



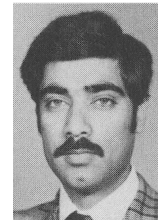
AUTHORS — OCTOBER 1984

FISSION REACTORS

DETECTION OF CONTROL ROD VIBRATION BY NEUTRON NOISE ANALYSIS

Saleem A. Ansari (top) (MSc, physics, Punjab University, Lahore, 1972; MSc, nuclear engineering, Quaid-i-Azam University, Islamabad, 1975) has worked on the surveillance of nuclear reactors using reactor noise analysis techniques at Pinstech since 1977. He also worked at Kernforschungszentrum Karlsruhe on malfunction diagnosis at the KNK-II sodium-cooled power reactor for 1½ years. **Syed Khwaja Ayazuddin** (MSc, physics, University of Karachi, 1975; MSc, nuclear engineering, Queen Mary College, London, 1977) has worked in the nuclear engineering division of Pinstech as a senior scientific officer since 1978 engaged in the kinetic and dynamic study of nuclear research and power reactors. His main interests are in the fields of neutron and temperature noise analysis for the surveillance study of nuclear reactors and vibration analysis of rotatory machines, pumps, etc.

Saleem A. Ansari
Syed Khwaja Ayazuddin



EXPERIMENTAL AND MATHEMATICAL SIMULATION TECHNIQUES FOR DETERMINING AN *IN SITU* RESPONSE TESTING METHOD FOR NEUTRON SENSORS USED IN REACTOR POWER PLANT PROTECTION SYSTEMS

Alireza Behbahani (top) (BS, electrical engineering, Utah State University, 1975; MS, 1977, and PhD, 1983, nuclear engineering, The Ohio State University) is presently associated with the chemical and nuclear engineering department at the University of Cincinnati. His primary areas of interest are nuclear instrumentation; reactor control; radiation detectors and counters; reactor kinetics, dynamics, and simulation; and experimental reactor physics. **Don W. Miller** [BS, physics, Miami University (Ohio), 1964; PhD, nuclear engineering, The Ohio State University, 1971] is professor and chairman of nuclear engineering at The Ohio State University. His primary areas of interest are nuclear instrumentation, measurement, control, and applications of artificial intelligence in engineering.

Alireza Behbahani
Don W. Miller



NOISE SOURCE AND REACTOR STABILITY ESTIMATION IN A BOILING WATER REACTOR USING A MULTIVARIATE AUTOREGRESSIVE MODEL

Shigeru Kanemoto (top right) (MS, nuclear engineering, Osaka University, 1976) is a staff researcher in the nuclear engineering department at Nippon Atomic Industry Group Company, Ltd. (NAIG). His current research interests include signal processing techniques based on autoregressive modeling, boiling water reactor (BWR) noise analysis, and BWR diagnosis system development. **Shigeaki Tsunoyama** (top left) (BS, physics, Tokyo University, 1967) is a senior researcher in the systems analysis department at NAIG and has been engaged in the development of the physical model in the area of BWR dynamics and safety. **Yasumasa Andoh** (center right) (BS, nuclear engineering, Tokyo University, 1968) is a senior researcher in the nuclear engineering department at NAIG. His current interests include signal processing techniques, BWR plant dynamics, and plant diagnosis system development. **Fumiaki Yamamoto** (bottom left) (MS, electrical and control engineering, Waseda University, 1975) is a deputy manager of the Reactor Control & Dynamics Section in the reactor design engineering department at Toshiba Corporation. His current responsibilities include BWR transient and stability analysis, plant diagnosis system development, and load following operation. **Shirley A. Sandoz** (bottom right) (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.

*Shigeru Kanemoto
Shigeaki Tsunoyama
Yasumasa Andoh
Fumiaki Yamamoto
Shirley A. Sandoz*



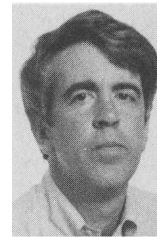
OPTIMIZATION OF BOILING WATER REACTOR CONTROL ROD PATTERNS USING LINEAR SEARCH

Takashi Kiguchi (top right) (PhD, nuclear engineering, University of Tokyo, 1975) is a senior researcher at Energy Research Laboratory (ERL) of Hitachi, Ltd. He has been engaged in the development of on-line computer systems to monitor and control nuclear power plants. His current interests include knowledge engineering techniques for system design and control. **Kazuyori Doi** (top left) (BS, electrical engineering, Tokushima University, 1968) participated in research at ERL of Hitachi, Ltd. from 1968 to 1982. He was engaged in research on nuclear reactor dynamics, control, optimization, and related computer applications. Since 1983, he has worked for Hitachi Works of Hitachi, Ltd. **Takaharu Fukuzaki** (bottom right) (BS, nuclear engineering, University of Tokyo, 1971) is a researcher at ERL of Hitachi, Ltd. He has been engaged in the research on application of computers to support operators and engineers of nuclear power plants. His current interests include improvement of on-line computer systems for core performance evaluation to realize high availability and flexibility of reactor operations. **Bjorn Frogner** (bottom left) (PhD, nuclear engineering, University of California, Berkeley, 1974) is co-founder of Expert-EASE Systems, Inc., where he is primarily engaged in the application of supermicro- and minicomputers for computationally complex engineering applications. He was employed by Systems Control, Inc. from 1975 through 1983 where he was the project manager for the development of core monitoring and prediction systems.

*Takashi Kiguchi
Kazuyori Doi
Takaharu Fukuzaki
Byorn Frogner
Chan Lin
Alexander B. Long*



Chan Lin (top) (PhD, nuclear engineering, University of California, Berkeley, 1983) is employed at Systems Control, Inc. where he has been involved since 1980 in the Power Shape Monitoring Systems Project of both boiling water and pressurized water reactors. **Alexander B. Long** (bottom) (BA, physics, Williams College; MS and PhD, nuclear engineering, University of Illinois) is currently a program manager in the nuclear safety and analysis department of the Electric Power Research Institute. His responsibilities include the formulation and management of R&D projects involving the application of advanced technologies (hardware and software) to the control and safety of nuclear power plants.



COMBINATION OF TWO SPECTRAL SHIFT CONTROL METHODS FOR PRESSURIZED WATER REACTORS WITH IMPROVED POWER UTILIZATION

Yigal Ronen (top) (BS, mechanical engineering, and MS, nuclear engineering, Technion-Israel Institute of Technology, 1967; PhD, nuclear engineering, Cornell University, 1970) is associate professor of nuclear engineering at Ben-Gurion University. His research interests include advanced concepts of nuclear reactors and problems in uncertainty analysis. He is currently president of the Israel Nuclear Society. **Yaakov Fahima** (BSc, chemical engineering, 1977, and MSc, nuclear engineering, 1980, Ben-Gurion University of the Negev) is currently a doctoral student in the Department of Nuclear Engineering at Ben-Gurion University. His current research is on bias operator methods and advanced tight lattice reactors.

*Yigal Ronen
Yaakov Fahima*



NUCLEAR SAFETY

DESCRIPTION OF THE RISØ PUFF DIFFUSION MODEL

Torben Mikkelsen (top) (BS, electronics, 1975, MS, physics engineering, 1978, and PhD, meteorology, 1983, Technical University of Denmark) is employed in the physics department of Risø National Laboratory. His general field of interest has so far been turbulence and diffusion applied to both ionized gases in plasma physics and to atmospheric flow. Currently, his research interests are concerned with the development of theories for relative diffusion for use with operational dispersion models. **Søren E. Larsen** (center) (MS, physics engineering, 1968, and PhD, meteorology, 1971, Technical University of Denmark) is employed by Risø National Laboratory. His current interests are in the areas of boundary layer meteorology air pollution dispersion, air/sea interaction, and climatology. **Søren Thykier-Nielsen** (bottom) [MS, electronics engineering (operations research), Danish Technical University, 1967] is employed in the health physics department of Risø National Laboratory. Since 1967 he has been engaged in the safety assessment of nuclear power reactors and development of dose-consequence models for releases of fission products to the atmosphere. His interests include atmospheric dispersion of fission products and emergency response models.

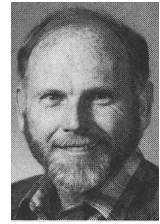
*Torben Mikkelsen
Søren E. Larsen
Søren Thykier-Nielsen*



A FUEL ROD DEBRIS PACKING MODEL

Jeffrey A. Moore

Jeffrey A. Moore (BS, mathematics, 1958, BS, aeronautical engineering, 1958, and MS, aeronautical engineering, 1959, University of Michigan; PhD, engineering science, State University of New York at Buffalo, 1967) is a staff member in the Safety Assessment Group, Energy Division, Los Alamos National Laboratory. His current interests include degraded core modeling and detonations within nuclear facilities.



NUCLEAR FUELS

THE SODIUM-BONDING PIN CONCEPT FOR ADVANCED FUELS PART II: ANALYSIS OF THE CLADDING CARBURIZATION

*Claudio Ronchi
Michel Coquerelle
Hubert Blank
Jacques Rouault*

Claudio Ronchi (top right) (Dr. rer. nat., University of Milan, Italy, 1965) is research officer in the Joint Research Center of the European Communities. He is working in fuel performance analysis and modeling for liquid-metal fast breeder reactors and light water reactors. His interests are mainly in solid state and thermodynamics. **Michel Coquerelle** (top left) (PhD, solid state chemistry, University of Brussels, 1960) is in charge of postirradiation examinations at the European Institute for Transuranium Elements, Karlsruhe. He gained his initial experience in this field while working for the French nuclear research center at Saclay (1960-1964). His current interests include both conventional fast breeder oxide and advanced fuels. **Hubert Blank** (bottom right) (PhD, metal physics, Technical University of Stuttgart, 1957) is head of the physics division of the European Institute for Transuranium Elements, Karlsruhe and has directed the Swelling of Advanced Fuels Project at this Institute since 1973. **Jacques Rouault** (bottom left) (Dipl. Ing., ECP, 1976) works in the plutonium department at Centre d'Etudes Nucléaires, Cadarache and is involved in fast reactor fuel behavior (compatibility problems).

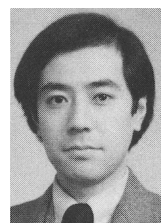


RADIOACTIVE WASTE MANAGEMENT

ION EXCHANGE ADSORPTION OF RADIOACTIVE CESIUM, COBALT, MANGANESE, AND STRONTIUM TO GRANITOID ROCKS IN THE PRESENCE OF COMPETING CATIONS

Toshiaki Ohe

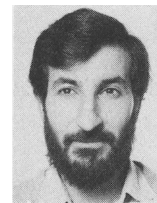
Toshiaki Ohe (BE, 1976; ME, environmental chemistry, Keio University, Japan, 1978) is a research chemist at the Energy Laboratory of the Central Research Institute of Electric Power Industry. His recent activities include mechanisms of geochemical interactions of radionuclides, which concern radioactive waste disposal.



INVESTIGATIONS OF THE VOLATILIZATION OF MOLYBDENUM AND RUTHENIUM DURING SUBSOLIDUS SINTERING OF MODIFIED SYNROC-B CRYSTALLINE WASTE FORMS

A. G. Solomah (top) (PhD, nuclear engineering, North Carolina State University, 1980) is a research scientist at Whiteshell Nuclear Research Establishment, Atomic Energy of Canada, Pinawa, Manitoba. His research interests are materials behavior under irradiation, chemistry of volatile fission products, nuclear fuel cycle analysis, and radioactive waste management. His current research interests are concerned with the separation of radium from uranium-thorium solutions and radium chemistry. **R. Odoj** (diploma, chemistry, 1973; PhD, physical chemistry, 1978, University of Bonn, Federal Republic of Germany) is group leader of the Institute of Chemical Technology at the Nuclear Research Center Jülich. His research interests are the process chemistry of the nuclear fuel cycle and particularly the volatilization of the fission products and their compounds during solidification as well as their influence on the physical and chemical stability of the products for final disposal.

*A. G. Solomah
R. Odoj*



MATERIALS

LOW-TEMPERATURE RUPTURE BEHAVIOR OF ZIRCALOY-CLAD PRESSURIZED WATER REACTOR SPENT FUEL RODS UNDER DRY STORAGE CONDITIONS

Robert E. Einziger (top) (BS, physics, Georgia Institute of Technology, 1967; MS and PhD, physics, Rensselaer Polytechnic Institute, 1973) is currently a senior scientist at the Westinghouse Hanford Company where he is studying the breach mechanisms and performance of light water reactor spent fuel during dry interim storage and geologic disposal. **Rajiv Kohli** (PhD, School of Mines, Leoben, Austria, 1983) is currently responsible for hot cell examination of irradiated fuel rods at the Battelle Columbus Laboratories' Hot Laboratory Facility. His current research interests include spent fuel storage, fuel/cladding interactions, chemical thermodynamics, and high-temperature material chemistry.

*Robert E. Einziger
Rajiv Kohli*



INTERACTION OF INTERSTITIAL IMPURITIES WITH RADIATION-INDUCED DEFECTS LEADING TO IMPROVED ELEVATED TEMPERATURE MECHANICAL PROPERTIES OF MILD STEEL

K. Linga Murty (MSc, physics, Andhra University, India, 1963; MS, 1967, and PhD, 1970, materials science and engineering, Cornell University) is associate professor in the nuclear engineering and materials engineering departments at North Carolina State University, Raleigh, and has been involved in research on the effects of aggressive environment and neutron exposure on the mechanical properties and fracture characteristics of metals. He has been actively pursuing research on creep and mechanical anisotropy of Zircaloy and embrittlement of nuclear pressure vessel steels. He is currently involved in studies on the improvement of mechanical properties of metals through laser surface treatment and ion implantation.

K. Linga Murty



A STUDY OF THE REPRODUCIBILITY OF DATA FROM STEADY-STATE TESTS IN SIMULATED LIQUID-METAL FAST BREEDER REACTOR FUEL ASSEMBLIES

A. E. Levin (top) (SB, mechanical engineering, 1975, and ScD, nuclear engineering, 1980, Massachusetts Institute of Technology) is a member of the research staff at Oak Ridge National Laboratory (ORNL). He is a concept leader on the current ORNL study on small and inherently safe reactors and is also on the staff of the Thermal-Hydraulic Out-of-Reactor Safety (THORS) program. His current research interests include heat transfer and flow dynamics in two-phase systems, liquid-sodium thermal hydraulics, and evaluation of inherently safe small power reactor concepts. **J. L. Wantland** (BS, mechanical engineering, University of Oklahoma, 1948; MS, mechanical engineering, University of Wisconsin, 1951; PhD, University of Tennessee, 1969) is a senior staff member at ORNL where he has been engaged in experimental and analytical thermal-hydraulic R&D of advanced fission reactor concepts since 1955. He is program manager of the ORNL Breeder Reactor Safety Program and principal investigator of the THORS program.

A. E. Levin
J. L. Wantland

**A NEW UNIVERSAL FORMULA FOR EFFICIENCY: SENSITIVITY TO COOLING CONDITIONS OF NUCLEAR AND CONVENTIONAL POWER STATIONS**

Nassar H. S. Haidar (Diploma, nuclear engineering, Moscow Power Institute, USSR, 1970; MS, reactor physics and technology, 1971, and PhD, physics, 1974, University of Birmingham, United Kingdom) is a senior researcher at the Nuclear Research Centre of the Lebanese National Council for Scientific Research at the Lebanese University in Hadath-Beirut, a visiting professor of mathematics at various universities in the Middle East, and an independent consultant on nuclear power. His research interests range from thermal neutron spectroscopy and nuclear power technico-economics to applied mathematics.

Nassar H. S. Haidar

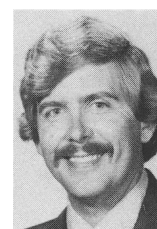


ANALYSES

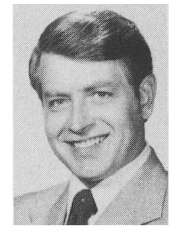
NEUTRON RESONANCE TRANSMISSION ANALYSIS OF REACTOR FUEL SAMPLES

James W. Behrens (right) (BS, University of Illinois, 1970; MS, University of California, 1976) joined the Lawrence Livermore National Laboratory (LLNL) in 1970 and then the National Bureau of Standards (NBS) in 1978. At LLNL he was responsible for an extensive experimental program to measure fast neutron-induced fission cross sections at the LLNL 100-MeV electron Linac. His specialties include advanced neutron detector R&D and studies of fission systematics. For the past several years, he has been developing detectors for use in nondestructive

James W. Behrens
Ronald G. Johnson
Roald A. Schrack



analysis (NDA) and nondestructive evaluation (NDE) applications. **Ronald G. Johnson** (top) (BA, Gustavus Adolphus College, 1963; MS, 1966, and PhD, 1970, nuclear physics, Iowa State University) joined the NBS in 1979. Previously, he held positions at the University of Toronto (1970 to 1975), The Pennsylvania State University (1975 to 1979), and LLNL. His interests are primarily in photonuclear reactions and in the basic and applied aspects of neutron reactions. **Roald A. Schrack** (bottom) (BA, 1949, and MS, 1950, University of California, Los Angeles; PhD, University of Maryland, 1961) has been a physicist at the NBS for the past 35 years. He has carried out research in particle physics, mainly on the interactions of neutral mesons and neutrons using the accelerators and reactor at NBS. For the past several years, much of his work has been related to NDA and NDE applications of neutron measurement techniques.



FISSION REACTORS

A COLD-BOTTOM SUPPORTED VESSEL FOR SODIUM-COOLED REACTORS

Didier Costes

Didier Costes (Ecole Polytechnique de Paris, 1947; Ecole Nationale des Ponts et Chaussées, Paris, 1950-1952) served in Africa from 1953 to 1959 as Ingénieur des Ponts et Chaussées and has worked at Commissariat à l'Energie Atomique since 1959. He was involved in mechanical and thermal problems related to reactor design and safety for Magnox, heavy water, pool research, liquid-metal fast breeder, and pressurized water reactors and took part in research on prestressed vessels for water reactors. His main current interest is in seismic and dynamic problems, ultimate behavior of structures, and probabilistic approach. He was an organizer of the SMiRT-6 conference (Paris, 1981) and of the associated seminar on structural reliability.



ENVIRONMENTAL EFFECTS ON A PRESSURE-ACTIVATED SWITCH

*T. P. Toepker
J. J. Kelley*

T. P. Toepker (top) (BS, physics, 1961, MEd, 1964, and MS, physics, 1968, Xavier University; PhD, nuclear engineering, University of Cincinnati, 1978) is the senior test engineer at Research Dynamics Incorporated (RDI) working on nuclear equipment qualification programs. He taught nuclear physics and directed the nuclear physics laboratory at Xavier for 11 years. In addition to his interests in nuclear physics, he has interests in holographic techniques for stress analysis. **J. J. Kelley** (attended Ohio State University and Eastland Vocational, Columbus, Ohio) is a research and test technician at RDI. He is responsible for performing National Bureau of Standards traceable calibrations on single-ended pressure transmitters and differential pressure transmitters at high line pressure. He also has experience in repair and maintenance of automobile, motorcycle, and aircraft engines, cooling systems, and mobile and stationary fuel distribution systems.

