



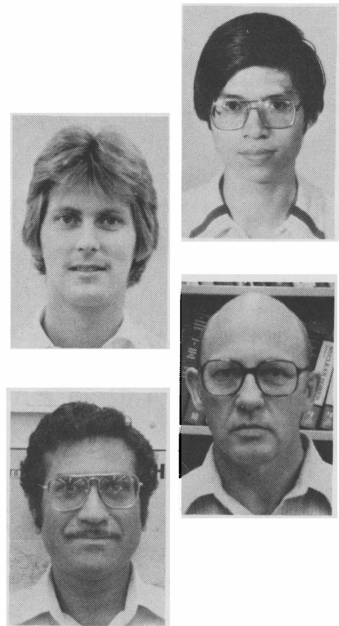
AUTHORS — APRIL 1984

POSTACCIDENT DEBRIS COOLING

DRYOUT OF AN INDUCTIVELY HEATED BED OF STEEL PARTICLES WITH SUBCOOLED FLOW FROM BENEATH THE BED

F. P. Tsai (top right) (BS, nuclear engineering, National Tsing-Hua University, 1978; MS, mechanical engineering, National Taiwan University, 1980) is a PhD candidate in the Department of Mechanical, Aerospace, and Nuclear Engineering in the School of Engineering at the University of California at Los Angeles (UCLA). **J. Jakobsson** (top left) (BS, mechanical engineering, University of Iceland, 1981; MS, thermal engineering, UCLA, 1983) is currently working in industry. His interests include the areas of heat and mass transfer. **I. Catton** (bottom right) (BS, engineering, UCLA; PhD, engineering, UCLA, 1966) is a professor in the Department of Mechanical, Aerospace, and Nuclear Engineering in the School of Engineering at UCLA. He also directs the T. E. Hicks Nuclear Energy Laboratory. His special interests include thermal hydraulics and nuclear safety. **V. K. Dhir** (bottom left) (PhD, mechanical engineering, University of Kentucky, Lexington, 1972) is a professor in the Department of Mechanical, Aerospace, and Nuclear Engineering in the School of Engineering at UCLA. His research interests include thermal hydraulics of nuclear reactors and reactor safety.

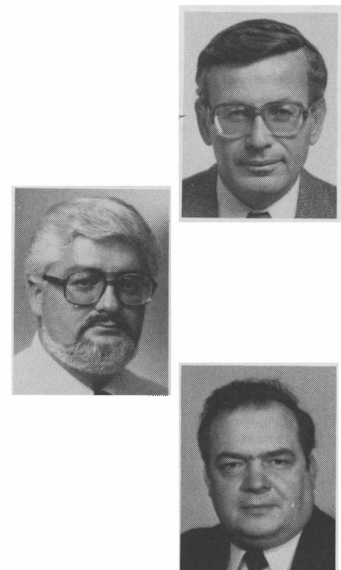
*F. P. Tsai
J. Jakobsson
I. Catton
V. K. Dhir*



MODES OF HEAT REMOVAL FROM A HEAT-GENERATING DEBRIS BED

D. Squarer (top) (BSCE, fluid mechanics, and MS, fluid mechanics, Technion, Israel Institute of Technology; MS, nuclear science and engineering, Carnegie-Mellon University; PhD, mechanics and hydraulics, University of Iowa) has worked at the Westinghouse R&D center from 1968 to 1981 on various topics, many of which are related to nuclear reactors performance and safety. He is currently on a loan assignment to the Electric Power Research Institute, where he is involved with severe accident and "source term" research. **L. E. Hochreiter** (center) (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 applied to reactor safety. He is also a lecturer at Carnegie-Mellon University. **A. T. Pieczynski** (bottom) (BS, mechanical engineering, University of Pittsburgh, 1963) is a senior engineer at the Westinghouse R&D center. He is currently working on core debris deposition in nuclear reactor piping.

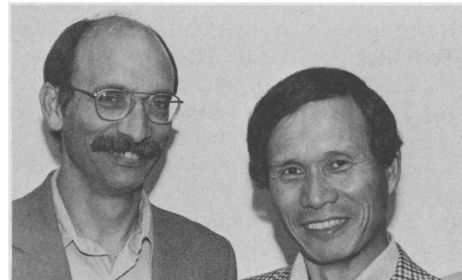
*D. Squarer
L. E. Hochreiter
A. T. Pieczynski*



ON THE PATTERN OF WATER PENETRATION INTO A HOT PARTICLE BED

D. H. Cho (top photo, right) (BS, chemical engineering, Seoul National University, 1961; MS, 1964 and PhD, 1966, chemical engineering, University of Minnesota) is a section manager in the Reactor Analysis and Safety Division of Argonne National Laboratory (ANL). His current research activities are concerned with a wide variety of heat transfer and fluid dynamics phenomena relevant to nuclear reactor safety assessment. **Donn R. Armstrong II** (top photo, left) (BS, chemical engineering, Northwestern University, 1962; PhD, chemical engineering, University of Minnesota, 1966) is a member of the Heat Transfer and Fluid Dynamics Section of the Reactor Analysis and Safety Division of ANL. His interests include vapor explosions and transition phase phenomena. **S. H. Chan** (bottom) (PhD, mechanical engineering, University of California, Berkeley, 1969) is a professor and chairman of the Department of Mechanical Engineering at the University of Wisconsin-Milwaukee. Previously, he taught in New York and was on the research staff in the Reactor Analysis and Safety Division at ANL. His current research areas include thermal radiative transfer, thermal radiation properties of reactor materials, thermal-hydraulic analysis of breeder and water reactors, heat transfer, and fouling heat transfer in geothermal energy systems.

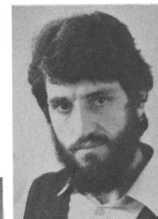
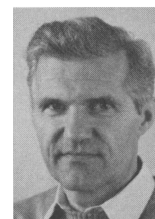
*D. H. Cho
Donn R. Armstrong II
S. H. Chan*



RADIATIVE CONTRIBUTION TO THE HEAT TRANSFER IN LIQUID URANIA

M. Bober (top) [Dr. Ing., University of Karlsruhe, Federal Republic of Germany (FRG), 1968] is a physicist at the Institut für Neutronenphysik und Reaktortechnik at Kernforschungszentrum Karlsruhe (KfK). He has been working in the field of thermodynamics of nuclear materials since 1961. His current main interest is in the study of thermophysical properties of materials at extreme temperatures for application to nuclear safety research. **J. Singer** (center) (Ing., physical technics, Fachhochschule Ravensburg, FRG, 1972) is a physical engineer at the Institut für Neutronenphysik und Reaktortechnik at KfK. He is engaged in material investigations at high temperatures and in the development of components for inertial confinement fusion. **K. Wagner** (bottom) (Dr. Ing., University of Karlsruhe, FRG, 1983) is a physicist whose doctoral thesis was on the high-temperature optical properties of nuclear materials at the Institut für Neutronenphysik und Reaktortechnik at KfK. At present he is working at the laboratory of steel process engineering at HOESCH AG Dortmund, FRG.

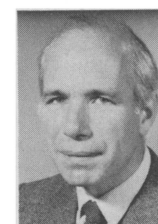
*M. Bober
J. Singer
K. Wagner*



ON THE LOCATION AND MECHANISMS OF DRYOUT IN TOP-FED AND BOTTOM-FED PARTICULATE BEDS

G. Hofmann (Dipl.-Ing., Technische Hochschule Darmstadt, Federal Republic of Germany, 1962) has performed thermo-hydraulic research in the area of light water reactor (LWR) safety at the Kernforschungszentrum Karlsruhe since 1963. His current technical interest is in the investigation of the coolability of degraded LWR cores, both experimentally and by modeling the observed mechanisms.

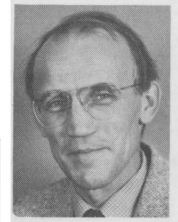
G. Hofmann



MECHANICAL BEHAVIOR OF SNR-300 REACTOR VESSEL COMPONENTS UNDER POSTACCIDENT HEAT REMOVAL CONDITIONS

Hartwig Laue (top) (Dipl.-Ing., konstruktiver Ingenieurbau, Technische Universität Hannover, 1964) is a department manager for strength, reactor, and handling. **Klaus Hermann Kerz** (Dipl.-Ing., Physikalische Ingenieurwissenschaften, Technische Universität Berlin, 1975) prepares strength calculations for the reactor tank and internal component parts of the fast breeder reactor, SNR-300, in Kalkar. Future tasks will be design calculations for the SNR-2 reactor tank.

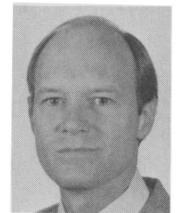
*Hartwig Laue
Klaus Hermann Kerz*



A COOLABILITY MODEL FOR POSTACCIDENT NUCLEAR REACTOR DEBRIS

Ronald J. Lipinski (BS, physics, California Institute of Technology, 1971; MS, 1973, and PhD, 1976, nuclear engineering, University of Illinois, Urbana-Champaign) has been at Sandia National Laboratories since 1977. His recent past experience is in assessing the coolability of particulate debris from either liquid-metal or water reactors. He is currently involved in assessing the uncertainty in the radiological source term from a severe light water reactor accident.

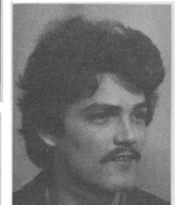
Ronald J. Lipinski



COOLING OF DEBRIS BEDS

Leopold Barleon (top) [Dr.-Ing., University of Karlsruhe, Federal Republic of Germany (FRG), 1970] is a research engineer at the Institute of Reactor Components at Kernforschungszentrum Karlsruhe (KfK). Since 1975 he has worked in the field of post-accident heat removal of fast reactors. **Klaus Thomauske** (center) is a technician at the Institute of Reactor Components at KfK. He has been engaged in the instrumentation and test operation of experimental facilities since 1981. **Heinrich Werle** (bottom) (Dr.-Ing., University of Karlsruhe, FRG, 1970) is a research physicist at the Institute of Neutron Physics and Reactor Technology at KfK, where he is currently working on fast reactor safety.

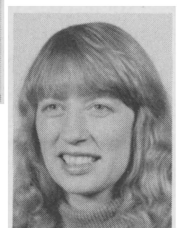
*Leopold Barleon
Klaus Thomauske
Heinrich Werle*



LIGHT WATER REACTOR DEBRIS FROM SEVERE IN-PILE TRANSIENT TESTS

Richard R. Hobbins (top) (AB, chemistry, Princeton University, 1960; PhD, metallurgy, University of Delaware, 1969) is manager of the Fission Product Research and Postirradiation Examination Support Branch, EG&G Idaho, Inc. He has spent 15 years at the Idaho National Engineering Laboratory (INEL) performing and supervising research in the area of fuel behavior under accident conditions. His current research interest is the relationship between fuel damage and the release and transport of fission products under severe core damage accident conditions in light water reactors (LWRs). **Beverly A. Cook** (bottom) (BS, metallurgical engineering, University of Washington, 1975) is supervisor of the Postirradiation Examination Section of the Light Water Reactor Safety Research Division at EG&G Idaho,

*Richard R. Hobbins
Beverly A. Cook
Richard E. Mason*



Inc. She has spent $8\frac{1}{2}$ years at the INEL conducting examinations and analyzing the results from research in the area of fuel behavior under accident conditions. Her current research includes fuel behavior under severe core damage accident conditions in LWRs. **Richard E. Mason** (right) (MS, materials science and engineering, University of Utah) is a staff member with the Advanced Fuels Group at Los Alamos National Laboratory. His current activities are in fuel irradiation behavior studies of UN, UO_2 , and UC for compact reactors. He was recently a senior staff engineer with EG&G Idaho, Inc. He was involved in post-irradiation examination studies of transient tested LWR fuel rods and fuel behavior code development.

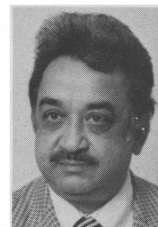
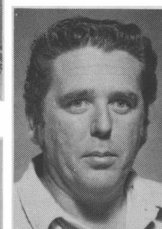
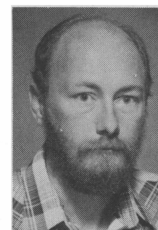


NUCLEAR SAFETY

STEAM GENERATOR LEAK DETECTION IN LIQUID-METAL FAST BREEDER REACTORS BY CHEMICAL METHODS

George J. Licina (top) (BS, metallurgical engineering, University of Illinois, 1972) is a materials technology engineer at the General Electric Company Advanced Reactor Systems Department (GE-ARSD). He is involved in testing of environmental effects on materials for liquid-metal fast breeder reactor applications and with developing impurity monitors for sodium and steam systems. **Dwight R. Springer** (center) is supervisor, Test Operations and Support Services at GE-ARSD. He has been involved in testing of materials and components for liquid-metal service for the past 15 years. **Prodyot Roy** (bottom) (PhD, materials science, University of California, Berkeley, 1963) is principal scientist in the GE-ARSD Materials Technology Group. His current interests include mechanical properties and environmental interactions with steam generator materials and the development of coolant impurity monitoring instrumentation.

*George J. Licina
Dwight R. Springer
Prodyot Roy*

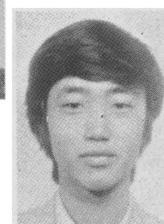


FUEL CYCLES

NONSOLUBLE FISSION PRODUCT RESIDUES, CRUD, AND FINE CHIPS OF ZIRCALOY CLADDING IN HEADEND PROCESS OF NUCLEAR FUEL REPROCESSING

Kozo Gonda (top) (BS, chemistry, Nagaya University, 1959; PhD, nuclear chemistry, Tokyo Institute of Technology, 1969) is group leader of the Operation Testing Laboratory (OTL) Group in the Tokai Reprocessing Plant of Power Reactor and Nuclear Fuel Development Corporation (PNC). He has been associated with PNC since 1961, working the initial stage on chemical separation of uranium isotopes and on the solvent extraction process of the Tokai Reprocessing Plant. His current interests include interfacial phenomenon of solvent extraction by the Purex process. **Koichiro Oka** (center) (BE, applied chemistry engineering, Waseda University, 1964) is a senior chemist. He joined the OTL Group in 1978 to develop the study of coprocessing. He is presently a researcher at Toray Industries, Inc. **Keiichi Hayashi** (bottom) (BE, nuclear chemistry, Kyoto University,

*Kozo Gonda
Koichiro Oka
Keiichi Hayashi*



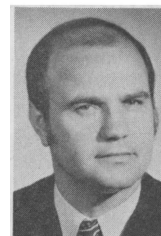
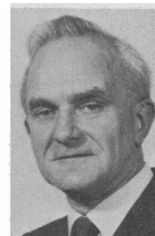
1978; ME, nuclear chemistry, Kyoto University, 1980) is a junior chemist. He joined the OTL Group in 1981 from Sumitomo Atomic Energy Ind., Ltd. to study the field of nuclear fuel reprocessing.

NUCLEAR FUELS

CHEMICAL INTERACTIONS BETWEEN UO_2 AND ZIRCALOY-4 FROM 1000 to 2000°C

Wolfgang Dienst (top) (MS, experimental physics, 1954, and PhD, solid-state physics, 1958, Free University of Berlin) is a scientific member of the Karlsruhe Nuclear Research Center, head of the department at the Institute for Materials Research, and a professor in the faculty of mechanical engineering, University of Karlsruhe. Since 1962, he has been engaged in research on properties and behavior of nuclear materials. His main interest is in irradiation behavior of ceramic nuclear fuels, mechanical and chemical interaction of fuel and cladding, and fuel element performance in general. **Peter Hofmann** (center) (BS, mechanical engineering, 1964, MS, nuclear engineering, 1968, and PhD, materials science, 1974, University of Karlsruhe) is a senior scientist and group leader at the Institute for Materials Research at the Karlsruhe Nuclear Research Center. Since 1968, he has been engaged in research on the behavior of light water reactor (LWR) fuel elements under accident conditions, Zircaloy stress corrosion cracking phenomena, physical chemistry of irradiated fuel rods, and compatibility behavior of fuel rod components. Current research interests include LWR fuel rod behavior under severe fuel damage conditions, with emphasis on the UO_2 /Zircaloy interaction at very high temperatures. **Deborah K. Kerwin-Peck** (bottom) (BS, engineering physics, University of Arizona, 1974; MS, mechanical engineering, University of Idaho, 1982) is a senior engineer in the LWR Fuel Research Division at EG&G Idaho, Inc. She has been a guest scientist at the Karlsruhe Nuclear Research Center from 1980 to 1983, representing the interests of the U.S. Nuclear Regulatory Commission and EG&G Idaho. She has specialized in fuel rod materials behavior research, most recently involving high-temperature UO_2 /Zircaloy-4 interactions under severe fuel damage conditions.

*Wolfgang Dienst
Peter Hofmann
Deborah K. Kerwin-Peck*



RADIOACTIVE WASTE MANAGEMENT

ON THE APPLICABILITY OF ANALYTICAL SOLUTIONS OF THE TRANSPORT EQUATION FOR THE MIGRATION OF SUBSTANCES IN GROUNDWATER-BEARING HORIZONS

Marion Petschel (top) [Dipl.-Chem., physical chemistry, Technical University Dresden, German Democratic Republic (GDR), 1971] is scientific collaborator in the National Board of Nuclear Safety and Radiation Protection of the GDR. Since 1971 she has been engaged in research on safety evaluation of radioactive waste storage with current interest to all areas of migration of radionuclides in the underground. **Dietmar Zappe** (Dipl.-Phys., 1966, Dr. rer. nat., 1971, and Dr. sc. nat., 1979, Technical University Dresden, GDR) is a lecturer for experimental physics

*Marion Petschel
Dietmar Zappe*

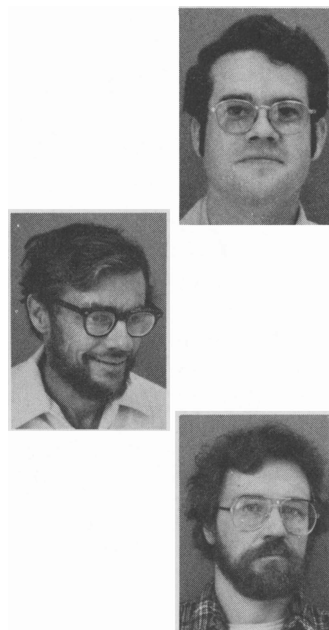


and radiation protection physicists. He worked for some years at the National Board for Nuclear Safety and Radiation Protection of the GDR in the field of safety assessment for radioactive waste disposal. His current interests include the information processing for all dosimetric purposes and radiation detection techniques.

THE EFFECT OF COMPOSITION OF SELECTED GROUNDWATERS FROM THE BASIN AND RANGE PROVINCE ON PLUTONIUM, NEPTUNIUM, AND AMERICIUM SPECIATION

Terry F. Rees (top) (BS, chemistry, Metropolitan State College, 1974; MS, chemistry, 1981, and PhD, applied chemistry, 1982, Colorado School of Mines) is a research chemist in the Transuranium Research Project (TRP) of the U.S. Geological Survey. His current research interest is in the geochemical behavior of the transuranium elements under conditions expected in and near possible nuclear waste repositories. **Jess M. Cleveland** (center) (BS, chemistry, Georgia Institute of Technology, 1951; MS, chemistry, 1955, and PhD, inorganic chemistry, 1959, University of Colorado) is chief of the TRP of the U.S. Geological Survey. His current interests include actinide element coordination chemistry and the groundwater chemistry of the transuranium elements. **Kenneth L. Nash** (bottom) (BA, chemistry, Lewis University, 1972; MS, chemistry, 1975, and PhD, inorganic chemistry, 1978, Florida State University) is a research chemist in the TRP of the U.S. Geological Survey. His primary research interest is in the solution chemistry of the actinide elements and its application to nuclear waste disposal.

*Terry F. Rees
Jess M. Cleveland
Kenneth L. Nash*

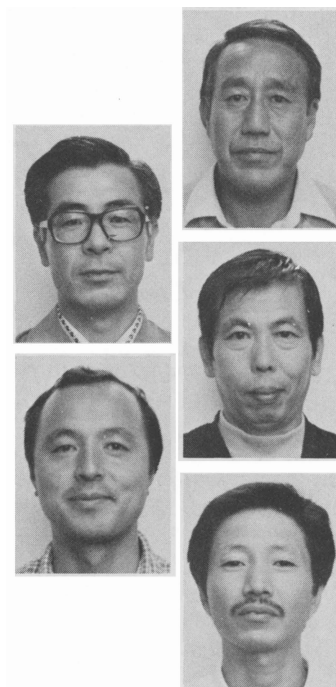


MATERIALS

INVESTIGATION OF OXIDES FORMED IN THE CORROSION OF SUS-304 IN HIGH-TEMPERATURE WATER THROUGH THE MEASUREMENT OF EVOLVED HYDROGEN AND RADIOCHEMICAL ANALYSES

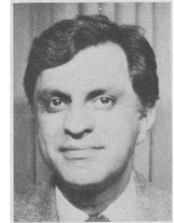
Enzo Tachikawa (top right) (BS, organic chemistry, Nagoya University, 1958; PhD, chemistry, University of California, Irvine, 1967) is the head of the Radiochemistry Laboratory at the Japan Atomic Energy Research Institute (JAERI) and has worked on hot atom chemistry and radiation chemistry. His current interests include tritium chemistry related to fusion reactors. **Michio Hoshi** (top left) (Dr., chemistry, Tohoku University, 1972) is a research scientist at JAERI and has worked in the field of actinoid solution chemistry and corrosion chemistry since 1964. **Chiaki Sagawa** (center right) is a technician with 25 years of experience in chemical analysis of materials used in nuclear reactors. He is currently concerned with chemical and radiochemical analyses of corrosion products. **Chushiro Yonezawa** (bottom left) is a technician with 15 years of experience in activation analysis. His interest has been in activation analysis and Mössbauerspectroscopy of corrosion products. **Mikio Nakashima** (bottom right) (BS, radiochemistry, Tohoku University, 1975) is a research scientist at JAERI and has worked on tritium chemistry. He is now completing his PhD dissertation.

*Enzo Tachikawa
Michio Hoshi
Chiaki Sagawa
Chushiro Yonezawa
Mikio Nakashima*



SCALING CRITERIA FOR TWO-PHASE FLOW LOOPS AND THEIR APPLICATION TO CONCEPTUAL 2 × 4 SIMULATION LOOP DESIGN*Gunol Kocamustafaogullari
Mamoru Ishii*

Gunol Kocamustafaogullari (top) (PhD, mechanical engineering, Georgia Institute of Technology, 1971) completed a year as a postdoctoral research associate at the same institution on the investigation of multiphase structured media. The next 6 years were spent at the Istanbul National Academy of Engineering and Architecture in Turkey. Since 1980, he has been with the mechanical engineering department at the University of Wisconsin-Milwaukee. His current research areas include thermal-hydraulic analysis of nuclear reactors, boiling heat transfer, and modeling of two-phase flow systems. **Mamoru Ishii** (BS, Yokohama National University, 1966; MS, New York University, 1968; PhD, mechanical engineering, Georgia Institute of Technology, 1971) is a staff member of the Reactor Analysis and Safety Division, Argonne National Laboratory (ANL). He has worked on two-phase thermal hydraulics, fast reactor safety problems, and water reactor accident phenomenological modeling at ANL since 1974. Before joining ANL, he worked on the basic modeling of two-phase flow at Grenoble Nuclear Research Center as an invited scientist.

**TECHNIQUES****PAINT DECONTAMINATION KINETICS***Edward W. Thornton*

Edward W. Thornton (BSc, 1973, and PhD, 1976, chemistry, Nottingham University) is a research officer in the Plant Chemistry Branch of the U.K. Central Electricity Generating Board's Berkeley Nuclear Laboratories. His major research interests are in the contamination and decontamination properties of surface coatings.

