

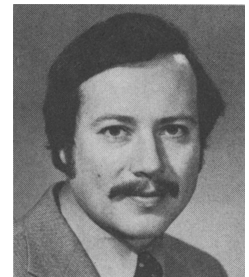


AUTHORS — DECEMBER 1980

ARGONNE NATIONAL LABORATORY SPECIALISTS' WORKSHOP ON BASIC RESEARCH NEEDS FOR NUCLEAR WASTE MANAGEMENT

BASIC RESEARCH FOR EVALUATING NUCLEAR WASTE FORM PERFORMANCE

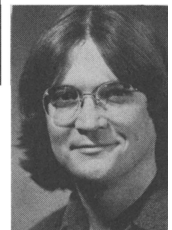
Don J. Bradley



Don J. Bradley (BS, chemical engineering, Washington State University, 1971; MS, nuclear engineering, University of Washington, 1973) is a senior scientist at Pacific Northwest Laboratory. He has been active in waste solidification programs over the past five years. He is currently responsible for the Waste Package Interactions—Nuclide Release Studies Task of the Waste/Rock Interactions Technology Program, aimed at studying interactions of nuclear waste forms with geologic environments, to provide radionuclide release data and models for safety assessments.

THE NATURE OF GLASS LEACHING

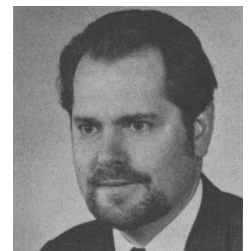
*G. L. McVay
C. Q. Buckwalter*



G. L. McVay (top) (BS, metallurgical engineering, 1965, MS, ceramic engineering, 1967, and PhD, ceramic engineering, 1970, University of Missouri-Rolla) is a senior research scientist and a technical leader of the Glass Technology Group at Pacific Northwest Laboratory (PNL). His interests and activities are in developing an understanding of glass and ceramic interactions with aqueous solutions. **C. Q. Buckwalter** (BS, business management, Pennsylvania State University, 1971; BS, 1976, and MS, 1978, chemistry, Arizona State University) is currently a staff scientist at PNL, where he is involved in solar mirror degradation research and theoretical interpretations of glass leaching.

SELF-DIFFUSION PROCESSES IN OXIDE GLASSES

G. H. Frischat

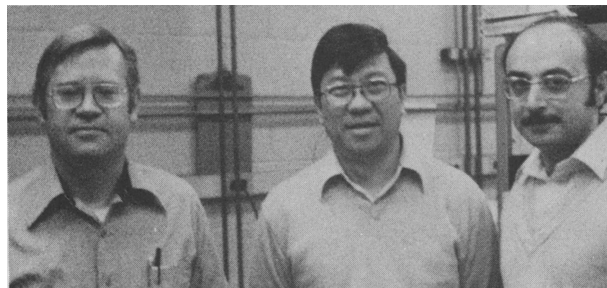
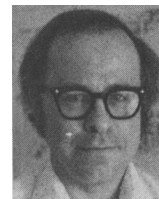


Guenther Heinz Frischat (Diploma, physics, 1963, and PhD, physics, 1965, Wuerzburg University; Dozent, Technical University of Clausthal, 1970) is teaching and performing research in the field of glasses and ceramics. He has been a professor at the Technical University of Clausthal since 1974.

X-RAY PHOTOELECTRON SPECTROSCOPY STUDIES OF SILICATE GLASSES: IMPLICATIONS TO BONDING AND LEACHING

Boyd W. Veal (group photo, left) (PhD, physics, University of Wisconsin, 1969) is a research scientist in the Materials Science Division at Argonne National Laboratory (ANL). His current research interests include the application of x-ray photoelectron spectroscopy (XPS) and optical spectroscopy techniques in the study of electronic structure of amorphous and crystalline solids. **Daniel J. Lam** (group photo, center) (PhD, physical metallurgy, Rensselaer Polytechnic Institute, 1960) is a senior scientist and group leader in the Materials Science Division at ANL. His research interests include the studies of electronic structure and its relationship to physical and chemical properties of alloys and compounds. **A. P. Paulikas** (single photo) (BS, engineering physics, University of Illinois, 1963) is a scientific associate in the Materials Science Division of ANL, currently engaged in XPS studies of silicate glasses. **Douglas P. Karim** (group photo, right) (BS, engineering physics, Cornell University, 1969; MS, 1970, and PhD, 1977, physics, Northwestern University) is a research scientist in the Materials Science Division at ANL. His current research interests include the application of XPS, extended x-ray absorption fine structure, and ion beam techniques in the study of the structure and bonding of atoms in glasses and solutions.

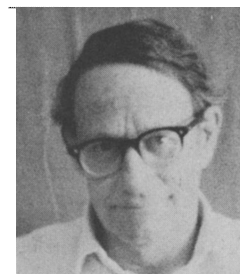
*B. W. Veal
D. J. Lam
A. P. Paulikas
D. P. Karim*



URANIUM AND THORIUM DISEQUILIBRIUM IN ZEOLITICALLY ALTERED ROCK

John N. Rosholt (BS, chemical engineering, University of Colorado, 1948; MS, 1961, and PhD, 1963, marine science, University of Miami, Florida) has been a research chemist for the U.S. Geological Survey since 1948. He has investigated radioactive disequilibrium of the uranium and thorium decay series in many natural environments for the past 32 years. He is currently working on quaternary geochronology using U-series dating techniques.

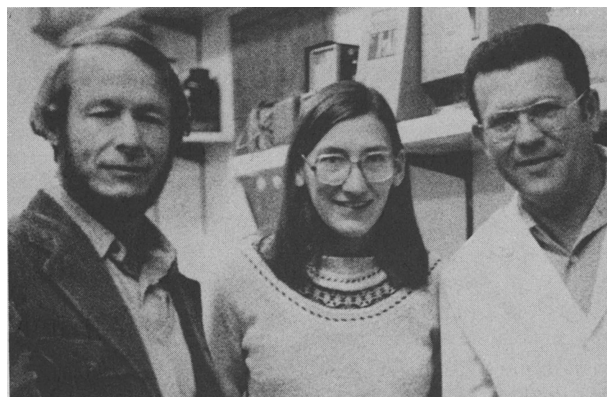
John N. Rosholt



APPLICATION OF FIELD-FLOW FRACTIONATION TO RADIOACTIVE WASTE DISPOSAL

Marcus N. Myers (right) (BS, chemistry, 1950, and MS, organic chemistry, 1952, Brigham Young University; PhD, physical chemistry, University of Utah, 1965) is an associate research professor and laboratory coordinator in Dr. Giddings' group at the University of Utah where he has worked since receiving his PhD. His work has involved many aspects in the field of separations. Previously, he worked in the area of plutonium chemistry and radiochemical methods for General Electric Company. **Kathy A. Graff** (center) (BS, chemistry, Indiana University of Pennsylvania, 1970; MS, analytical chemistry, University of Illinois, 1972) is involved in experiments in field-flow fractionation in Dr. Giddings' group at the University of Utah. Her experience has been in the areas of environmental chemistry and engineering. **J. Calvin Giddings** (left) (BS, chemistry, Brigham Young University, 1952; PhD, physical chemistry, University of Utah, 1954) is professor of chemistry at the University of Utah where his studies of the mechanisms and dynamics of chromatography and other separation systems have led to his current interest in macromolecular separations. Field-flow fractionation and steric separations are two new approaches being developed in this area. Other studies have included impact of human population, environmental chemistry, and characterization of environmental particulate matter.

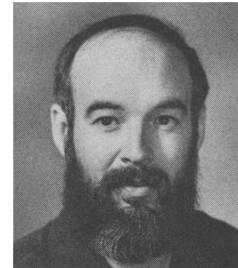
*Marcus N. Myers
Kathy A. Graff
J. Calvin Giddings*



DIFFUSION COEFFICIENTS AND THEIR USE

John F. Relyea (BS, 1970, and MS, 1972, physics, University of Arkansas; PhD, agronomy-soil chemistry, University of Arkansas, 1978) is a research scientist at Pacific Northwest Laboratory. He is currently investigating the interaction of geologic media with radioactive waste.

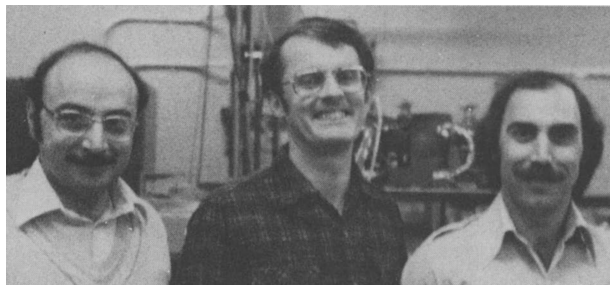
J. F. Relyea



EXTENDED X-RAY ABSORPTION FINE STRUCTURE STUDIES OF ACTINIDE IONS IN AQUEOUS SOLUTION

Douglas P. Karim (left) (BS, engineering physics, Cornell University, 1969; MS, 1970, and PhD, 1977, physics, Northwestern University) is a research scientist in the Materials Science Division at Argonne National Laboratory (ANL). His current research interests include the application of x-ray photoemission spectroscopy, extended x-ray absorption fine structure (EXAFS), and ion beam techniques in the study of the structure and bonding of atoms in glasses and solutions. **Gordon S. Knapp** (center) (AB, physics, University of California, Berkeley, 1962; PhD, physics, University of California, San Diego) is a research scientist whose expertise is in the field of superconductivity, magnetism, and EXAFS studies. He developed new methods of making heat capacity measurements on radioactive samples and led the development of the first really practical in-laboratory EXAFS facility. **Panayotis Georgopoulos** (right) (Diploma, physics, University of Athens, Greece, 1971; PhD, materials science, Northwestern University, 1978) is a post-doctoral appointee. His interests are in the field of x-ray diffraction and EXAFS of alloys and intermetallic compounds. He has developed new methods of x-ray diffuse scattering analysis and has been instrumental in the development of the ANL in-laboratory EXAFS facility.

*Douglas P. Karim
P. Georgopoulos
G. S. Knapp*



OXIDATION STATE SPECIFIC DETECTION OF TRANSURANIC IONS IN SOLUTION

James V. Beitz (top) (AB, chemistry, Columbia College, New York, 1971; PhD, physical chemistry, University of California, Berkeley, 1976) is an assistant scientist in the Heavy Elements Group of the Chemistry Division of Argonne National Laboratory (ANL). He has been active in applying lasers to problems of chemical interest. His present research efforts include photochemistry of the actinides, solution analysis using laser-based techniques, and electron transfer kinetics in low-temperature solids. **Jan P. Hessler** (BA, Kalamazoo College, 1965; PhD, physics, Michigan State University, 1971) is an assistant scientist in the Heavy Elements Group of the Chemistry Division of ANL. He is a pioneer in the utilization of laser techniques to study the optical properties of the actinides. His current research interests include dynamic properties of optically excited ions, nonlinear optical processes, and the utilization of laser techniques for the detection of trace impurities.

*James V. Beitz
Jan P. Hessler*



POSSIBLE APPLICATIONS OF THE MÖSSBAUER TECHNIQUE IN WASTE MANAGEMENT STUDIES

Stanley L. Ruby (BA, Columbia University, 1947) is a physicist at Argonne National Laboratory who has helped to develop many new applications for Mössbauer spectroscopy. This technique enables one to determine some aspects of the micro-environment of a nucleus by measurements of gamma rays emitted by it.

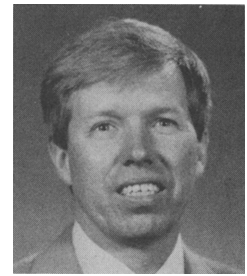
S. L. Ruby



ROCK ALTERATION AND MINERAL TRANSFORMATIONS FOR NUCLEAR WASTE MANAGEMENT

Philip A. Helmke (BS, chemistry and physics, University of Wisconsin-Stevens Point, 1964; PhD, analytical chemistry, 1971) is an associate professor in the Department of Soil Science at the University of Wisconsin-Madison. He has studied terrestrial and lunar basalts. His current research interests include the behavior of elements in geological systems with emphasis on trace elements and the development of analytical techniques to study element species in solution.

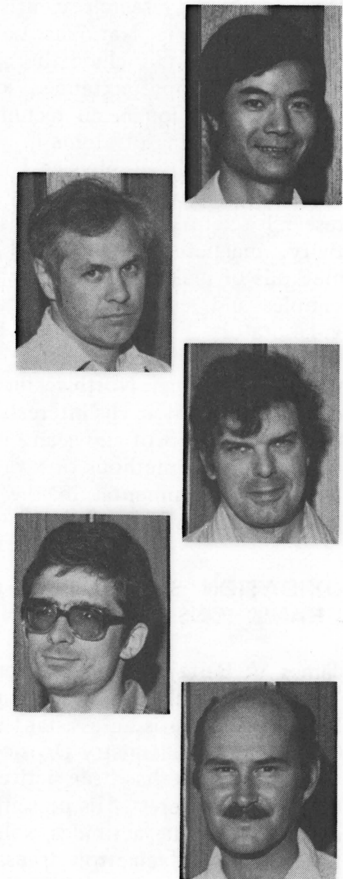
Philip A. Helmke



ASPECTS OF FELDSPAR DISSOLUTION

Patrick C. Fung (top right) (BS, Lakehead, and PhD, McMaster, geology, 1978) is interested in geochemistry of sedimentary and igneous rocks, trace elements, and experimental geochemistry. In his undergraduate years, he worked in field mapping and analysis of rocks and minerals. Since joining Atomic Energy of Canada Limited (AECL), Whiteshell Nuclear Research Establishment, as a research geochemist, he has been studying mineral-water interaction for the Canadian Nuclear Fuel Disposal Program. **Gordon W. Bird** (top left) (BS, New Brunswick; MS, Alberta; PhD, Toronto, 1971) has research interests in geochemistry and phase equilibria of geological materials. Before completing his PhD, he worked as a regional exploration geologist. After finishing his degree he spent six years at Victoria University in Wellington, New Zealand, as a research fellow and senior lecturer in mineral sciences. He joined AECL in 1978 as a research geochemist and is currently responsible for coordinating the research program to develop backfilling and sealing techniques for the Nuclear Fuel Waste Disposal Program. **N. Stewart McIntyre** (center right) (BS and PhD, chemistry, University of Western Ontario) has for the past nine years worked in the Analytical Science Branch, Whiteshell Nuclear Research Establishment, specializing in the development of instrumental techniques for surface analysis. **Guiliano G. Sanipelli** (bottom left) (Cambrian College, 1977) joined AECL at Whiteshell Nuclear Research Establishment in 1978 and has been working on dissolution and surface studies of minerals. **Vincent J. Lopata** (bottom right) (chemical technology, Red River Community College, 1970) has been employed by AECL since graduation, working in several fields of chemical research. From 1970 to 1976, his main area of interest was radiolysis of water and alcohols using pulse radiolysis and flash photolysis techniques. Since 1976 his interest has been in the Nuclear Fuel Waste Management Program of AECL, specifically looking at methods to immobilize radionuclides from the environment.

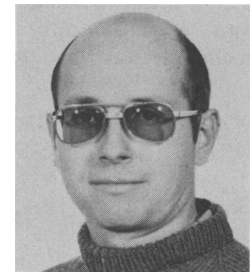
*P. C. Fung
G. W. Bird
N. S. McIntyre
G. G. Sanipelli
V. J. Lopata*



STABILITY OF GLASS IN THE GEOLOGIC ENVIRONMENT: SOME EVIDENCE FROM STUDIES OF NATURAL SILICATE GLASSES

Robert A. Zielinski (PhD, geochemistry, Massachusetts Institute of Technology, 1972) is a research chemist for the U.S. Geological Survey, Uranium-Thorium Resources Branch, Denver, Colorado. His interests include the measurement and interpretation of trace element abundances in rocks for the purpose of determining their origin and magmatic history. His current research consists of laboratory and field studies of the mobility of uranium during crystallization and low-temperature alteration of volcanic rocks.

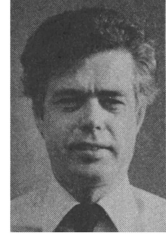
Robert A. Zielinski



FUEL CYCLE UTILIZING PLUTONIUM-238 AS A "HEAT SPIKE" FOR PROLIFERATION RESISTANCE

The three authors are employed at Allied-General Nuclear Services (AGNS). **William R. Waltz** (top) (BS, physics, North Carolina State University, 1961; MS, nuclear science and engineering, Carnegie-Mellon University, 1969) has been involved in fuel cycle studies and process plant nuclear criticality safety at the Barnwell Nuclear Fuel Plant. Prior to joining AGNS in 1974, Waltz was employed at the Bettis Atomic Power Laboratory. **W. Lynn Godfrey** (center) (BES, chemical engineering, Brigham Young University, 1961) is a senior engineer. His responsibilities include modeling and evaluation of the nuclear fuel cycle. His nuclear experience began at Hanford Engineering Development Laboratory where he was involved in fuel reprocessing and radioactive waste management programs. **Alan K. Williams** (bottom) (BA, chemistry, University of Northern Colorado, 1952) is presently vice president for the Operations and Technical Division of AGNS. Prior to joining AGNS in 1974, Williams was employed at the Rocky Flats plant where he directed various groups in research and development, technical support, and production. His prime interests are in chemical processing of the transuranium elements.

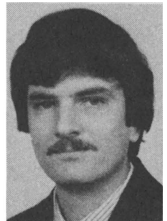
*W. R. Waltz
W. L. Godfrey
A. K. Williams*



CRITICAL EXPERIMENTS SUPPORTING CLOSE PROXIMITY WATER STORAGE OF POWER REACTOR FUEL

Gary S. Hoovler (top right) (BS, 1973, and MS, 1977, nuclear engineering, University of Virginia) is research engineer in the Reactor Experiments Group at The Babcock & Wilcox Company (B&W) Lynchburg Research Center (LRC). As operations supervisor of the CX-10 critical facility, he has primary responsibility for the design and performance of critical experiments at LRC. **M. Neil Baldwin** (top left) (BS, 1952, and BA, 1955, Lynchburg College; MS, Vanderbilt University, 1957) is group supervisor of reactor experiments at LRC. His group has the prime responsibility for all critical experiments and swimming pool reactor operations at LRC. He has been directly involved with critical experiments for 20 years. **Raymond L. Eng** (bottom right) (BS, chemistry, 1969, and PhD, nuclear engineering, 1975, Massachusetts Institute of Technology; MEA, George Washington University, 1980) is a senior research engineer at LRC, working on computational analysis of nuclear criticality systems. He had previous experience at Stone & Webster Engineering Corp., Boston, in the design of high density spent fuel storage racks. **Fred G. Welfare** (bottom left) (BS, 1957, and MS, 1959, nuclear engineering, North Carolina State University) is currently employed at LRC, where his primary activity is the development of methods for nuclear criticality safety calculations. Other interests include general neutronics calculations and critical experiments. He has a total of 14 years experience in nuclear criticality safety at B&W and at the Oak Ridge Y-12 Plant.

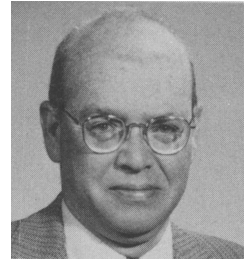
*Gary S. Hoovler
M. Neil Baldwin
Ray L. Eng
Fred G. Welfare*



CASCADE PERFORMANCE FOR LARGE SEPARATION FACTORS

George Emanuel

George Emanuel (PhD, aeronautical sciences, Stanford University, 1962) recently joined the faculty of the University of Oklahoma in the Department of Aeronautical, Mechanical, and Nuclear Engineering. Previous to this he was a staff member in the Applied Photochemistry Division at Los Alamos Scientific Laboratory. His work has been in the areas of fluid mechanics, radiative transfer theory, chemical kinetics, all aspects of pulsed and continuous wave chemical lasers, and laser isotope separation processes.



TECHNIQUES

A NEW NEUTRON DETECTION TECHNIQUE: FISSILE RESISTORS

Michel Roche (top right) (PhD, solid-state physics, Dijon University, France) is an engineer at the Atomic Energy Commission of France at Valduc Center. From 1963 to 1969, he was in charge of low-energy accelerators, especially of the layout of Lancelot. Since 1969, he has been the leader of a group connected with experimental neutronics and high-power relativistic electron beam generators. **Jeannine Morin** (top left) (diploma, Ecole Polytechnique Féminine) is an engineer at the Atomic Energy Commission of France at Valduc Center, in charge of neutron dosimetry connected to the Caliban and Prospero reactors, and the Lancelot accelerator. **Roger Musart** (bottom right) (MS, University of Lille, France; diploma, Institute Supérieur d'Electronique du Nord) is an engineer at the Atomic Energy Commission of France at Valduc Center, in charge of an applied electronics group specializing in fast nuclear instrumentation. **Bernard Pierre** (bottom left) (diploma, Conservatoire National des Arts et Métiers) is a qualified technician at the Atomic Energy Commission of France at Valduc Center, specializing in fast electronic measurements.

*M. Roche
J. Morin
R. Musart
B. Pierre*

