



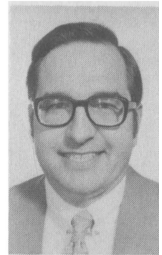
AUTHORS — SEPTEMBER 1976

URANIUM RESOURCES

PREFACE: URANIUM RESOURCES

James S. Tulenko (top) (MA, applied physics, Harvard University; MS, nuclear engineering, Massachusetts Institute of Technology) is manager of fuel engineering in the Nuclear Power Generation Division, Babcock & Wilcox Company, Lynchburg, Virginia. He served as manager of the Nuclear Development Section at United Nuclear Corporation. He has published extensively in the areas of fuel economic analysis, plutonium utilization, and utility water reactor analysis, and he currently serves as chairman of the Fuel Cycle Division of the American Nuclear Society. Veikko O. Uotinen (MS, physics, Worcester Polytechnic Institute, 1963) is a senior engineer in the Fuel Engineering Section, Nuclear Power Generation Division, Babcock & Wilcox Company, Lynchburg, Virginia. Prior to joining Babcock & Wilcox, he served on the research staff of Battelle-Northwest Laboratory, where he concentrated his efforts on plutonium recycle studies. His present interests span the various stages of the nuclear fuel cycle.

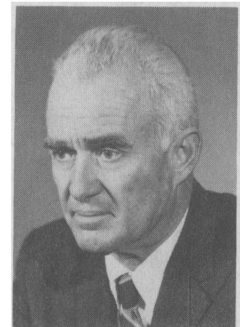
*J. S. Tulenko
V. O. Uotinen*



URANIUM RESOURCES—ARE THEY ADEQUATE?

Robert D. Nininger (BA, geology, Amherst College, 1941; MA, economic geology, Harvard University, 1942) is assistant director for raw materials, Division of Nuclear Fuel Cycle and Production, U.S. Energy Research and Development Administration. His interests pertain to uranium exploration and supply.

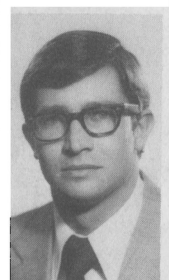
Robert D. Nininger



U₃O₈ SUPPLY IN TECHNICAL AND COMMERCIAL TRANSITION

P. F. Schutt (top) (MS, physics, Illinois Institute of Technology and the University of Arizona) is senior vice president and founding director of Nuclear Assurance Corporation, with 19-yr experience in the nuclear power field. He was formerly in the U.S. Atomic Energy Commission Combined Operations Planning Group and was manager of Program Development and Propositions with the Babcock & Wilcox Company. J. S. Hobbs (BS, nuclear engineering, North Carolina State University) is a project manager with Nuclear Assurance Corporation. He has been involved in several studies regarding the commercial aspects of the uranium industry.

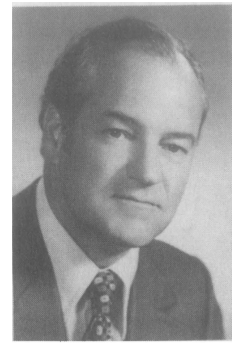
*P. F. Schutt
J. S. Hobbs*



THE CHANGING SCENE FOR URANIUM IN CANADA

Noel O'Brien

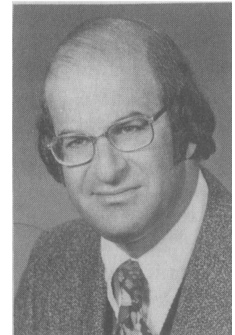
Noel O'Brien (B. Eng., McGill University, 1951) is vice-president, Minerals and Marketing, Denison Mines Limited, Toronto, Canada, with responsibilities for uranium marketing and development of new mineral projects.



URANIUM: THE MARKET AND ADEQUACY OF SUPPLY

Bernard H. Cherry

Bernard H. Cherry (MS, nuclear engineering, University of Illinois) was nuclear fuels manager, General Public Utilities Corporation (GPU), from 1969 to 1974. He is currently manager of fuel resources for GPU with responsibility for the planning, procurement, and management of nuclear fuel, coal, and oil.

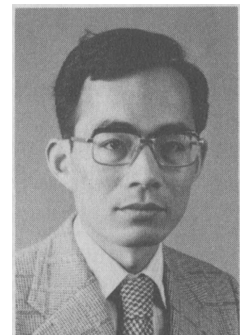


REACTORS

TRANSIENT HYDRAULICS AND HEAT TRANSFER IN TURBULENT FLOW

Hiroshi Kawamura

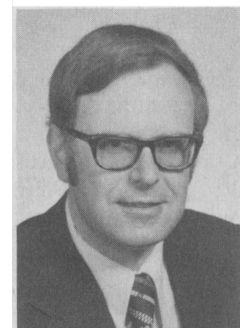
Hiroshi Kawamura (PhD, nuclear engineering, University of Tokyo, 1970) is a research scientist with the Japan Atomic Energy Research Institute, Tokai, Japan. He has studied transient heat transfer with and without phase change since 1965. He studied at Kernforschungszentrum Karlsruhe, Germany, in 1974-1975. His current interests are in the transient heat transfer in turbulent flow and heat transfer in a fusion reactor.



SAFETY ADVANTAGES OF PRESTRESSED CONCRETE REACTOR VESSELS

Zdeněk P. Bažant

Zdeněk P. Bažant (PhD, Czechoslovak Academy of Sciences, 1963) is a professor at Northwestern University, Evanston, Illinois. Under the sponsorship of the National Science Foundation, the U.S. Energy Research and Development Administration, and the Advanced Research Projects Agency, he has been directing an extensive research program in structural mechanics problems of nuclear concrete structures.

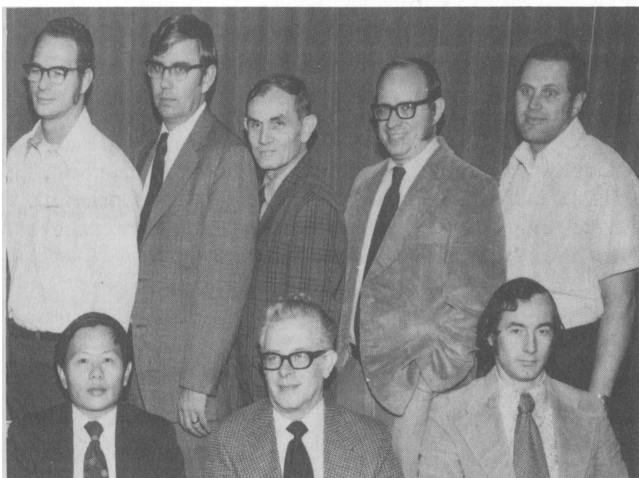


A TOKAMAK EXPERIMENTAL POWER REACTOR

The authors are all members of the Tokamak Experimental Power Reactor (TEPR) Project at Argonne National Laboratory. P. J. Bertoncini (seated, top left) (PhD, University of Wisconsin, 1968) is concerned with plasma static performance analysis and system modeling; M. A. Abdou (seated, top right) (PhD, University of Wisconsin, 1973) performed the blanket, shield, and neutronics analyses; S. T. Wang (seated, bottom left) (PhD, Stanford University, 1970) is involved in the evaluation and design of superconducting magnet systems; H. C. Stevens (seated, bottom center) (BS, Purdue University, 1949) is responsible for engineering design; and D. L. Smith (seated, bottom right) (PhD, Iowa State University, 1965) is responsible for material evaluation and selection for the primary energy conversion system. (Standing, top left to right) J. A. Fasolo (BS, Ohio State University, 1951) is involved in the analysis and design of neutral-beam and charged-particle injection systems; J. N. Brooks (PhD, New York University, 1972) is concerned with studies on plasma burn-cycle dynamics and plasma-support systems modeling and analysis; J. B. Darby, Jr. (PhD, University of Illinois, 1958) is associate director of the ANL-Controlled Thermonuclear Research (CTR) Program; V. A. Maroni (PhD, Princeton University, 1967) is responsible for tritium technology and is manager of the primary energy conversion system studies; W. M. Stacey, Jr. (PhD, Massachusetts Institute of Technology, 1966) is manager of the TEPR Project, director of the ANL-CTR Program, and manager of plasma physics and performance analysis. (Standing, bottom left to right) J. R. Purcell (BS, Colorado University, 1956) is manager of magnet systems studies; J. S. Patten (PhD, State University of New York, 1973) is involved in the analysis and design of the coolant system for the primary energy conversion system; J. S. Moenich (BS, Illinois Institute of Technology, 1955) is responsible for the analysis and design of vacuum systems; K. E. Evans, Jr. (PhD, University of Illinois, 1970) is concerned with plasma static-equilibrium analysis; and R. L. Kustom (PhD, University of Wisconsin, 1969) is responsible for the power supply systems studies and design and is manager of the plasma support system activities.

W. M. Stacey, Jr.
 V. A. Maroni
 J. R. Purcell
 M. A. Abdou
 P. J. Bertoncini
 J. N. Brooks
 J. B. Darby, Jr.
 K. Evans, Jr.

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 H. C. Stevens
 S. T. Wang



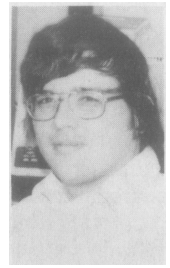
THEORETICAL AND EXPERIMENTAL DYNAMIC ANALYSIS OF THE H. B. ROBINSON NUCLEAR PLANT

T. W. Kerlin (top) (PhD, The University of Tennessee, 1966) is a professor in the Nuclear Engineering Department, The University of Tennessee, and director of the Power Plant Dynamics, Control and Testing Division, of The University of Tennessee Engineering Experiment Station. He is interested in power plant dynamic modeling and testing. E. Marcia Katz (center) (BS, mechanical engineering, Purdue University; MS and PhD, nuclear engineering, The University of Tennessee) is a member of Tau Beta Pi, the American Nuclear Society, the American Society of Mechanical Engineers, and the Society of Women Engineers. Jivan G. Thakkar (bottom) (MS, nuclear engineering, The University of Tennessee, 1975) is studying for a PhD in nuclear engineering at The University of Tennessee. He is currently working on dynamic models for the high-temperature gas-cooled reactor systems.

T. W. Kerlin
 E. M. Katz
 J. G. Thakkar
 J. E. Strange



John E. Strange (right) (BS, nuclear engineering, The University of Tennessee, 1974) is studying for his MS in nuclear engineering at The University of Tennessee. He is also working part time for the Tennessee Valley Authority as a quality assurance engineer.

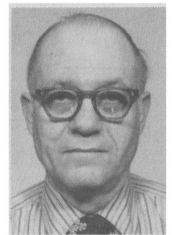
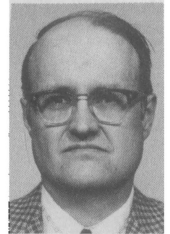


CHEMICAL PROCESSING

REMOVAL OF RADIOIODINE FROM GAS STREAMS BY ELECTROLYTIC SCRUBBING

*J. C. Mailen
D. E. Horner*

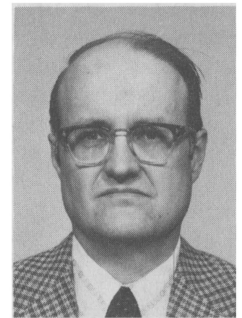
James C. Mailen (top) (PhD, chemical engineering, University of Florida, 1964) is a research engineer at Oak Ridge National Laboratory (ORNL). He has been engaged in various reactor fuel reprocessing areas including fluoride volatility methods, molten salt breeder reactor studies, and liquid-metal fast breeder reactor (LMFBR) studies. His current interests include containment problems common both to LMFBR and light water reactor fuel reprocessing plants. Donald E. Horner (BS, chemistry, Georgia Institute of Technology; MS, chemistry, Emory University, 1946) is a chemist in the Chemical Technology Division of ORNL. He has been engaged for many years in solvent extraction research and development work aimed at separations of many elements including uranium, plutonium, and fission products. His present work involves the development of chemical processes for processing spent reactor fuels.



USE OF CHEMICAL EQUILIBRIUM DATA TO CALCULATE IODOX COLUMN OPERATIONS

J. C. Mailen

James C. Mailen (PhD, chemical engineering, University of Florida, 1964) is a research engineer at Oak Ridge National Laboratory. He has been engaged in various reactor fuel reprocessing areas including fluoride volatility methods, molten salt breeder reactor studies, and liquid-metal fast breeder reactor (LMFBR) studies. His current interests include containment problems common to both LMFBR and light water reactor fuel reprocessing plants.

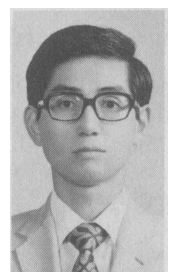


FUELS

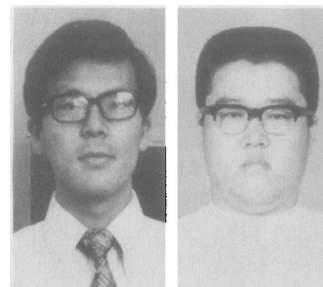
VELOCITY MEASUREMENTS IN THE SUBCHANNEL OF THE WIRE-SPACED SUBASSEMBLY

*Toshihide Ohtake
Shinichi Uruwashi
Keiichi Takahashi*

Toshihide Ohtake (right) (BS, mechanical engineering, Waseda University) is an assistant senior engineer at the Tokai Works of Power Reactor and Nuclear Fuel Development Corporation (PNC). He has been involved in the fabrication design of the fuel subassembly of the JOYO Fast Experimental Reactor. His current work is the investigation of thermal-hydraulic characteristics of the fuel



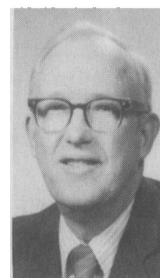
subassembly. Shinichi Uruwashi (left) (mechanical engineering, Katsuta Technical High School) has been involved in the fuel pin failure experiment, the out-of-pile experiment of fuel subassembly, and the observation of fuel-sodium interaction phenomena at the Tokai Works of PNC. Keiichi Takahashi (right) (mechanical engineering, Takahagi Technical High School) is assigned to the out-of-pile test of the fuel subassembly at the Tokai Works of PNC.



NEUTRON SPECTRUM AND RADIAL POWER DISTRIBUTION MEASUREMENTS IN A TRIGA REACTOR FUEL ELEMENT

Walter L. Weaver III (top) (PhD, nuclear engineering, University of Illinois, 1975) is an assistant nuclear engineer in the Fast Reactor Safety Division at Brookhaven National Laboratory. His interests include methods development for reactor safety, in particular thermohydraulic analysis of multiloop reactor heat transport systems including heat exchangers and steam generators. Marvin E. Wyman (center) (BS, physics, St. Olaf College; PhD, physics, University of Illinois) taught college physics for four years and worked at Los Alamos Scientific Laboratory for five years. He returned to the University of Illinois in 1958 to help develop a graduate nuclear engineering program. He has been chairman of the program since 1965. His research interests include experimental reactor physics, fission physics, and thermal systems. Barclay G. Jones (bottom) (PhD, University of Illinois) has industrial experience with English Electric, Atomic Energy Research Establishment (Harwell), Canadair Nuclear Division, and Westinghouse Atomic Power. He is currently a professor of nuclear and mechanical engineering at the University of Illinois. In addition to reactor heat transfer, he is doing research on turbulent dispersion and basic fluid turbulence.

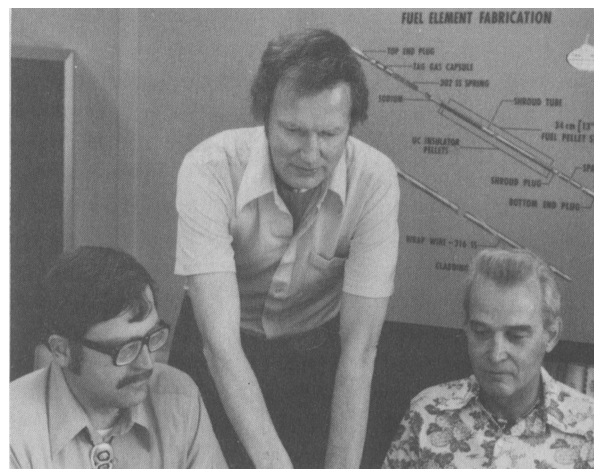
*Walter L. Weaver III
Marvin E. Wyman
Barclay G. Jones*



CLADDING OVALITIES IN ADVANCED LIQUID-METAL FAST BREEDER REACTOR FUEL ELEMENTS

Jerry F. Kerrisk (center) (BS, chemical engineering, Illinois Institute of Technology, 1960; PhD, physical chemistry, University of New Mexico, 1968) has been involved with the advanced liquid-metal fast breeder reactor (LMFBR) fuel program at Los Alamos Scientific Laboratory (LASL) since 1968 and is currently engaged in the design and analysis of steady-state and off-normal irradiation experiments. John O. Barner (left) (BS, ceramic engineering, University of Washington, 1961; MS, engineering, University of California at Berkeley, 1963) has been involved with design, fabrication, and analysis of advanced LMFBR fuel elements since 1966. He is presently in charge of the steady-state irradiation testing of advanced fuel elements at LASL. Roy L. Petty (right) (BA, chemistry, University of Wichita, 1948; MS, physical chemistry, University of Wichita, 1950; PhD, physical chemistry, University of Kansas, 1953) has been at LASL since 1958 and in the advanced fuels program since 1974. He is currently involved with postirradiation examination and analysis of advanced fuel element tests.

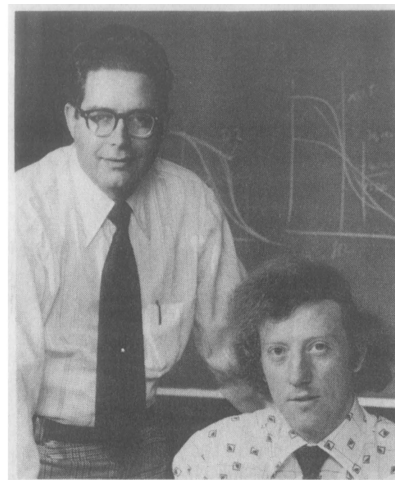
*Jerry F. Kerrisk
John O. Barner
Roy L. Petty*



SWELLING AND MICROSTRUCTURAL CHANGES IN IRRADIATED VANADIUM ALLOYS

J. Bentley (right) and P. W. Wiffen are members of the Radiation Effects Group in the Metals and Ceramics Division of Oak Ridge National Laboratory. Bentley (PhD, physical metallurgy, University of Birmingham, England, 1974) is currently interested in electron microscopy and radiation effects in metals and alloys. Wiffen (PhD, materials science, Northwestern University, 1967) is currently working in the area of irradiation effects in controlled thermonuclear reactor materials and has 12 years of experience with radiation effects in metals.

*J. Bentley
P. W. Wiffen*



GRAIN BOUNDARY PENETRATION KINETICS OF NITRIDED TYPE 304L STAINLESS STEEL

John A. Reeves, Jr. (photo not available) (MS, metallurgical engineering, Colorado School of Mines, 1974) is now assistant manager of Longwall Operations for Mid-Continent Coal and Coke Company, Carbondale, Colorado. David L. Olson (top) (PhD, materials science, Cornell University, 1970) is an associate professor of metallurgical engineering at the Colorado School of Mines. He is concerned with research in the areas of corrosion, reactive metals, and joining. Walter L. Bradley (PhD, materials science, University of Texas, 1969) is an associate professor of metallurgical engineering at the Colorado School of Mines. He is involved with research in areas of mechanical behavior of materials and phase transformations.

*J. A. Reeves, Jr.
D. L. Olson
W. L. Bradley*



INFLUENCE OF SECTION THICKNESS ON FATIGUE CRACK GROWTH IN TYPE 304 STAINLESS STEEL

Paul Shahinian (BS, metallurgical engineering, Virginia Polytechnic Institute, 1943; SM, metallurgy, Massachusetts Institute of Technology, 1947; PhD, University of Maryland, 1959) is a consultant in the Thermostructural Branch at the Naval Research Laboratory. He has done extensive research on metallurgical, mechanical, and environmental effects on high-temperature behavior of metals. His current interests include the applicability of fracture mechanics concepts to metals at elevated temperature.

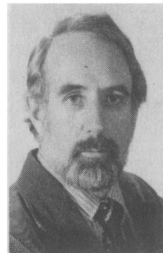
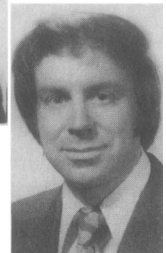
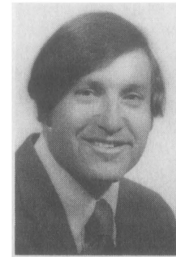
Paul Shahinian



FAST-NEUTRON HODOSCOPE AT TREAT: DATA PROCESSING, ANALYSIS, AND RESULTS

Alexander De Volpi (top left) (MS, nuclear engineering and physics, Virginia Polytechnic Institute, 1958; PhD, physics, Virginia Polytechnic Institute, 1967), hodoscope group leader, is a physicist with a reactor research background. He accepted a 2-yr appointment at Argonne National Laboratory (ANL) in the Institute of Nuclear Science and Engineering, later transferring to Reactor and Applied Physics Research. His past research includes the neutron yield from ^{252}Cf . Roy R. Stewart (top right) (MS, mechanical engineering, University of Illinois at Chicago, 1969) has worked in the Reactor Engineering and Reactor Analysis and Safety (RAS) Divisions at ANL for the past 13 yr as an assistant experimenter and fuel motion study analyst. James P. Regis (center left) (BS, mathematics, St. Procopius College, 1964) has been at ANL since 1965. He presently provides computer programming and data analysis assistance in the RAS Division for the hodoscope group. George S. Stanford (bottom right) (MA, physics, Wesleyan University, 1951; PhD, nuclear physics, Yale University, 1956) has been at ANL since 1959. He is currently in the RAS Division, analyzing and interpreting hodoscope data. Edgar A. Rhodes (bottom left) (MS, physics, Virginia Polytechnic Institute, 1965; PhD, physics, Florida State University, 1972) has research experience in solid-state and reactor physics. He joined the ANL staff in 1964 as a member of the RAS Division hodoscope group.

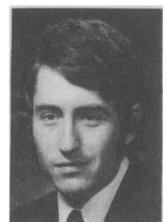
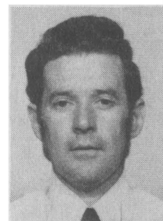
A. De Volpi
R. R. Stewart
J. P. Regis
G. S. Stanford
E. A. Rhodes



EVALUATION OF INITIAL LOADING COUNTING RATE DATA FROM EXPERIMENTS WITH THE MOCK-UP CORE FOR THE FAST FLUX TEST FACILITY

John T. Mihalczko (top) (PhD, nuclear engineering, University of Tennessee) is a member of the research staff at Oak Ridge National Laboratory (ORNL) (operated by Union Carbide Nuclear Division). He has been involved in a variety of static and kinetic reactor physics experiments and their analysis. His current interests include fusion experiments and their analysis. G. C. Tillett, Jr. (center) (MS, nuclear engineering, University of Oklahoma, 1972) is an engineer with the Division of Reactor Development and Demonstration of the U.S. Energy Research and Development Administration, currently employed in the Clinch River Breeder Reactor Project Office at Oak Ridge, Tennessee. His interests include reactor physics, reactor instrumentation, and reactor safety and reliability. D. L. Selby (bottom) (MS, nuclear engineering, University of Tennessee, 1974) is currently employed by the Computer Sciences Division, Union Carbide Nuclear Division. He presently has responsibility for the ORNL portion of the analysis of the low-level flux monitor systems design for the Clinch River Breeder Reactor, Fast Test Reactor, and related experiments.

J. T. Mihalczko
G. C. Tillett
D. L. Selby



NEUTRON DOWNSCATTERING IN LASER-INDUCED FUSIONING PLASMAS

*Finis H. Southworth
Hugh D. Campbell*

Finis H. Southworth (top) (PhD, nuclear engineering, University of Florida) is assistant professor of nuclear engineering at the University of Illinois in Champaign-Urbana. His current interests include fusion reactor neutronics, advanced fusion fuel systems analysis, and fusion plasma numerical models. Hugh D. Campbell (PhD, University of British Columbia, 1968) is associate professor of nuclear engineering at the University of Florida. His research activities include plasma diagnostics, uranium plasmas, nuclear pumped lasers, and fusion.

