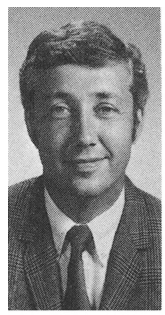
nuclear technology
CONTINUING NUCLEAR APPLICATIONS & TECHNOLOGY

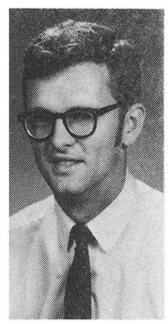
AUTHORS — FEBRUARY 1971

REACTORS

EXPERIENCES WITH DYNAMIC TESTING METHODS AT THE MOLTEN-SALT REACTOR EXPERIMENT

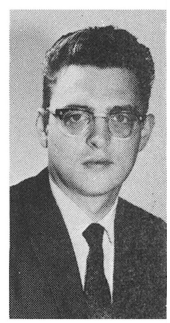
T. W. Kerlin
S. J. Ball
R. C. Steffy
M. R. Buckner

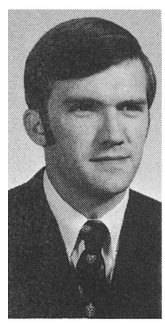




THEORETICAL DYNAMICS ANALYSIS OF THE MOLTEN-SALT REACTOR EXPERIMENT

T. W. Kerlin
S. J. Ball
R. C. Steffy

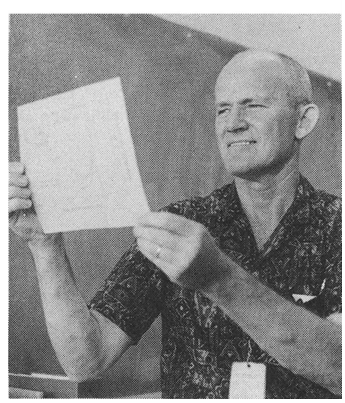




T. W. Kerlin (top left) (PhD, engineering science, University of Tennessee, 1966) worked at Atomics International and Oak Ridge National Laboratory prior to joining the nuclear engineering faculty at the University of Tennessee in 1967. His main research interests are the theoretical and experimental dynamics analysis of reactor systems. S. J. Ball (top right) (BE, electrical engineering, Yale University, 1957) has been employed in the Instrumentation and Controls Division, Oak Ridge National Laboratory for 13 years. His primary interests are reactor and process dynamics, and he is currently working on nuclear desalting plant control problems. R. C. Steffy (bottom right) (MS, nuclear engineering, University of Tennessee, 1969) worked at Oak Ridge National Laboratory prior to joining the Nuclear Engineering Branch of the Office of Power at the Tennessee Valley Authority. He is now involved in work on reactor safety and licensing problems. M. R. Buckner (bottom left) (PhD, nuclear engineering, University of Tennessee, 1970) is now working in the Computer Science Section at Savannah River Laboratory. His current work deals with space-time kinetics.

A SMALL NUCLEAR REACTOR FOR UNDERSEA USE

Carroll B. Mills



Carroll B. Mills, for 13 years a Los Alamos physicist, is active in parametric studies of fast to thermal spectrum characteristics for safety and advanced applications, using critical experiment results for quality evaluation.

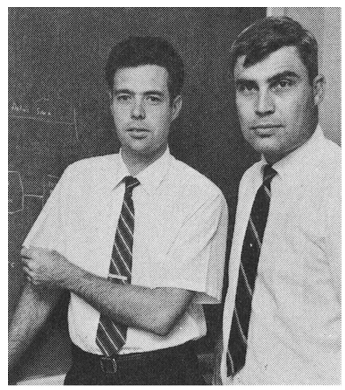
THE INSTRUMENTED SUBASSEMBLY SYSTEM IN EBR-II

A. Smaardyk
C. J. Divona
E. Hutter

A. Smaardyk (left) has been involved for over 20 years in the design and development of reactor concepts and components at Argonne National Laboratory. He is facility manager for the EBR-II instrumented subassemblies. C. J. Divona's (center) interests have been in sodium technology and fast reactor components since joining Argonne in 1962, and he was the engineer responsible for the prototype instrumented subassembly. Currently, he is working on a system for the handling of failed fuel subassemblies in EBR-II. E. Hutter (right) has been active in the design of fast reactors for over 20 years, beginning with EBR-I. As section manager, he is currently responsible for reactor component engineering of the EBR-II Project.

CALCULATION OF NEUTRON DETECTOR RESPONSE IN A SUBCRITICAL REACTOR

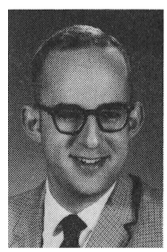
W. R. Waltz
J. F. Walter

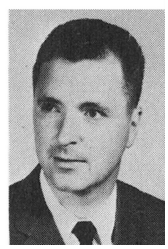


William R. Waltz (left) (MS, nuclear science and engineering, Carnegie-Mellon University) is a senior engineer at the Bettis Atomic Power Laboratory. His current area of study is nuclear safeguards. J. F. Walter (PhD, University of Pittsburgh, 1957) is a manager at the Bettis Atomic Power Laboratory where he has been involved in nuclear design and submarine propulsion since 1957.

SHORT-INTERVAL SERIES PULSING—EXPERIMENTAL STUDIES AND NUMERICAL EXPERIMENTS

H. A. Kurstedt, Jr.
G. H. Miley





Harold A. Kurstedt, Jr. (left) (PhD, nuclear engineering, University of Illinois) is presently working as program manager on the research and development activities of the Federal Systems Division of Industrial Nucleonics Corporation, Columbus, Ohio. His previous experience includes university faculty positions in mechanical engineering and nuclear engineering. George H. Miley, professor of nuclear and of electrical engineering at the University of Illinois, has previously contributed articles to *Nuclear Applications* dealing with radiation energy conversion. His other research deals with neutron pulse propagation and plasma systems.

CHEMICAL PROCESSING

AN EMPIRICAL MODEL FOR SAFE PIPE INTERSECTIONS CONTAINING FISSILE SOLUTION

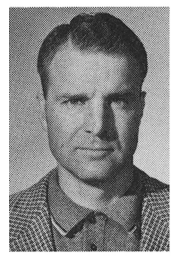
Deanne Dickinson
C. L. Schuske

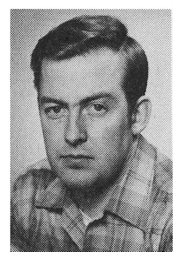
Deanne Dickinson (left) is a research physicist at the Dow Chemical Company's Rocky Flats Plant working on computer calculations for nuclear safety purposes. C. L. Schuske is director of nuclear safety and an ANS and APS member. He is active in ANS standards committees.

ACCELERATORS

VERY INTENSE NEUTRON SOURCE

R. M. Brugger
G. J. Russell
B. W. Johnson
G. P. DeVault

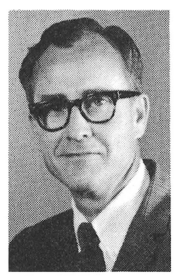
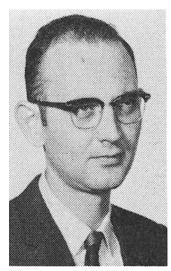
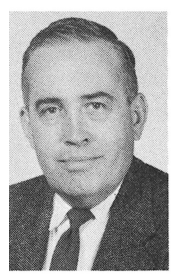


R. M. Brugger (top left) is currently manager of the Nuclear Technology Division, Idaho Nuclear Corporation, Idaho Falls, Idaho. He is presently engaged in directing research and technical support associated with the testing reactors at the National Reactor Testing Station. B. W. Johnson (bottom left) is currently a research scientist for Kaman Sciences Corporation in Colorado Springs, Colorado. His previous experience includes that as a nuclear engineer with the U.S. Atomic Energy Commission in Idaho Falls, Idaho; as a research scientist with Lockheed Research Laboratories in Palo Alto, California; and as a reactor physicist with the Advanced Technology Division of American Standard in Mountain View, California. G. P. DeVault (top right) is an associate professor of Physics at Montana College of Mineral Science and Technology, and a visiting staff member at the Los Alamos Scientific Laboratory. He is currently engaged in research on nonequilibrium statistical mechanics and the equations of state of solids. G. J. Russell (bottom right) is presently a PhD candidate in nuclear engineering at the University of Wisconsin, Madison, Wisconsin. Past experience includes 5 years with the U.S. Atomic Energy Commission, Idaho Falls, Idaho and as a reactor physicist for $3\frac{1}{2}$ years with Idaho Nuclear Corporation, Idaho Falls, Idaho.

INSTRUMENTS

CONSTRUCTION MATERIALS FOR NEUTRON CAPTURE-GAMMA-RAY MEASUREMENT ASSEMBLY USING CALIFORNIUM-252

F. E. Senftle
A. G. Evans
D. Duffey
P. F. Wiggins


Frank E. Senftle (top right) (PhD, physics, University of Toronto, 1947) is in charge of the solid state physics research of the Isotope Geology Branch, United States Geological Survey. He was head of the Radiation Laboratory, Department of Mines and Technical Services, Ottawa, Ontario, Canada, until 1949 at which time he joined the staff of the Massachusetts Institute of Technology as a research associate. From 1951 until the present, Senftle has been with the United States Geological Survey. A. Gary Evans (top left) (MPh, University of Michigan, 1963) is a research chemist with E. I. du Pont de Nemours at the Savannah River Laboratory. His assignments at Savannah River Laboratory have included research in radiation protection, californium source fabrication, and reactor safety. Dick Duffey (bottom left) (PhD, University of Maryland) is professor of nuclear engineering at the University of Maryland. Following work with the U.S. Atomic Energy Commission as a nuclear engineer at Washington, D.C. and Hanford, Washington, he started the nuclear engineering program at the University in 1954 and established the nuclear reactor project there in 1957, serving as Nuclear Reactor Director through 1967. His technical interests are nuclear reactor design, construction, and operation, and neutron uses. Peter F. Wiggins (bottom right) (PhD, nuclear engineering, University of Maryland, 1970) joined the Naval Academy faculty in 1962 and is now an associate professor in the naval systems engineering department. He is currently interested in ocean sediment analysis by neutron-capture gamma rays.

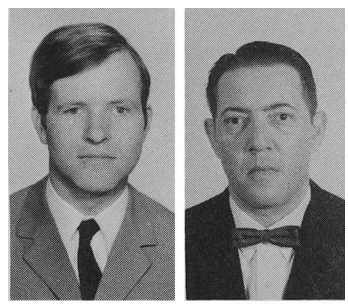
DETECTION AND LOCATION OF LEAKING TRIGA REACTOR FUEL ELEMENTS

G. D. Bouchey
S. J. Gage

S. J. Gage (left) (PhD, Purdue) is presently an associate professor of mechanical engineering, the coordinator of the nuclear engineering program, and the director of the Nuclear Reactor Laboratory at the University of Texas at Austin. Among his interests are research in the area of nuclear analysis including nuclear materials safeguards studies. G. D. Bouchey (MS, Kansas State University) is reactor supervisor for the Nuclear Reactor Laboratory at the University of Texas at Austin. His interests include activation analysis, neutron radiography, and operations research. Both individuals have been actively involved with the utilization of the University of Texas reactor for a wide variety of research applications at the University of Texas at Austin and other Texas governmental agencies.

A SIMPLE TOTAL-REFLECTING LOW-ENERGY NEUTRON SPECTROMETER

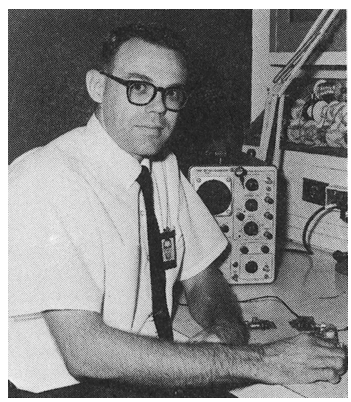
Werner Fiala
Carlos V. Wheeler



Werner Fiala (left) (PhD, physics, University of Vienna, 1968) is assistant professor of physics at the University of Puerto Rico (Mayaguez) and concurrently head of the Cold Neutron Spectrometry program at the Puerto Rico Nuclear Center. Carlos V. Wheeler (MS, physics, University of Puerto Rico, 1969) is an associate professor of mechanical engineering at the University of Puerto Rico (Mayaguez). He is presently on sabbatical leave at the Industrial Engineering Department, Pennsylvania State University.

SELF-AUDITING MULTICHANNEL NEUTRON MONITOR

W. F. Splichal, Jr.

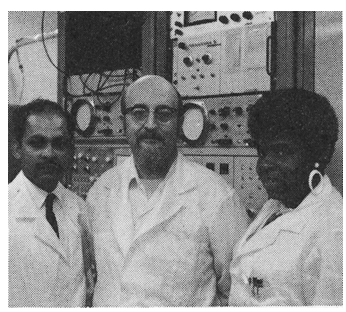


William F. Splichal, Jr. (BS, nuclear engineering, Kansas State University) was at the Savannah River Laboratory from 1962 to 1969, where his primary field of interest was developing and improving instruments for radiation protection groups. He worked on projects involving the design of electronic circuitry, radiation detectors, and measuring and monitoring devices.

ANALYSIS

NEUTRON ACTIVATION ANALYSIS OF INORGANIC CONSTITUENTS OF AIRBORNE PARTICULATES

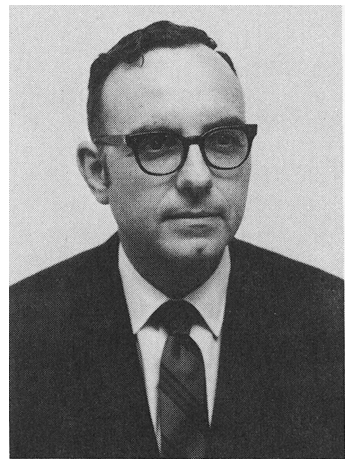
K. K. S. Pillay
C. C. Thomas, Jr.
C. M. Hyche



K. K. S. Pillay, C. C. Thomas, Jr., and C. M. Hyche (shown left to right) are all members of the Research Department of the Western New York Nuclear Research Center, Inc. Thomas is research manager and has been with the Center since 1962. His major interests are in activation analysis, radiation chemistry, and radiation biology. Pillay (PhD, Pennsylvania State University, 1965) is senior research scientist at the Center and interested in nuclear chemistry and in the applications of nuclear methods to analytical problems. Hyche is a research technician at the Center and works in the field of activation analysis.

FORMATION OF INTIMATE OXIDE-CARBON MIXTURES OF FUEL MATERIALS AS AN INTERMEDIATE FOR CARBIDE AND NITRIDE FUELS

E. A. Coppinger
B. M. Johnson



E. A. Coppinger (not shown) (chemical engineering, University of Idaho, 1951) was a senior engineer with Battelle-Northwest (and formerly General Electric Hanford Laboratories) for 18 years before his death in November 1969. He had extensive experience in many aspects of chemical separation and fuel preparation processes in the nuclear field, including conceptual and pilot plant development, and economic evaluation. B. M. Johnson (PhD, University of Wisconsin, 1956) is manager of the Fluid and Energy Systems Section and has been involved in problems of heat mass and momentum transfer since 1956. He was responsible for this work as manager of the Engineering Analysis Unit at Battelle-Northwest. His recent work has been principally in the areas of reactor heat transfer and safety.

Corrigenda

The author is grateful to A. B. Chilton and A. Vetter for locating the typographical errors in the paper "Gamma-Ray Buildup Factor Coefficients for Concrete and Other Materials," *Nucl. Appl. Technol.*, **9**, 439-441 (September 1970), by D. K. Trubey. In Table I, the values of the coefficient D should be:

Material	Type	E (MeV)	D
Ordinary concrete	Exposure	1.0	0.04566
Ordinary concrete	Energy deposition[a]	3.0	0.00825
Magnetite concrete	Tissue kerma	8.0	0.01153
Magnetite concrete	Tissue kerma	10.0	0.01199
Air	Tissue kerma	3.0	0.01017

[a]Chilton data.

Also, the right half of Table I is based on Refs. 5 and 6, rather than Ref. 4 as erroneously indicated in footnote b.

On November 20, F. de Waegh brought to our attention that in the October 1970 issue of *Nuclear Applications and Technology* the photographs were interchanged in Fig. 6 of the articles entitled "Burst Strength of EBR-II Irradiated Fuel Pin Sections," by R. L. Fish et al., and "Plutonium Recycle Studies for the SENA Reactor," by J. Debrue et al. The captions are correct in their present positions (pp. 526 and 535).

On November 2, Peter C. Jurs and Thomas L. Isenhour requested that we publish the following explanatory addition to their article, "An Analog Computer Controlled Gamma-Ray Spectrometer for Comparative Activation Analysis," which begins on p. 584 in the October 1970 issue of *Nuclear Applications & Technology*.

Add the following:

Equation (5), as written, was derived for the case where R_B, the interfering background count rate, is all due to a single radioactive species. If this is not the case, i.e., if R_B comes from several species, then Eq. (5) can be written more generally as

$$S = -\left(\frac{\frac{dR_B}{dt} + \lambda_S R_S - \alpha\lambda_S R_S^{\dagger}}{R_B + R_S - \alpha R_S^{\dagger}} - \frac{\frac{dR_B'}{dt} + \lambda_S R_S - \alpha\lambda_S R_S^{\dagger\prime}}{R_B' + R_S' - \alpha R_S^{\dagger\prime}}\right) . \quad (5a)$$

The two trivial solutions discussed are exhibited by Eq. (5a). One other trivial solution is obtained if all the background species have identical half-lives and spectra. In general, however, experimental use of the method described in this paper depends on the degree to which Eq. (5a) approximates Eq. (5). The two determinations reported were performed with only one background interference, and they thus conformed to the assumption built into Eq. (5).

Due to an error on our part an incorrect version of a Letter-to-the-Editor from P. Goldschmidt was published on pp. 450-451 of the October 1970 issue of *Nuclear Applications and Technology*. The correct version is published in this month's Letter-to-the-Editor.