is now criticality section leader in the Safety and Reliability Directorate. His principal interests are in criticality safety of process plants and in the development/correlation of basic criticality data. **Richard A. Libby** (bottom) (MS, nuclear engineering, University of Washington, 1972) is a senior engineer at the Battelle Washington (D.C.) office of PNL. He has been active in criticality safety calculations since 1974. He is currently assisting with systems integration studies for the waste management program.

