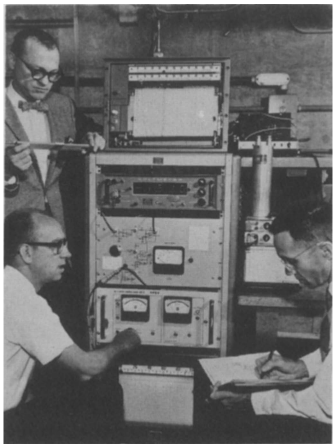
AUTHORS AND PAPERS

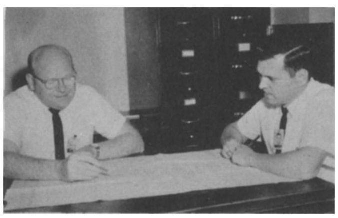
The highly condensed summaries of papers and technical notes (below) are intended to assist the busy reader in determining the order in which to read the technical material. Biographical comments are for human interest.



TIME-TO-POWER STARTUP

An unusual approach to reactor startup technique, based on the projected length of time that will elapse before goal power is reached, is presented in this article. The time-to-power method uses instantaneous flux level and reactor period to achieve specific, desirable startup characteristics more efficiently than with ordinary period and level instrumentation, according to the authors.

W. L. Bunch (standing), L. D. Philipp (kneeling), and M. R. Wood have collaborated on a number of projects involving the development of special instrumentation for various reactor systems. Bunch provided physics support for formulation of the time-to-power concept. Philipp developed the solid-state circuitry used in the instrument. Wood has been responsible for much of the special instrumentation required for the initial startup testing of the Hanford reactors and provided the group with experience in defining the needs and evaluating the applicability of the various instruments.



BOSF BY ANALOG COMPUTER

Manual control of the power level at a heavy-water-cooled and -moderated production reactor is aided by the use of an analog computer designed to measure the burnout safety factor. The device has been successfully employed at specific power of over 220 kW/g of ^{235}U and at neutron fluxes up to 6×10^{15} n/(cm^2 sec).

Development of the computer was a joint effort by two Savannah River Plant Technical Groups. E. S. Occhipinti (top right, Clarkson College of Technology, MSChE, 1953) and F. R. Field (top left, Cornell University, BChE, 1952) of Reactor Engineering provided the concept, design calculations, and reactor operating instructions. P. E. Mix (bottom right, University of South Carolina, BSEE, 1956) and J. S. Stutheit (bottom left, University of Arkansas, MS Physics, 1951) of Instrument Assistance were responsible for circuit design, component fabrication, and calibration instructions.

RADIATION EFFECTS

An analysis of the various factors influencing the observed effects of a radiation field on the output of electrical components in the field was conducted at Battelle Memorial Institute's Columbus Laboratories. The magnitude of several of these effects is illustrated by a simple in-core experiment.

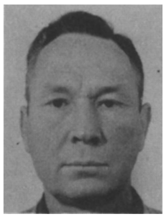
J. N. Anno has been associated with Battelle's programs in radiation effects for over ten years, first as Operating Supervisor for the Battelle Research Reactor (1955-60), and later as Associate Chief of the Applied Nuclear Physics Division (1960-65), His PhD in physics is from Ohio State University (1965).

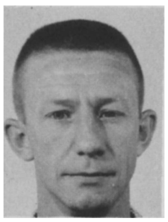
PLUTONIUM (IV) SORPTION KINETICS

The kinetics of the sorption of plutonium(IV) on Dowex 1X4 from various nitric acid and mixed aluminum nitrate-nitric acid solvents are presented in this work. Kinetic results and previously reported equilibrium parameters may be coupled with the fundamental partial differential equation that describes the operation of a fixed-bed anion exchange column to allow computer optimization of plant-scale processing equipment.

D. B. James (Iowa State University, PhD, 1960) was associated with research at Ames Laboratory concerning the cation exchange separation of the lanthanides by displacement chromatography with chelating eluants. Since joining Los Alamos Scientific Laboratory in 1960, his work has been concerned with the anion-exchange behavior of the actinides, especially plutonium(IV) from nitrate solutions.

RADIOISOTOPE-SOURCE HOT PRESS

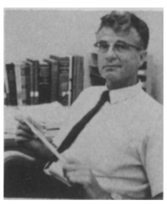




Forming research quantities of radioactive materials in a glove box or manipulator cell is facilitated by the miniature vacuum hot press described in this paper. The press can be readily disassembled and reassembled in a glove box through the access ports. A water-cooled jacket and the use of self-alignment result in a small assembly.

R. E. McHenry (shown at left), Isotope Fuel Group Leader, and T. C. Quinby are members of the Isotope Development Department at Oak Ridge National Laboratory. Both have been engaged in research on large scale production and applications of radioisotopes for more than fifteen years. Their current work is in the development of isotope power fuels.

RELEASE OF ^{6}Li FROM BeO



The authors tentatively propose that ^{6}Li diffuses in irradiated BeO by a cation vacancy mechanism, on the basis of studies at 100-1600°C. Release was found to be diffusion controlled, and diffusion coefficients were determined. The feasibility of reprocessing irradiated BeO by a high temperature treatment was investigated and found to be promising.

Ludwig J. Stieglitz (standing) got his doctoral degree as a chemist at the Technische Hochschule, Munich, Germany, and joined General Atomic as a research and development associate in 1963. His present concerns are radiation effect studies at the Nuclear Research Center, Karlsruhe, Germany. Lloyd R. Zumwalt (PhD, physical chemistry, California Institute of Technology, 1939) is a group leader in reactor chemistry research at GA. He began his nuclear career with the Manhattan Project at Berkeley and Oak Ridge and held responsible positions at Tracerlab and Nuclear Science and Engineering Corporation prior to joining General Atomic in 1956.

COATED-PARTICLE MATHEMATICAL MODEL

A mathematical model for investigating the irradiation behavior of pyrolytic-carbon-coated fuel microspheres has been formulated. The model can be used to study the influence on coated-particle life of a number of design parameters. Two modes of coating failure are predicted by the model for typical two-layer coated particles: failure initiated at the inner coating surface from fuel swelling, fission-gas pressure, and outer coating shrinkage; and failure initiated at the outer coating surface resulting from anisotropic thermal expansion and fast-neutron damage to the pyrolytic carbon structure.

J. W. Prados (shown at left) and J. L. Scott have collaborated on studies of fuel irradiation behavior at Oak Ridge National Laboratory over the past eight years. Prados (PhD, chemical engineering, University of Tennessee, 1957) is Professor of Chemical Engineering at the University of Tennessee, where he has specialized in the mathematical simulation of chemical-process and nuclear-fuel systems. Scott (PhD, metallurgical engineering, University of Tennessee, 1957) is head of the Ceramics Laboratory at ORNL and was formerly head of the Fuels Evaluation Group.

DESIGN OF PINHOLE-RAY CAMERAS

A theory for the performance of pinhole gamma-ray cameras is described in terms of parameters analogous to those used in describing visible light cameras. Several cameras constructed of depleted uranium were built and used for the nondestructive examination of irradiated fuel rods, and the results are illustrated, demonstrating damage, swelling, and cracking in fuel rods.

Moses A. Greenfield (shown at left) and Roscoe Koontz have been working as a team on radiation problems for the past 15 years. Greenfield (PhD, physics, NYU, 1941) is Professor of Radiology at the University of California, Los Angeles, School of Medicine and is a consultant to Atomics International. Mr. Koontz is an engineering specialist at Atomics International with a major interest in radiation measurements and in problems of reactor safety.

GAMMA-RAY-HEATING CALORIMETER

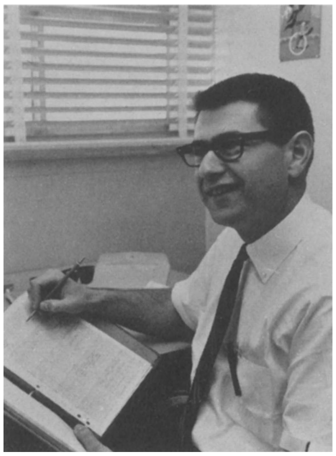
A differential calorimeter for making in-pile gamma-ray-heating measurements in the range from 3 to 50 mW/g of sample is described. Results obtained with two separate calorimeter systems of the same type are in agreement within 10%. Some design considerations are discussed, and representative results of measurements made at two reactors are given.

Dale A. Herbst (shown at right) and James H. Talboy are associated with the Reactor Operations Division of Argonne National Laboratory. Herbst (BS, physics, St. Procopius College) is a Scientific Assistant and has been at ANL since 1962. Talboy (PhD, physics, Iowa State University, 1956) has been an Associate Physicist at ANL since 1959; prior to this, he was with Bendix Research Laboratory in Detroit. Both authors are interested in the physics and instrumentation of operating reactors.

DISCHARGE VALVE FOR FLUIDIZED BED

This brief note describes a breech-lock conical valve used to permit periodic discharge of alumina from a fluidized bed utilized in a fluoride volatility process. The valve was locally designed and fabricated and performs satisfactorily under very demanding conditions.

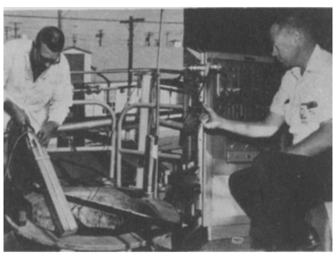
Warren L. Gottwald is a machinist in the Central Shops at Argonne National Laboratory, where he has been for the last nine years. His work has included developing devices for experimentation in shielded caves. Prior to coming to ANL, he graduated as a mathematics major from Lyons Township Junior College, La Grange, Illinois.



NPR SHIELD FLUX MEASUREMENTS

The measured neutron fluxes and gamma dose rates in the reflector and primary shield of the NPR are compared to those calculated by the removal diffusion theory computer program MAC. Agreement is excellent for fast neutron flux and gamma dose rate in the concrete shield and for thermal and epithermal flux in the graphite reflector. Calculated and measured values of thermal and epithermal fluxes in the concrete shield were in general agreement (within a factor of 2).

J. Greenborg is a Research Engineer at Battelle Memorial Institute's Pacific Northwest Laboratories. His present interests are experimental and analytical reactor shielding studies, shielding code development, fast reactor physics, and radioisotope applications. His MS in nuclear engineering is from the University of Washington (1962).



PULSED NEUTRON MEASUREMENTS

Results of pulsed neutron experiments in very large water systems show that the observed decay of the neutron density is very nearly exponential, and that the decay constant is close to the asymptotic value. One-group, time-dependent diffusion theory gave very poor predictions of the fundamental-mode decay constants. The significance of fast neutron dispersion is illustrated by a comparison of some relatively simple theoretical models.

Kermit L. Garlid (standing) is an Associate Professor of both Nuclear Engineering and Chemical Engineering at the University of Washington and a consultant on pulsed neutron studies to the Critical Mass Laboratory of Battelle-Northwest. His special field of interest is the analysis of the dynamic characteristics of chemical and nuclear systems. S. R. Bierman is a research engineer in the Critical Mass Laboratory of Battelle-Northwest Laboratories. His main area of responsibility is in neutron kinetic and critical mass physics studies of plutonium systems.