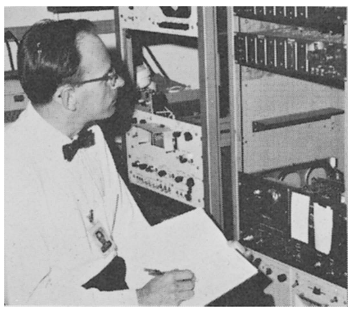
AUTHORS AND PAPERS

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.

CRITICALITY OF ^{233}U SOLUTION ARRAYS

Criticality of reflected and unreflected arrays of bottles containing ^{233}U solutions was determined as a function of bottle spacing. Experimental data compared favorably with Monte Carlo calculations, k_{eff} being computed to within ≈ 0.03 of unity.

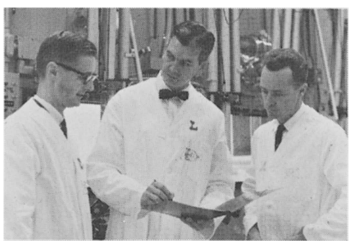
R. C. Loyd (l), a senior research scientist at the Plutonium Critical Mass Laboratory of Battelle-Northwest, specializes in uranium and plutonium criticality experiments. E. D. Clayton is Manager of the Critical Mass Physics Section and Research Associate Professor at the University of Washington. J. H. Chalmers, below, is a senior engineer in the Criticality Inspectorate of the UKAEA Health and Safety Branch.



PLUTONIUM-BERYLLIUM SOURCES

Plutonium-beryllium sources were found to have increasing neutron yields of up to 2% per year due to ^{241}Am buildup from the β decay of ^{241}Pu present in the sources.

M. Edward Anderson (MS in physics, University of Michigan) has been associated with isotopic source programs at Mound Laboratory for nine years. His principal concerns were measurements of fast-neutron fluxes and energy spectra.



U_3Si FUEL ELEMENTS

The rate of swelling of Zircaloy-clad U_3Si fuel elements in a pressurized water reactor decreases with increasing burnup. A central void in each element reduces the increase in its external diameter.

M. A. Feraday, G. H. Chalder, and K. D. Cotnam (l to r) are members of the Fuel Materials Branch at Chalk River. Chalder is leader of the Metallic Fuels Group within the Branch, and Feraday and Cotnam are development engineer and development technologist, respectively, in this group.

EFFECT OF Na ON STAINLESS PIPE

Type-304 stainless-steel pipe, exposed to liquid sodium for $\approx$7800 h, suffered no adverse mechanical effects even though large amounts of surface nitriding from the calcium nitride impurity in the Na decreased the ductility of the surface layer.

George A. Ratz (standing), a senior metallurgist at US Steel's Applied Research Laboratory, is involved with developing new and improved stainless steels. Kenneth G. Brickner, a staff engineer at the Laboratory for over eleven years, holds several patents and has written a number of papers on stainless steels.

HYDROGEN-GRAPHITE REACTIONS

Kinetics of reactions of hydrogen with pyrographite and normal graphite were studied at high temperatures and pressures, then correlated with rates reported in the literature.

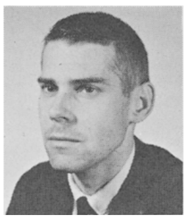
John Chi, a senior engineer at Westinghouse Astronuclear Laboratory, and Charles Landahl, staff member, Los Alamos Scientific Laboratory, cooperated in the thermophysics evaluation of hydrogen reactions with graphite as a part of the KIWI and NERVA nuclear rocket development programs. Currently, Landahl is pursuing high-temperature and -pressure experimental programs while Chi is with the Systems and Technology Department at Astronuclear Laboratory where he is involved with thermal and systems analysis and with conceptual design activities.

SODIUM CORROSION

The first experiment reported on the in-reactor corrosion of candidate metals for LMFBR fuel claddings shows only slight negligible effect of molten sodium on vanadium-titanium alloys.

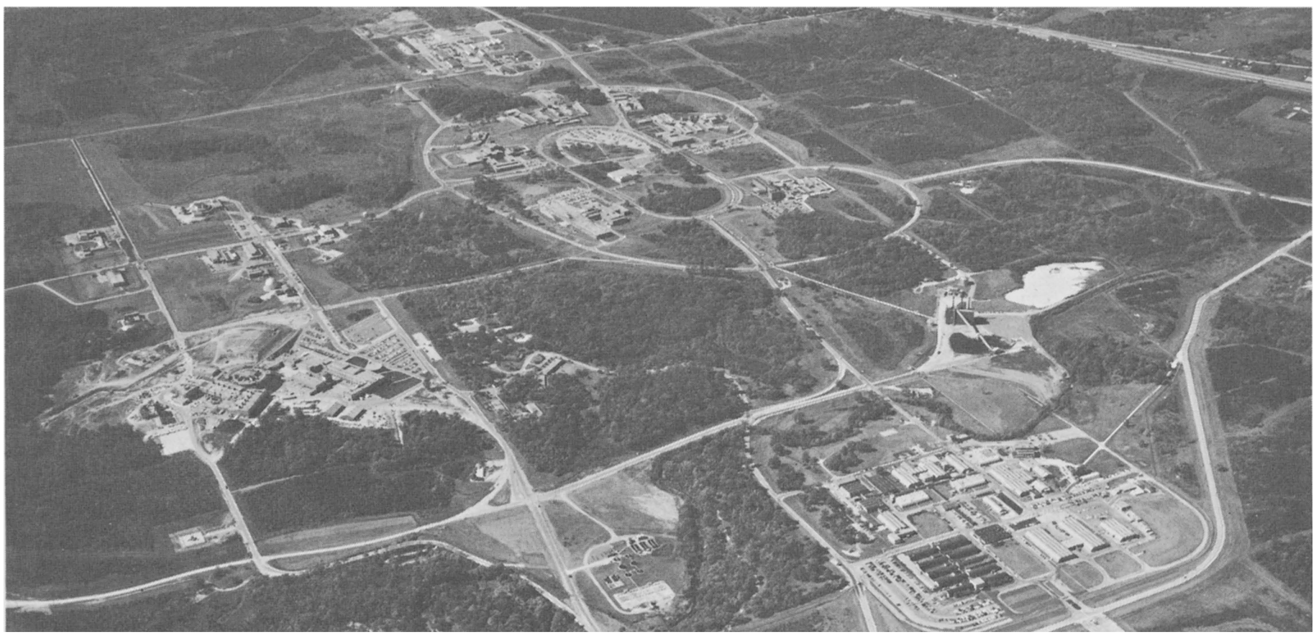
Sherman Greenberg, C. F. Cheng, and W. E. Ruther are members of the Applied Corrosion Group of the Metallurgy Division at Argonne National Laboratory, shown at bottom of page. The Group is principally engaged in the study of sodium corrosion problems as they pertain to the LMFBR program.

PRESSURIZER PERFORMANCE



Primary pressures for load-drop transients at the Shippingport Reactor are in agreement with calculations from a digital computer program, called TOPS, which can predict effects of spray systems and heater operation on pressure transients.

J. A. Redfield (PhD, University of Pittsburgh, 1963), a Fellow Engineer in the A4W Kinetics Group, has worked on many phases of reactor plant dynamics since joining Westinghouse in 1955. V. Prescop (MS, University of Pittsburgh) is a PhD candidate at the Carnegie-Mellon University, having worked at Bettis in plant control and test evaluation for the Shippingport reactor. S. G. Margolis (PhD, University of Pittsburgh, 1962) is Associate Professor in the Division of Interdisciplinary Studies at the State University of New York at Buffalo.



FAST-NEUTRON SPECTRA MEASUREMENT

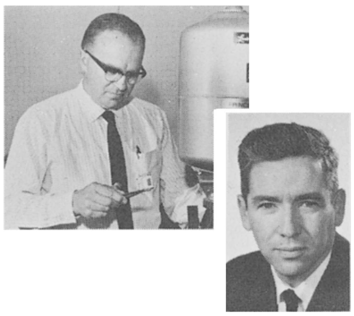
An improved method of measuring proton recoil tracks in nuclear emulsions without interference from chemical fog or gamma-ray background permits calculation of a fast-neutron spectrum in the 0.3- to 2.5-MeV range.

James H. Roberts is Professor of Physics at Northwestern University where his research specialties are nuclear emulsion techniques and solid-state track detectors. A. N. Behkami, from Iran, recently completed his studies at Northwestern and presently holds a post-PhD Fellowship at the Nuclear Structure Laboratory at the University of Rochester.

APPLYING PREDICTION ANALYSIS

A prediction analysis technique can determine, in advance of a proposed experiment, the accuracy with which a radioactive half-life can be measured.

John R. Wolberg, r, (PhD, MIT, 1962) is a senior lecturer at Technion, Israel Institute of Technology, where he works in reactor physics and control, desalination, and radiology. Gad Hetsroni (PhD, Michigan State University, 1962), also a senior lecturer, does research in experimental design, two-phase flow, turbulence, and desalination.



MULTI-ELEMENT DETECTORS

Chemically loaded epoxy resin disks permitted simultaneous activation of six elements and determination of cadmium ratios by high-resolution γ spectrometry using a Ge(Li) diode.

Pieter de Lange, now at the Atomic Energy Board in Pretoria, worked in both nuclear and neutron physics in five countries since receiving his Doctorate at the University of Pretoria in 1959. C. B. Bigham (PhD, University of Liverpool, 1954) works on the Intense Neutron Generator at AECL's Accelerator Physics Branch. Prior to an IAEA appointment in Argentina, he measured neutron cross sections, neutron spectra, and lattice parameters for the CANDU reactors.

LETTER TO THE EDITOR

IRRADIATION BEHAVIOR OF HOLLOW-CORE METALLIC-URANIUM FUEL ELEMENTS

Dear Sir:

Reduction of irradiation-induced swelling is one of the keys to the successful performance of metallic-uranium fuel elements. This letter describes the interim results of a continuing irradiation test of metallic-uranium fuel elements that have shown no volume increase when irradiated to >6500 megawatt-days per ton (MWd/t), 3.9×10^{20} fissions/cm^3, under power reactor conditions.

The alloying of uranium with iron, aluminum, silicon, molybdenum, chromium, and other elements in varying amounts, and the application of external restraints through system pressure or high-strength cladding have been effective in reducing the innate swelling of pure uranium by one or two orders of magnitude in the temperature range[1-4] 400 to 600°C. However, even with these improvements, at exposures of economic interest for metallic uranium, i.e., ≈ 10 000 MWd/t and greater, the swelling would reach values that could result in plastic strain failures of the cladding on solid rods[5] and possibly buckling of the inner-bore cladding of tubular elements.[4]

To further reduce the external volume increase, the fuel elements in this irradiation test incorporate a longitudinal void in the center of a Zircaloy-2-clad coextruded uranium rod. The fuel elements are rods 0.45-in. o.d. by 6.25-in. long. Two thicknesses of cladding 0.025 and 0.050 in. and three uranium void