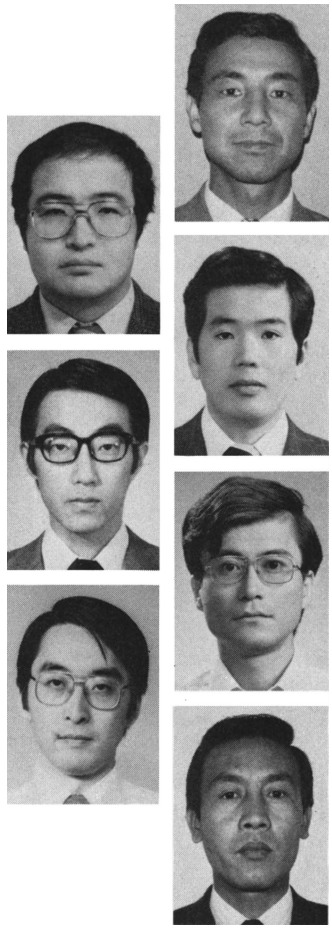
nuclear technology®

AUTHORS — NOVEMBER 1982

FISSION REACTORS

THE DEVELOPMENT OF THE REACTOR MANAGEMENT SYSTEM

Tsutomu Otsuka
Koichi Sekimizu
Yasunori Sakamoto
Nobuhiko Netsu
Akio Yanagisawa
Kiyoshi Niki
Atsuro Kawamura



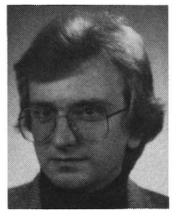
Tsutomu Otsuka (top right) (nuclear engineering, Ibaraki Advanced Vocational Training Center, Japan, 1969), **Koichi Sekimizu** (top left) (BE, automatic control engineering, 1969, ME, 1971, and PhD, 1979, nuclear engineering, Tokyo Institute of Technology, Japan), and **Yasunori Sakamoto** (second from top right) (BS, 1974, and MS, theoretical physics, 1976, Waseda University, Japan) are members of the Boiling Water Reactor (BWR) System Analysis Group at the Nuclear Research Laboratory of Nippon Atomic Industry Group Company. Their current work involves BWR core performance analysis and related computer system development. **Nobuhiko Netsu** (center left) (BE, Tohoku University, Japan, 1977; ME, nuclear engineering, Tohoku University, Japan, 1979) is an engineer engaged in core management of BWR nuclear power plants at Tokyo Electric Power's Fukushima No. 1 nuclear power station. **Akio Yanagisawa** (third from top right) (BE, electronic engineering, 1973, and ME, computer science, 1975, Nagoya University, Japan) has been with the Toshiba Corporation in Tokyo, Japan, since 1975. His current work involves the application of on-line computer systems to the monitoring of the nuclear power plant core performance. **Kiyoshi Niki** (bottom left) (BS, pure and applied sciences, 1971, MS, theoretical physics, 1973, and ScD, theoretical physics, 1977, The University of Tokyo, Japan) is presently a nuclear power plant computer system engineer at Toshiba Corporation. His current interests are in the application of on-line computer systems to the monitoring and prediction of the nuclear power plant core behavior. **Atsuro Kawamura** (bottom right) (BE, automatic control engineering, Osaka University, Japan, 1969) is now control and instrumentation engineer of Toshiba Corporation's Nuclear Energy Group. His current work is the application of on-line process computer systems to the BWR nuclear power plants.

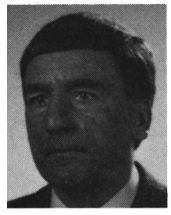
GENERAL FEATURES OF ADVANCED PRESSURIZED WATER REACTORS WITH IMPROVED FUEL UTILIZATION

Werner Oldekop
Hans-Dieter Berger
Wilfried Zeggel

Werner Oldekop (right) [Dipl. Phys., Dr. Rer. Nat., University of Göttingen, Federal Republic of Germany (FRG), 1951] has been professor at the Technical University of Braunschweig since 1966 and head of the Institute for Spaceflight Engineering and Reactor Technology. His working and research fields are

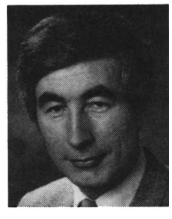
nuclear technology, space power systems, and energy conversion. **Hans-Dieter Berger** (top) (Dipl. Ing., nuclear engineering, Technical University of Braunschweig, FRG, 1978) is a co-worker at the Institute for Spaceflight Engineering and Reactor Technology. His current technical interests are in neutron physics of tight pitch lattices and terrestrial application of power systems proven in space. **Wilfried Zeggel** (bottom) (Dipl. Ing., chemical engineering, and Dr.-Ing., nuclear engineering, Technical University of Braunschweig, FRG, 1977) is a senior co-worker at the Institute for Spaceflight Engineering and Reactor Technology. He is a project manager of a scientific advanced pressurized water reactor cooperation with the utility Rheinisch Westfälisches Elektrizitätswerk in Essen, FRG. His research interests are in fundamentals of thermal-hydraulic problems of water-cooled tight lattices.





DESIGN CRITERIA FOR PRESTRESSED CONCRETE REACTOR VESSELS FOR HIGH-TEMPERATURE REACTORS

Claus Elter
Gerhard Becker



Claus Elter (top) [Dipl.-Ing., mechanical engineering, 1962, and Dr.-Ing., reactor technology, 1973, habilitation, 1981, Rheinisch-Westfälische Technische Hochschule (RWTH), Aachen, Federal Republic of Germany (FRG)] is currently manager of the Reactor Systems Division in Hochtemperatur-Reaktorbau (HRB) in Mannheim. He is lecturing on mechanical engineering in reactor technology at RWTH Aachen. His current interests are centered on establishing clearly defined design criteria in order to simplify the licensing procedure and to obtain economical structural solutions. **Gerhard Becker** (Dipl.-Ing., civil engineering, 1970, and Dr.-Ing., 1974, Technische Hochschule Darmstadt, FRG) is head of the Prestressed Concrete Reactor Vessel (PCRV) Department of the HRB. His current interests include improving the economics of the design of PCRVs for high-temperature reactors.

NUCLEAR SAFETY

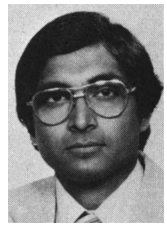
BOILING AND DRYOUT PREDICTIONS IN POSTACCIDENT HEAT REMOVAL SITUATIONS

C. Benocci
J-M. Buchlin
C. Joly

Photographs and biographies were not available at the time of publication.

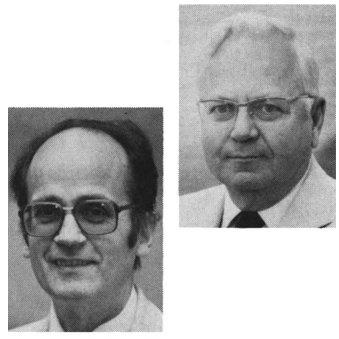
A METHOD FOR PROPAGATING UNCERTAINTY IN PROBABILISTIC RISK ASSESSMENT

Shahid Ahmed
R. E. Clark
D. R. Metcalf



Shahid Ahmed (right) (BS, electrical engineering, University of Karachi, Pakistan; MS, nuclear engineering, Iowa State University, 1978) is a principal staff member of the Advanced Energy Division of The Kuljian Corporation. Formerly a senior engineer at Babcock & Wilcox Company (B&W), he is the principal investigator for several projects related to risk assessment, availability improvement, and decision analysis of large technological systems in general and nuclear power generation in

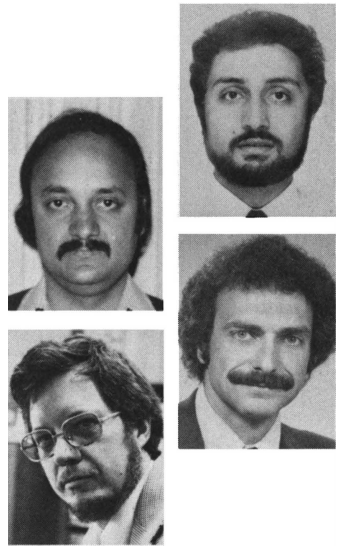
particular. **R. E. Clark** (top) (PhD, mathematics, University of North Carolina, 1959) is a principal mathematician and supervisor of Statistical Methods, Applied Mathematics Unit, Nuclear Power Generation Division, B&W. **D. R. Metcalf** (bottom) (PhD, nuclear science, University of Michigan) is an associate professor of nuclear engineering at the University of Virginia. For a number of years he has been involved in neutron transport theory. More recently he was on leave during the 1980-1981 academic year and worked as an engineering consultant with the B&W Nuclear Power Generation Division. His recent research work with B&W has been in the area of reliability with emphasis on uncertainty analysis.



RECRITICALITY CONSIDERATIONS IN DISRUPTED GAS-COOLED FAST REACTOR CORE GEOMETRY

Farzad Rahnema
S. Arif Ahmad
William E. Kastenberg
Gerald C. Pomraning

Farzad Rahnema (top right) [PhD, nuclear engineering, University of California, Los Angeles (UCLA), 1981] is currently in nuclear methods development at the General Electric Company's Nuclear Energy Business Group in San Jose, California. His technical interests are in physics model efficiency in the coupled nuclear thermal-hydraulics boiling water reactor simulator and perturbation theory. **S. Arif Ahmad** (top left) (MS, physics, Punjab University, Pakistan; MS, engineering, UCLA) is a graduate student at UCLA. He has interests in reactor physics and reactor safety. **William E. Kastenberg** (bottom right) (PhD, University of California, Berkeley, 1966) is currently professor of engineering and applied science at UCLA. His interests focus on reactor safety and risk assessment. **Gerald C. Pomraning** (bottom left) (PhD, Massachusetts Institute of Technology, 1962) is currently professor of engineering and applied science at UCLA. His interests are focused on neutral particle transport.

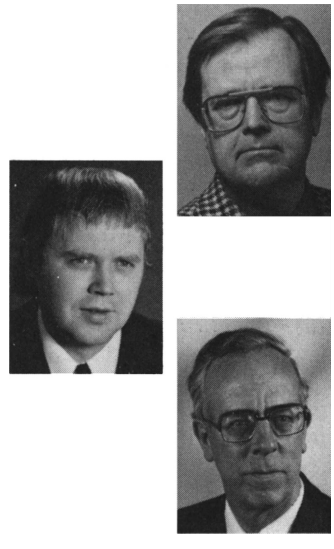


FUEL CYCLES

SOME NEUTRON PHYSICAL CONSEQUENCES OF MAXIMIZING THE CONVERSION RATIO OF PRESSURIZED WATER REACTORS OPERATED IN THE URANIUM-PLUTONIUM CYCLE

Klaus Penndorf
Frank Schult
Dietrich Bünemann

Klaus Penndorf (top) [MS, physics, University of Göttingen, Federal Republic of Germany (FRG), 1962; PhD, physics, University of Kiel, FRG, 1970) joined Forschungszentrum Geesthacht (GKSS) Research Center in 1962 and is now head of the Reactor Safety Division at the Institute of Physics. His current interests include physics foundations of nuclear engineering, reactor systems, fuel cycles, and fuel rod behavior. **Frank Schult** (center) (Dipl.-Ing., School of Physics and Engineering, Wedel, FRG, 1969) has been a GKSS staff member since 1970. His current interests are in computer modeling and computational physics. **Dietrich Bünemann** (bottom) (PhD, physics, University of Hamburg, FRG, 1964) joined GKSS in 1956 and is now director of the Institute of Physics. Since 1979, he has been a professor at the University of Hamburg. His current interests are in neutron physics, reactor technology, and environmental research.



CHEMICAL PROCESSING

VOLUME REDUCTION OF SPENT ION-EXCHANGE RESIN BY ACID DIGESTION

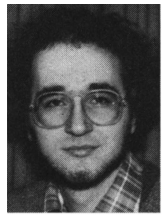
Miriam S. Mozes

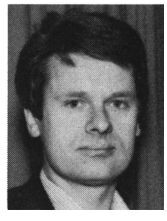
Miriam S. Mozes (BS, chemical engineering, Technion-Israel Institute of Technology, 1954; PhD, physical chemistry, Queen Mary College, University of London, United Kingdom, 1970) joined Ontario Hydro in 1970 and presently heads the Process Chemistry Unit of the Chemical Research Department. Her current interests are in the leaching behavior of nuclear waste forms and in the control of radionuclide emissions from the gaseous effluent streams from nuclear generating stations.

NUCLEAR FUELS

CESIUM RELEASE FROM COATED FUEL PARTICLES WITH FAILED COATINGS

Winfried Amian
Detlev Stöver





Winfried Amian (top) [Dr. Rer. Nat., Rheinisch-Westfälische Technische Hochschule, Federal Republic of Germany (FRG), 1981] is a scientific member at the Institut für Reaktorentwicklung (IRE) of Kernforschungsanlage (KFA)-Jülich. His main interest has been fission product transport in high-temperature reactor (HTR) fuel. He is presently involved in the study of spallation products and neutron spectrometry. **Detlev Stöver** (Dr. Rer. Nat., nuclear engineering, Technical University of Aachen, FRG, 1972) leads the Reactor Technology Section in IRE of KFA-Jülich. He has worked on fission product release from HTR fuel since 1972. His current technical interest focuses on tritium permeation in metallic and ceramic materials.

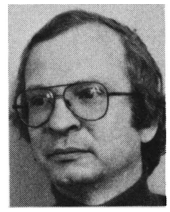
RADIOACTIVE WASTE MANAGEMENT

THE MIGRATION OF ^{137}Cs AND ^{90}Sr IN MULTILAYERED SOILS: RESULTS FROM BATCH, COLUMN, AND FALLOUT INVESTIGATIONS

Heinz Bachhuber
Kurt Bunzl
Wolfgang Schimmack
Ingbert Gans

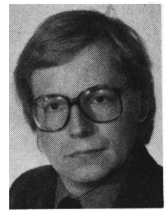
Heinz Bachhuber (top) [PhD, physical chemistry, University of Munich, Federal Republic of Germany (FRG), 1970] is a research scientist in the Analysis and Ecology of Radionuclides Group at the Gesellschaft für Strahlen- und Umweltforschung (GSF). His former work has dealt with the separation of lithium isotopes by ion exchangers and the synthesis and structure of new nitrogen-hydrogen compounds. His current interests include studies on the interactions of radionuclides with various soils. **Kurt Bunzl** (center) (PhD, physical chemistry, University of Munich, FRG, 1964) is presently leader of the Analysis and Ecology of Radionuclides Group at the GSF. His current interests include the transport of radionuclides and toxic heavy metals in the soil, the chemical analysis of these pollutants in environmental samples, and the mechanism and kinetics of ion-exchange processes. **Wolfgang Schimmack** (bottom) (PhD, physical chemistry, Technical University of

Munich, FRG, 1975) is a physicist in the Analysis and Ecology of Radionuclides Group at the GSF. His special interests involve model calculations of radionuclide migration in the soil and their experimental examination by column experiments. He is also working on problems related to the sorption of heavy metals by soil organic matter. **Ingbert Gans** (right) (PhD, University of Giessen, FRG, 1972) is a research physicist in the Institut für Wasser-, Boden- und Lufthygiene at the Bundesgesundheitsamt. He is presently engaged in studies on the control of emissions in the nuclear fuel cycle and on the radioecology of the aquatic environment.



A STUDY OF STRONTIUM AND CESIUM SORPTION ON GRANITE

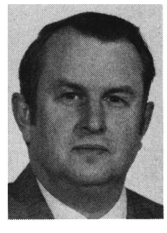
Kristina Skagius
Gunnar Svedberg
Ivars Neretnieks



Christina Skagius (top) (MS, chemical engineering, Royal Institute of Technology, Stockholm, 1977) has been working with different projects concerning nuclear waste disposal since 1977. She is presently studying the sorption and diffusion mechanisms of nuclides in different rock materials. **Gunnar Svedberg** (center) (PhD, chemical engineering, Royal Institute of Technology, Stockholm, 1975) is an associate professor in chemical engineering at the Royal Institute of Technology, a consulting engineer at Scandiaconsult in Stockholm, and project secretary in the Swedish Coal-Health-Environment Project. He has focused his attention on mathematical modeling of sorption processes and was involved in development of systems for filtered atmospheric venting of nuclear reactor containments for the Swedish Government Committee on Nuclear Reactor Safety. **Ivars Neretnieks** (bottom) (PhD, 1967) is a professor of chemical engineering at the Royal Institute of Technology. His interests include flow and mass transfer in porous beds as applied to adsorption, ion exchange, leaching, catalysis, etc. Since 1977 he has been involved in various aspects of nuclear waste management with emphasis on migration of radionuclides from a final repository.

DECONTAMINATION PROCESSES FOR WASTE GLASS CANISTERS

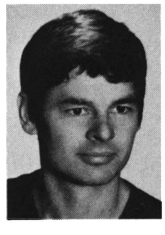
W. Nevyn Rankin



W. Nevyn Rankin (BS, metallurgical engineering, North Carolina State University, 1960) is a senior engineer at the Savannah River Laboratory, operated by E. I. du Pont de Nemours and Company for the U.S. Department of Energy. His current technical interests include characterization of solidified radioactive waste forms and evaluation of compatibility between waste forms and candidate canister materials.

PILOT-SCALE TESTING OF PYROLYSIS FOR THE VOLUME REDUCTION OF ORGANIC WASTE

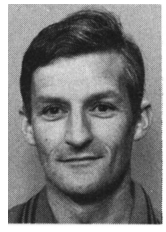
Gerhard Kemmler
Elmar Schlich

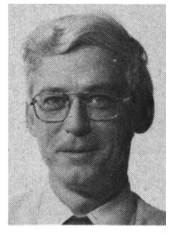


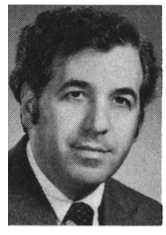
Gerhard Kemmler (top) [Dr. Rer. Nat., Dipl. Chem., University Karlsruhe, Federal Republic of Germany (FRG)] is responsible for the operation of the volume reduction plants at NUKEM, FRG. He is engaged in transuranic (TRU) treatment and recovery. From 1973 to 1977 he was a research chemist at Karlsruhe Nuclear Center, dealing with wet combustion of TRU-organic wastes. **Elmar Schlich** (Dr.-Ing., Dipl.-Ing., Technical University, Aachen, FRG) is head of the Department of Chemical Engineering Development at NUKEM. His research and development interests include the thermal processes to treat wastes, e.g., pyrolysis, gasification, and combustion.

THE BEHAVIOR OF A B_4C-PHENOLIC AND A GLASS-FIBER-REINFORCED B_4C-PHENOLIC COMPOSITE IN A SPENT NUCLEAR FUEL STORAGE POOL

Norman H. Macmillan
George I. Dooher
Robert G. Naum



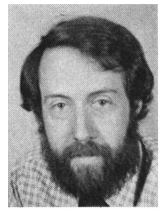


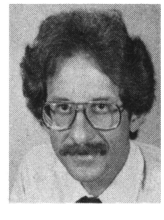


Norman H. Macmillan (top) (PhD, metallurgy and materials science, University of Cambridge, United Kingdom, 1969) spent five years with Martin-Marietta Laboratories and a year with the Department of Natural Philosophy, University of Aberdeen, before assuming his present position as a senior research associate at The Pennsylvania State University Materials Research Laboratory. He also spent one summer as a visiting scientist with the Danish Atomic Energy Commission. His principal research interests are the fundamental aspects of the flow and fracture of metals and ceramics. **George I. Dooher** (center) (AB, philosophy, Catholic University of America, 1963; MS, science education, State University of New York-Buffalo, 1966) joined Carborundum Company's Research and Development Division in 1974. His activities center on high-temperature material characterization and performance. From 1976-1980 he was quality assurance manager for the Nuclear Ceramic Business Unit. **Robert G. Naum** (bottom) (BS, physics and mathematics, and MBA, State University of New York-Buffalo) is business development manager of the Advanced Materials Division of The Carborundum Company. He has authored/co-authored 17 articles, holds seven patents, and has received five industrial awards.

INVESTIGATION OF CABLE DETERIORATION INSIDE REACTOR CONTAINMENT

Roger L. Clough
Kenneth T. Gillen

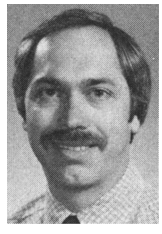




Roger L. Clough (top) (BA, chemistry, University of Utah, 1971; PhD, organic chemistry, Caltech, 1975; NATO Postdoctoral Fellow, Technical University of Munich, Federal Republic of Germany, 1976; NSF Postdoctoral Fellow, University of California, Los Angeles, 1977) is a member of the scientific staff at Sandia National Laboratories (SNL). His current research interests include radiation chemistry and photochemistry. **Kenneth T. Gillen** (BS, chemistry, University of California, Berkeley, 1964; PhD, physical chemistry, University of Wisconsin, 1970) is currently a member of the scientific staff at SNL. His research interests concern radiation effects on polymers and the development of accelerated aging techniques.

A GAS-PHASE UF_6 ENRICHMENT MONITOR

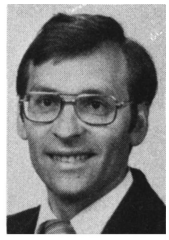
Richard B. Strittmatter

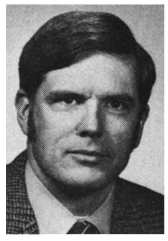


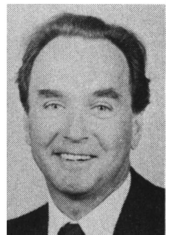
Richard B. Strittmatter (PhD, nuclear engineering, University of Illinois at Urbana-Champaign, 1978) is a staff member of the Safeguards Assay Group at Los Alamos National Laboratory. He is currently involved in the development of measurement techniques to improve nuclear materials accountability at uranium processing facilities.

HIGH-SPEED MOTION NEUTRON RADIOGRAPHY

Richard H. Bossi
Alan H. Robinson
John P. Barton



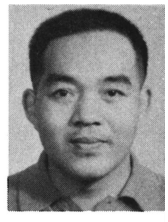


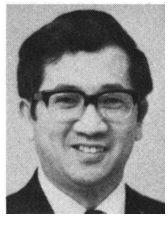


Richard H. Bossi (top) (PhD, nuclear engineering, Oregon State University, 1977) is employed in the Nondestructive Evaluation Section at Lawrence Livermore National Laboratory (LLNL) where he has worked since 1978. He worked in the field of neutron radiography at Oregon State University and, in 1977-1978, at Centre d'Etudes Nucleaires de Grenoble in France. Presently, he is the radiography group leader at LLNL with interests in industrial x-radiography, real-time imaging, computed tomography, and flash radiography. **Alan H. Robinson** (center) (PhD, nuclear engineering, Stanford University, 1965) is a professor of nuclear engineering at Oregon State University (OSU). Prior to joining OSU in 1966, he worked for General Electric Company in San Jose. In addition to his work in neutron radiography, he has worked in the areas of reactor physics and numerical methods. **John P. Barton** (bottom) (PhD, physics, University of Birmingham, United Kingdom, 1960) was a faculty member, Nuclear Engineering Department, OSU from 1971 to 1978. Prior to joining the OSU faculty, he was active in the development of neutron radiography at Argonne National Laboratory. He now is an independent consultant in neutron radiography.

ADSORPTION OF IODINE SPECIES WITH AMBERSORB® CARBONACEOUS ADSORBENTS

Chia-Lian Tseng
Pao-Shan Weng
Chien C. Lin





Chia-Lian Tseng (top) (chemical technology, Taiwan Provincial Hsinchu Technical Vocational School, 1960) has been a technologist in the Health Physics Division, Institute of Nuclear Science, National Tsing Hua University (NTHU) since 1963. His primary research interests include radioactive waste disposal and treatment. **Pao-Shan Weng** (center) (PhD, nuclear engineering, Texas A&M University, 1966) was an associate professor at NTHU until 1970 and has been a professor since then. His primary research interests include health physics and nuclear applications. Since 1981, he has been director of the Institute of Nuclear Science, NTHU. **Chien C. Lin** (bottom) (BS, chemical engineering, Tunghai University, 1959; PhD, chemistry, University of New Mexico, 1968) did his post-doctoral research at Washington University in St. Louis (1967 to 1970) in radiochemical studies of nuclear fission. He joined General Electric Company at the Vallecitos Nuclear Center in 1971. He is currently a principal engineer and technical leader, and his interests include reactor coolant chemistry, iodine chemistry, radiochemical techniques, fission product source terms, and corrosion product transport modeling. He was a visiting research professor at the Institute of Nuclear Science, NTHU, in 1980.