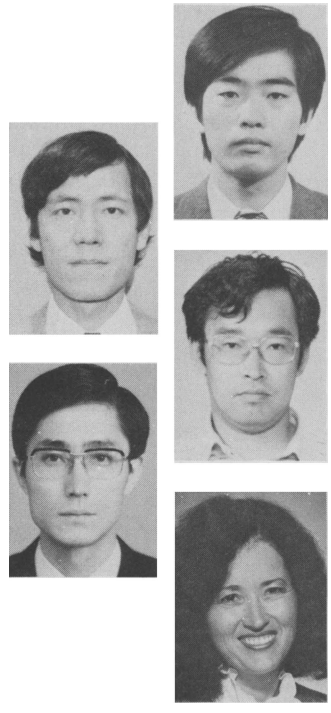
nuclear technology®

AUTHORS — JUNE 1984

FISSION REACTORS

CORE STABILITY TEST ANALYSIS USING THE AUTOREGRESSIVE MODEL

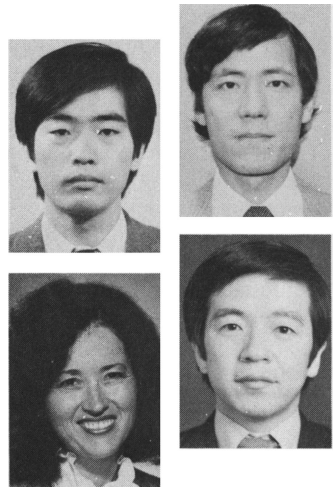
Tohru Mitsutake
Shigeaki Tsunoyama
Shigeru Kanemoto
Hideaki Namba
Shirley A. Sandoz



Tohru Mitsutake (top right) (BS, physics, 1976, and MS, nuclear engineering, 1979, Kyoto University) has been a staff engineer in the system analysis department at Nippon Atomic Industry Group Company, Ltd. since 1979, where he is involved in developing a parameter estimation method related to reactor dynamics. **Shigeaki Tsunoyama** (top left) (BS, physics, Tokyo University, 1967) is a senior researcher at Nippon Atomic Industry Group Company, Ltd. and has been engaged in the development of the physical model in the area of boiling water reactor (BWR) dynamics and safety. **Shigeru Kanemoto** (center right) (BS, 1974, and MS, 1976, nuclear engineering, Osaka University) joined Nippon Atomic Industry Group Company, Ltd. in 1976 and has been involved in the system identification research of BWRs with noise analysis. **Hideaki Namba** (bottom left) (BS, 1968, and MS, 1970, electrical engineering, Waseda University) is a deputy manager in the Reactor Control and Dynamics Section of Toshiba Corporation and is currently interested in the stability and abnormal operating transients of BWRs. **Shirley A. Sandoz** (bottom right) (PhD, mechanical engineering, Stanford University, 1973) has been employed by the Nuclear Energy Business Operation of the General Electric Company since 1971 in various areas involving fluids, heat transfer, and system dynamics technologies. She is currently manager of the system design methods group, responsible for BWR stability models and reactor tests.

REACTOR CORE STABILITY ANALYSIS FOR A BOILING WATER REACTOR BY A TRANSIENT MODEL

Shigeaki Tsunoyama
Tohru Mitsutake
Shigeo Ebata
Shirley A. Sandoz



Shigeaki Tsunoyama (top right) (BS, physics, Tokyo University, 1967) is a senior researcher at Nippon Atomic Industry Group Company, Ltd. and has been engaged in the development of the physical model in the area of boiling water reactor (BWR) dynamics and safety. **Tohru Mitsutake** (top left) (BS, physics, 1976, and MS, nuclear engineering, 1979, Kyoto University) has been a staff engineer in the system analysis department at Nippon Atomic Industry Group Company, Ltd. since 1979, where he is involved in developing a parameter estimation method related to reactor dynamics. **Shigeo Ebata** (bottom right) (BS, 1973, and MS, 1975, electrical engineering, Nagoya University) is an engineer in the Reactor Control and Dynamics Section of Toshiba Corporation and works on the transient analysis and system design of BWRs. **Shirley A. Sandoz** (bottom left) (PhD,

mechanical engineering, Stanford University, 1973) has been employed by the Nuclear Energy Business Operation of General Electric Company since 1971 in various areas involving fluids, heat transfer, and system dynamics technologies. She is currently manager of the system design methods group, responsible for BWR stability models and reactor tests.

AUTOMATED CONTROL ROD PROGRAMMING IN BOILNG WATER REACTOR CORES

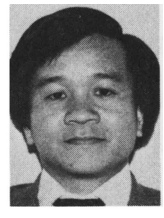
Wan-Li Zhong
J. Weisman

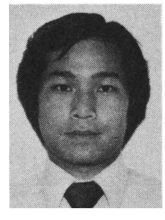
Wan-Li Zhong (photo not available) [engineering physics, Qinghua University in Beijing (Peking), China, 1962] worked in the area of nuclear computations at the Reactor Engineering and Design Institute, Beijing, China. From September 1981 to September 1983 he was a visiting scholar in the Department of Chemical and Nuclear Engineering at the University of Cincinnati (UC). He has now returned to the Reactor Engineering and Design Institute. **J. Weisman** (right) (PhD, University of Pittsburgh) is a professor of nuclear engineering and director of the Nuclear Engineering Program at the UC. Prior to joining UC in 1968, Weisman spent 18 years in industry where his last position was manager of thermal-hydraulic analysis for the Westinghouse Electric Corporation, Pressurized Water Reactor Division.

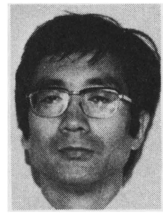
NUCLEAR SAFETY

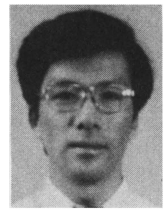
DEVELOPMENT OF A SODIUM VAPOR PRESSURE METER USING BETA-ALUMINA CERAMICS

Susumu Ninomiya
Fumio Ohtsuka
Hiromichi Nei
Osamu Takikawa
Mituo Harata





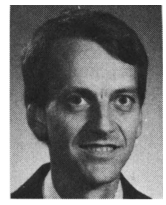


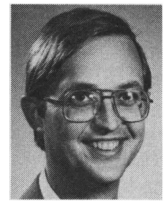


Susumu Ninomiya (top right) (MS, mechanical engineering, Osaka University, 1974) is a deputy manager in the Nuclear Engineering Laboratory at Toshiba Corporation. He has been engaged in studies on cold trap, vapor trap, and sodium cleaning. His current research interests include the study of sodium removal from narrow gap as crevice. **Fumio Ohtsuka** (top left) is a research engineer in the Nuclear Engineering Laboratory at Toshiba Corporation. His work has been the analysis of sodium vapor behavior in the fast breeder reactor cover gas system. **Hiromichi Nei** (center right) (BS, mechanical engineering, Hokkaido University, 1961; PhD, Tokyo Institute of Technology, 1978) is a manager in the Nuclear Engineering Laboratory, Toshiba Corporation. He has many years of experience with sodium technology, including experiments on sodium/water reaction and the development of sodium components. **Osamu Takikawa** (bottom left) (BS, physical chemistry, Nagoya University, 1973) is a researcher in the Research and Development Center at Toshiba Corporation. His current research interests include gas sensors, such as electrochemical sensors and semiconductor gas sensors. **Mituo Harata** (bottom right) (MS, crystal chemistry, Nagoya University, 1968) is a senior researcher in the Research and Development Center at Toshiba Corporation. He worked on the development of the beta-alumina solid electrolyte. His current research interests include the fabrication process of electronic ceramics.

ELECTRICALLY ENHANCED DEPOSITION OF A CONFINED AEROSOL IN THE PRESENCE OF IONIZING RADIATION

Robert A. Fjeld
Thomas J. Overcamp

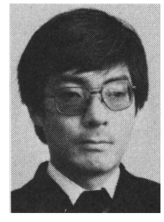


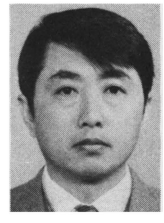


Robert A. Fjeld (top) (BS, nuclear engineering, North Carolina State University, 1970; MS, 1973, and PhD, 1976, nuclear engineering, The Pennsylvania State University) is an associate professor in the Department of Environmental Systems Engineering, Clemson University (CU). His primary technical interests are environmental aspects of nuclear technologies, aerosol physics, and radiation applications in environmental engineering. **Thomas J. Overcamp** (BS, mechanical engineering, Michigan State University, 1964; SM, 1970, and PhD, 1983, mechanical engineering, Massachusetts Institute of Technology) is an associate professor in the Department of Environmental Systems Engineering, CU. His interests include aerosol technology and air pollution control.

ANALYSIS OF COOLANT PRESSURE FLUCTUATION AND INDUCED VIBRATION OF LIQUID-METAL FAST BREEDER REACTOR FUEL PINS

Ken Amano
Kotaro Inoue

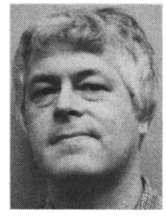


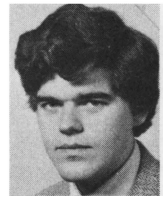


Ken Amano (top) (BE, electrical engineering, Yokohama National University, 1979; MS, plasma physics, Tokyo Institute of Technology, 1981) has been engaged in research on statistical mechanics of liquid metal in the fast breeder reactor (FBR) core system unit at the Energy Research Laboratory (ERL), Hitachi Ltd., Japan. **Kotaro Inoue** (BE, mechanical engineering, University of Tokyo, 1964; PhD, nuclear engineering, 1976) has engaged in reactor physics, safety analysis, systems design, solar energy development, and fusion systems research. He is presently a manager in the FBR core systems unit at the ERL, Hitachi Ltd., Japan.

DOMINANT FACTORS IN THE RELEASE OF FISSION PRODUCTS FROM OVERHEATED URANIA

C. D. Andriesse
R. H. J. Tanke



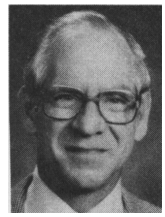


C. D. Andriesse (top) (PhD, Delft University of Technology, 1969) has worked as a research physicist in the KEMA Laboratories since 1980. He has published papers in the fields of neutron scattering, engineering of quantum solids, solid state astrophysics, and general astrophysics. His present work is on the behavior of fission products for the analysis of nuclear safety. **R. H. J. Tanke** (physics graduate, University of Utrecht, 1982) is performing his PhD thesis work in the KEMA Laboratories. His work concerns high-temperature mass spectrometry of irradiated UO_2 samples. He has studied problems in reactor physics at the Dodewaard Nuclear Power Station and at the Karlsruhe Nuclear Research Center.

RADIOACTIVE WASTE MANAGEMENT

LEACH TESTING OF IDAHO NATIONAL ENGINEERING LABORATORY WASTE FORMS IN A GAMMA FIELD

Robert P. Schuman



Robert P. Schuman (PhD, Ohio State University, 1946) works for EG&G Idaho, Inc., on the ultimate disposal of high-level defense and transuranium wastes. He worked for the Knolls Atomic Power Laboratory from 1947 to 1957 and at the National Reactor Testing Station from 1957 to 1969. He taught at Robert College, Boğaziçi Üniversitesi, Istanbul, from 1969 to

1977 and spent 1977-1978 as a visiting professor at Iowa State University. Among his interests are the chemical aspects of the nuclear fuel cycle, including waste management and actinide and fission product properties.

THE LEACHING BEHAVIOR OF ZIRCALOY CLADDING AND ITS IMPACT ON THE CONDITIONING OF WASTE FOR FINAL DISPOSAL

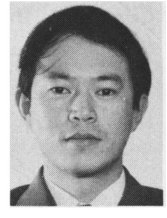
Berthold-Günter Brodda
Erich Richard Merz

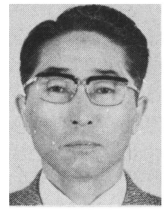
Berthold-Günter Brodda (photo not available) [Dr.-Ing., chemistry, Technical University of Berlin, Federal Republic of Germany (FRG), 1968] is a section leader at the Institute for Chemical Technology of Kernforschungsanlage (KFA) Jülich. He is currently working on hot analytical chemistry and on the characterization and disposal of special nuclear waste types. **Erich Richard Merz** (photo not available) (Dr. rer. nat, nuclear chemistry, University of Mainz, FRG, 1957; professor of Nuclear Technology Rheinisch Westfälische Technische Hochschule Aachen, 1970) has been director of the Institute for Chemical Technology of KFA since 1968. He is a member of the German Reactor Safety Commission. His work has been in the area of the backend of the nuclear fuel cycle including radioactive waste disposal.

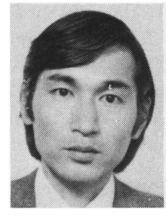
MATERIALS

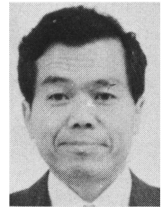
RADIOACTIVE CONTAMINATION OF CARBON STEEL IN A BOILING WATER REACTOR

Takashi Honda
Akira Minato
Katsumi Ohsumi
Hideo Matsubayashi









Takashi Honda (top right) (BS, electrochemical engineering, Yokohama National University, 1973) is a researcher at Hitachi Research Laboratory (HRL), Hitachi, Ltd. Since 1973 his general field of interest has been the corrosion of metals. His recent interests include the water chemistry of nuclear power plants. **Akira Minato** (top left) (BS, metallurgical engineering, Ibaraki University, 1953) is a senior researcher at HRL. Since 1970 he has been engaged in research on stress corrosion cracking of stainless steel and water chemistry of nuclear power systems. His current interests include the decontamination of nuclear plants. **Katsumi Ohsumi** (bottom right) (BS, nuclear engineering, Ohsaka University, 1970) is employed in the nuclear power plant engineering department, Hitachi, Ltd. His current technical interests include the water chemistry and radiation buildup control of nuclear power plants. **Hideo Matsubayashi** (bottom left) (BS, electrical engineering, Hiroshima University, 1957) is an assistant superintendent at Shimane Nuclear Power Plant, The Chugoku Electric Power Company, Inc. His current interests include the water chemistry and safety of nuclear power systems.

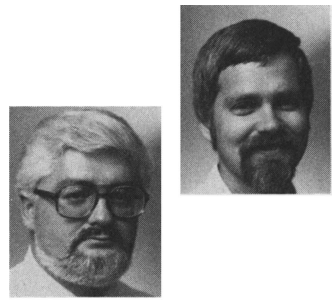
HEAT TRANSFER AND FLUID FLOW

HYDRAULICS OF BLOCKED ROD BUNDLES

Shi-chune Yao
M. J. Loftus
L. E. Hochreiter

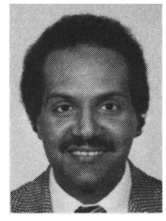
Shi-chune Yao (right) (BS, Tsing Hua University, Taiwan, 1968; MS and PhD, nuclear engineering, University of California, Berkeley, 1974) is a professor in the Department of Mechanical Engineering, Carnegie-Mellon University. His research interests are in the area of boiling heat transfer, two-phase flow, reactor

safety analysis, and spray combustion. He has also been a consultant at Westinghouse Electric Corporation for many years. **M. J. Loftus** (top) (BSME, MSME, 1978, PE) has worked in thermal-hydraulic testing and analysis of pressurized water reactor safety related experiments for approximately 11 years at Westinghouse. **L. E. Hochreiter** (bottom) (BSME, University of Buffalo; MS and PhD, nuclear engineering, Purdue University, 1971) joined Westinghouse in 1971 and has been working in the light water reactor thermal-hydraulics areas, particularly as applied to reactor safety. He is also a lecturer at Carnegie-Mellon University.

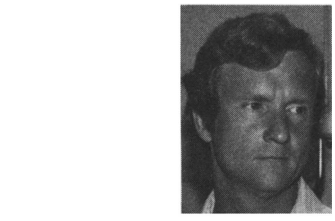


AN IMPROVED MULTIDIMENSIONAL FINITE DIFFERENCE SCHEME FOR PREDICTING STRATIFIED HORIZONTAL PIPE FLOW

Yassin A. Hassan
James G. Rice
Jong H. Kim



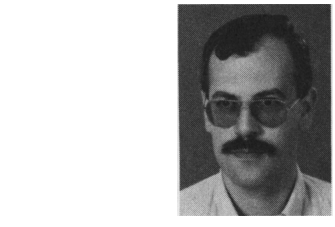
Yassin A. Hassan (top) (BSC, nuclear engineering, University of Alexandria, 1968; MSC, 1975, and PhD, 1979, nuclear engineering, University of Illinois) is a senior engineer at the Utility Power Generation Division, Babcock & Wilcox Company, Lynchburg, Virginia. He is responsible for developing, modifying, and maintaining various thermal-hydraulic computer codes, and is currently involved in the development and application of three-dimensional codes, especially those relevant to the thermal shock problem. **James G. Rice** (center) (BS, Old Dominion University, 1972; MS, 1974, and PhD, 1978, Virginia Polytechnic Institute and State University) is an assistant professor in the Department of Mechanical and Aerospace Engineering at the University of Virginia (UV). His research activities at UV are in the area of computational methods for problems in heat transfer and fluid flow. His computational work includes both finite element and finite difference methods for a variety of applications, ranging from thermal-hydraulic problems to turbomachinery fluid flow analysis. Prior to joining the faculty at UV, he was the supervisor of an industrial research group. This group was responsible for the development of computational methods for application to problems in the nuclear and fossil power industries. **Jong H. Kim** (bottom) (PhD, mechanical engineering, California Institute of Technology, 1971) is a project manager in the Nuclear Power Division of the Electric Power Research Institute. His interests include computational methods, testing and analysis in fluid flow, and heat transfer.



FISSION REACTORS

COMPARATIVE STUDY OF MEASUREMENTS BY MEANS OF GAMMA THERMOMETER STRINGS WITH FISSION CHAMBER MEASUREMENTS

Charles Hantouche



Charles Hantouche (BS, physics, Lebanese University, 1977; MS, 1980, and PhD, 1984, nuclear instrumentation, University of Grenoble, France) is a trainee scientist at the studies and research center of Electricité de France. His interests and activities are in developing and interpreting the signal provided by a new nuclear instrumentation in the pressurized water nuclear reactor.