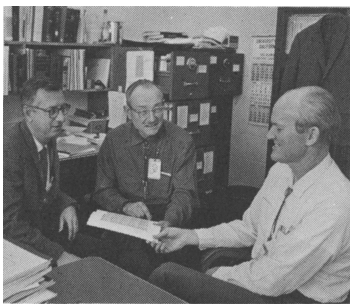
AUTHORS AND PAPERS

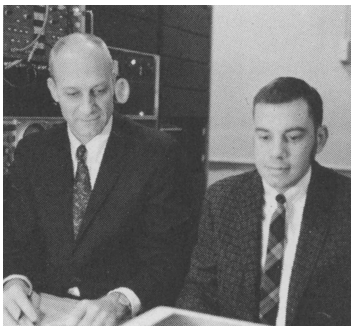
The highly condensed summaries of papers and technical notes (below) are intended to assist the busy reader in determining the order in which to read the technical material. Biographical comments are for human interest.



LOW CRITICAL MASS REACTOR DESIGN

An H_2O-moderated Be-reflected core with the very low critical mass of 300 g of ^{235}U has many attractive features and possible applications in a small power reactor or a new high-neutron-flux reactor concept.

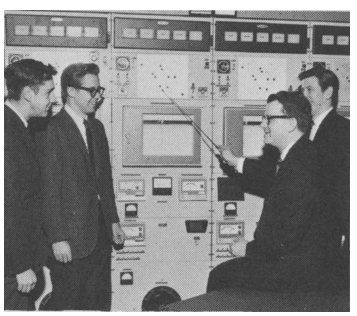
Robert I. Brasier (left), designer of the Los Alamos Small Reactor described in the paper, is in charge of LASL's advanced engineering projects. For eight years he has been involved in the design and construction of reactor prototypes at LASL. L. D. P. King (center), a member of the LASL Director's office and originator of the Kinetic Intense Neutron Generator concept, also described in the paper, has been active in the design and construction of special-purpose reactors at LASL for the past 25 years, beginning with the first water boiler critical assembly. Carroll B. Mills, a physicist with LASL for 12 years and a frequent author in Nuclear Applications, *is actively engaged in the correlation of measured reactivity and criticality with values calculated from transport theory and differential neutron cross sections.*



POWER AND FISSION DISTRIBUTION

Measurements of relative power distribution, absolute fission rate, and core volume fission density of the TSF-SNAP reactor verified the source terms predicted from Monte Carlo and discrete ordinates transport codes.

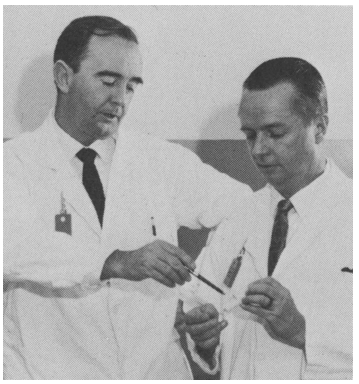
E. A. Straker (right), a member of ORNL's Neutron Physics Division since 1965, is engaged in the development of computer techniques for the solution of radiation transport problems and in the design and utilization of reactor and accelerator experiments for comparison with calculations. F. J. Muckenthaler has been head of the experimental group in radiation shielding of ORNL's Tower Shielding Facility since 1963; he came to ORNL in 1951 after two years at Fairchild Engine.



SODIUM PUMPS

Liquid-metal fast-breeder reactor system analysis provides criteria for selection of pumps operating at 10 000 to 200 000 gal/min with heads ranging from 100 to 450 ft in both seal-of-sodium and piped reactor concepts.

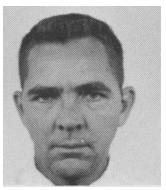
W. E. Gunson (pointing), now manager of mechanical systems on the Fast Flux Test Facility, was manager of thermal systems of the Westinghouse Advanced Reactors Division. J. A. George (left), H. P. Horner (right), and D. K. Goeser were members of the thermal systems group when this paper was written. The latter two are now with the FFTF project and George is now thermal systems manager on the LMFBR project.



^{238}Pu FOR BIOMEDICAL APPLICATIONS

Electrorefined ^{238}Pu metal of high chemical purity (80 at.% ^{238}Pu) gave a spontaneous fission rate of 2800 n/sec per gram of ^{238}Pu. Possible biomedical power sources were prepared and evaluated from ^{238}Pu-Ga, ^{238}PuN, and $^{238}PuO_2$.

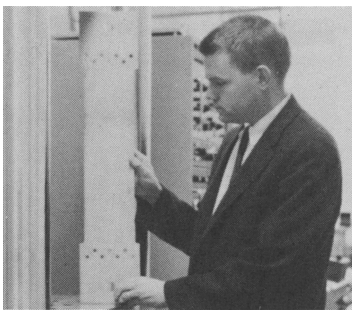
Lawrence J. Mullins (right) (PhD, University of New Mexico, 1957), at Los Alamos since 1946, is engaged in studies of high temperature chemistry of Pu metal systems, fused salt chemistry, electrochemical studies, and the present ^{238}Pu work. Joseph A. Leary (PhD, University of New Mexico, 1956) is group leader and has made numerous contributions in the fields of plutonium dosimetry, metallurgy, and special nuclear material.



CONVERSION OF UF_6 TO UO_2

UF_6, in a self-sustaining reaction with H_2 and O_2 in a flame reactor, is converted to UO_2 powder of 0.012- to 0.038-μm crystal sizes. Heat treatment reduces the fluorine content to $\leq$ 30 ppm and the resulting powder sinters into pellets having 95% of theoretical density.

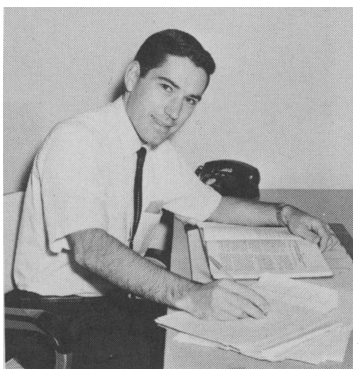
J. I. Federer (upper left) (MS, University of Tennessee, 1967) and W. C. Robinson, Jr. (center) (PhD, Iowa State University, 1964) are members of the staff of ORNL's Metals and Ceramics Division, which also included F. H. Patterson (BS, Colorado School of Mines, 1952) prior to his move to Battelle Memorial Institute. In recent years Federer has studied diffusion in BCC metals, and Patterson initiated the work on flame preparation of UO_2. All three have done applied research on chemical vapor deposition of refractory materials, with Robinson specializing in the thermodynamic considerations of the reactions involved.



ZIRCALOY-2 CRACK PROPAGATION BEHAVIOR

From crack propagation studies of Zircaloy-2 at room temperature in the annealed, hydrided annealed, and 35% cold-worked conditions it is possible to estimate the fatigue life of a flawed component.

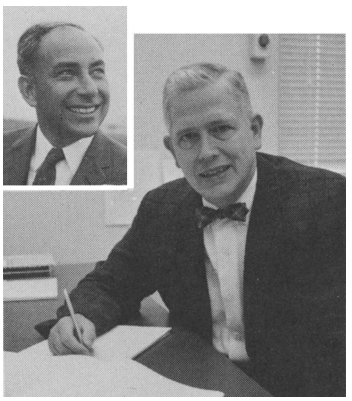
Lee A. James (MSME, University of Washington, 1965) spent eight years as a stress analyst and airframe designer before joining Battelle's Northwest Laboratory 18 months ago. He is now engaged in fracture mechanics and fatigue-crack propagation research.



GRAPHITE FRICTION AND WEAR IN DRY HELIUM

For graphites outgassed at 400°C the friction of graphite-graphite sliding bearing surfaces in dry helium increases by factors of 1.1 at 800°C and 4 at 400°C and then returns to initial values. These transients did not occur when outgassing and sliding were conducted at 25°C.

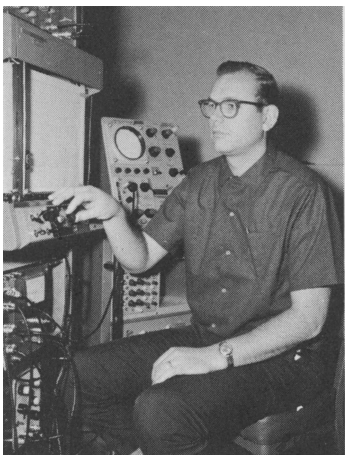
O. M. Stansfield (MS, University of California), a member of the Gulf General Atomic Metallurgy Department, is involved in the study of friction and wear of graphite HTGR core components. Other research activities include investigation of the effects of irradiation on control materials and thermal stability of reactor fuel.



OXYGEN EFFECTS IN LIQUID POTASSIUM

Oxygen added to liquid potassium sharply accelerated the initial rate of surface removal in a Nb-1% Zr system but produced no identifiable oxide film or microstructural change. Effects of molten metal velocity on Nb-1% Zr corrosion rate are swamped out by effects presumed related to oxygen.

Kurt Goldmann (left), manager of the liquid metal systems department at United Nuclear Corporation's Research and Engineering Center, has contributed in many areas to the development of power plants with recent emphasis on liquid-metal cooled reactors. John M. McKee, now with the LMFBR program office at Argonne National Laboratory, was engineering advisor at UNC from 1952 to 1967, working on liquid-metal technology and fuel development.



ULTRASONIC CHANNEL-MEASURING SYSTEM

Remote underwater measurements of thicknesses-of-coolant channels in spent fuel elements are made by timing an ultrasonic signal between two crystals, spring-loaded against opposite channel walls. The instrument has an accuracy of 0.5 mils, a resolution of 0.1 mil, and a range from 50 to 175 mils.

A. E. Arave (MS, University of New Mexico, 1965) is a member of the instrument development branch of Phillips Petroleum's Atomic Energy Division where he has also developed an ultrasonic anemometer for measuring steam convection currents.

NEUTRON, PROTON DEPTH-DOSE CURVES

Calculated depth-dose curves for 400- to 200-MeV protons and neutrons normally incident on a tissue-equivalent slab were compared with experimental values. A dose equivalent of 2×10^{-7} rem per unit fluence is a conservative estimate for radiation protection.

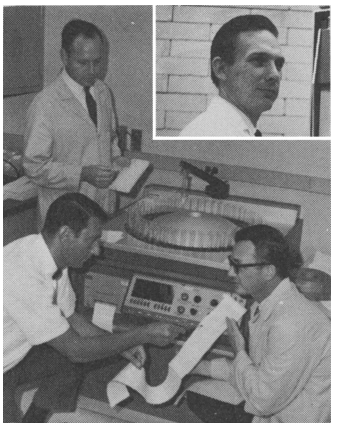
Pictured (left to right) are J. Neufeld (DSc, Pennsylvania), H. A. Wright (PhD, Tennessee), J. E. Turner (PhD, Vanderbilt), and W. S. Snyder (PhD, Ohio State), members of ORNL's Radiation Physics Section of the Health Physics Division. They have been interested in problems of dosimetry of high-energy particles for a number of years.

NEUTRON-CAPTURE GAMMA ANALYSIS

A curving beam port in the Saclay EL3 reactor is used to provide a gamma-free external neutron beam with which certain elements that cannot be determined by convential activation analysis can be determined by *in vivo* irradiation and measurement of the capture gammas.

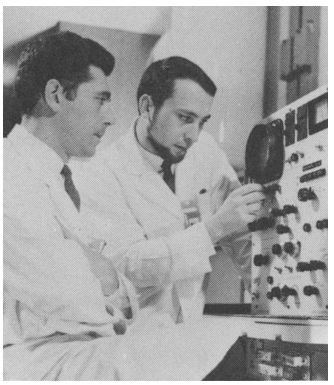
EARLY DIAGNOSIS OF CYSTIC FIBROSIS

Nail clippings taken from infants and children are analyzed for sodium, chlorine, and potassium by neutron activation analysis in a new procedure for the early diagnosis of cystic fibrosis.



The senior investigators are Gene L. Woodruff (standing), PhD, Assistant Professor, Nuclear Engineering Department, University of Washington; Albert L. Babb (right), PhD, Professor and Chairman, Nuclear Engineering Department; and Stanley J. Stamm (left), MD, Director, Cardio-Pulmonary Laboratory, Children's Orthopedic Hospital, Seattle, Washington. Doctors Stamm and Babb were recently cited by the Washington State Legislature's Joint Committee on Nuclear Energy for "a significant contribution to mankind through the peaceful use of nuclear energy in medicine." William E. Wilson, Jr. (inset), the chief reactor supervisor, developed the computer programs for on-line analysis of the irradiated nails. Yuki Yamamoto (not shown) is a graduate of the University of Tokyo, working on his MS degree in Nuclear Engineering.

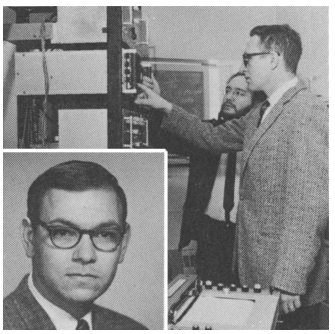
ACTIVATION DETERMINATION OF Br AND As



Traces of bromine (2.5×10^{-3} μg) and arsenic (0.5×10^{-3} μg) in plant life are rapidly and simultaneously determined using neutron activation followed by radiochemical separation.

André R. Fer (right) is a research investigator in the Grenoble University Biology Department, from which he received his doctor's degree in 1967. André L. Fourcy (Doctor-Engineer, 1965; Doctor of Science, 1967) is a group leader in the Plant Biology Laboratory of the French CEA Nuclear Center at Grenoble and an adjunct professor at Grenoble University. Both are primarily interested in the utilization of activation analysis.

NEUTRON ACTIVATION ANALYSIS OF BLOOD



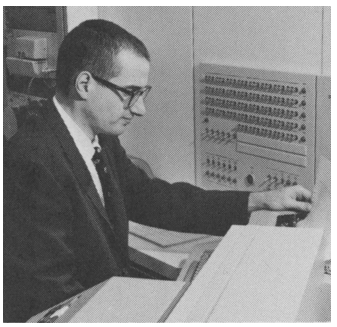
Fourteen trace elements in whole blood are measurable to ppb and ppm concentrations using neutron activation and Ge(Li) analysis. The technique is contamination-free and the most sensitive method known to measure many of the trace elements.

William A. Haller (right) (MS, nuclear chemistry, University of Notre Dame, 1963) and Royston H. Filby (left) (MSc, chemistry, McMasters University, 1957) are staff members of the Nuclear Reactor at Washington State University. Louis A. Rancitelle (inset) (PhD, chemistry, Cornell University) is a senior scientist at Battelle Northwest Laboratory.

CRITICAL PLUTONIUM SYSTEMS

In companion papers, plutonium-fueled critical experiments are first analyzed, then compared with computed results for nuclear safety use. The HFN multigroup diffusion theory code was found accurate for well-moderated systems whose isotopic ^{240}Pu content was $\leq 25\%$, and the DTF transport code worked reasonable well (except for a slab geometry) for undermoderated reflected homogeneous cores containing $\leq 12\%$ ^{240}Pu. Present critical dimensions for reflected, spherical cores should be increased by $\leq 23\%$.

L. E. Hansen, R. C. Lloyd, and R. D. Johnson (shown from left to right) and S. R. Bierman (inset) are staff members at the Plutonium Critical Mass Laboratory of Battelle's Pacific Northwest Laboratory. E. Duane Clayton (at right in group photograph) is manager of the BNWL's Physics Research Department and an associate professor in the University of Washington's Nuclear Engineering Department.



REACTOR NOISE STUDIES

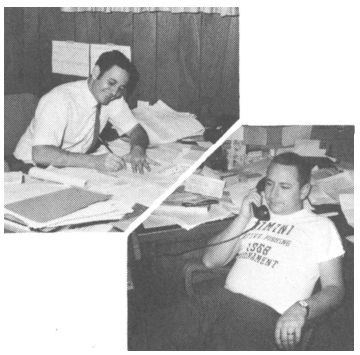
A technique that uses a digital computer for polarity crosscorrelation of outputs from two scintillation detectors determines the prompt neutron-decay constant of a fast critical assembly.

Charles Erwin Cohn (PhD, physics, University of Chicago, 1957) has been at Argonne National Laboratory since 1956 and is an associate physicist in the Reactor Physics Division. His major research interests are reactor noise and application of computer techniques to reactor experiments.

RESONANCE SELF-INDICATION TECHNIQUE

A technique for the nondestructive assay of fissile materials passes an epithermal neutron beam through a sample of thin fission detectors sensitive to resonance absorption lines in the transmitted flux. Up to 150 mil thicknesses of ^{233}U and ^{235}U were measured to accuracies of 2 to 10% and ≤ 270 mils samples of ^{239}Pu to 1 to 3%.

H. O. Menlove (upper left), M. M. Thorpe (upper right), and R. B. Walton are staff members at the Los Alamos Scientific Laboratory who have made extensive contributions in the field of nuclear physics, particularly neutron and fission physics. They have been engaged full time in the Nuclear Safeguards Program since 1967. Claudia D. Tesche, a student at the University of California, Berkeley, contributed to this work while employed in the Summer Graduate Program at the Los Alamos Scientific Laboratory.



MICROELECTROLYSIS CELL

Radioactive nuclides in microvolume solutions (5 to 250 μliters) are rapidly deposited as thin, uniform films (10 to 4000 sec) in an electrolysis cell having an adjustable cell gap for different solution volumes and a removal electrode on which the nuclide is deposited.

Francis J. Berlandi (above) (PhD, University of Michigan, 1966) and Harry B. Mark, Jr. (PhD, Duke University, 1960) have been working on methods of rapid separation of radioactive isotopes by electromechanical techniques. This work was done at Michigan where Mark is an associate professor.