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tor development and applications of nuclear energy. In 1952 the nuclear engineering department was created at Brookhaven, and Williams became its chairman. In this capacity he oversaw the design and construction of the high-flux beam reactor, which became—and has remained—one of the world's foremost research reactors. He also administered other research programs, including the liquid-metal-fueled reactor, and built up much of Brookhaven's strength in applied science. In 1962 he was named deputy director of the Laboratory, a post in which he served until his retirement in 1967.

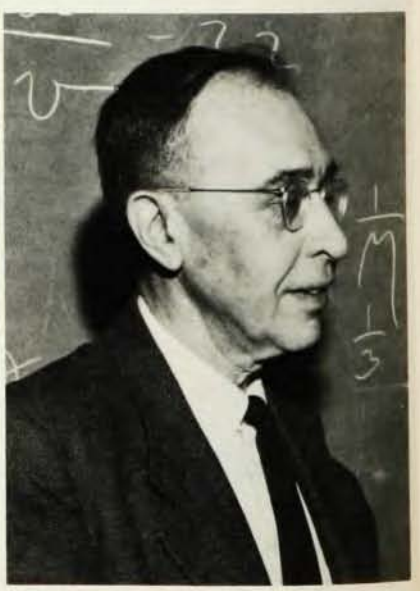
Williams, an early member of the American Nuclear Society, held many offices in that organization. He was a member of its board of directors from 1957 to 1960, its vice president for 1962–63, and its president for 1963–64.

Always interested in environmental preservation, Williams became the research administrator of the Marine Resources Council of the regional planning board of Nassau and Suffolk counties upon his retirement from Brookhaven, and he was a member of the US AEC's Atomic Safety and Licensing Board Panel. Williams had a great sense of social responsibility and took an active part in community affairs, holding office in town and county organizations.

MAURICE GOLDHABER
GEORGE H. VINEYARD
*Brookhaven National Laboratory*

## Gregory Breit

Gregory Breit was born 14 July 1899 in Nikolaev, Russia. He was educated at Johns Hopkins University, receiving his AB, AM and PhD degrees in 1918, 1920 and 1921, respectively. All three degrees were in electrical engineering,



which influenced his approach to physics throughout his long and active career.

He began as assistant professor of physics at Minnesota, and went on to become mathematical physicist at the Carnegie Institution, professor of physics at New York University and the University of Wisconsin. At Yale University he was professor for twenty-one years, and held the Donner chair for the last ten of these. He completed his professional career as distinguished professor of physics at the State University of New York at Buffalo, from which he retired in 1978. He died in Salem, Oregon, on 13 September 1981.

It was characteristic of Breit that he quickly recognized the potential for both energy generation and nuclear explosives in the discovery of fission; in the world climate of 1940, he persuaded his fellow physicists voluntarily to delay publication of papers in nuclear physics until after the war. He preceded J. Robert Oppenheimer in the very early organization of experiments and design of nuclear weapons, but left to go to Aberdeen Proving Ground (and Johns Hopkins) to work on the proximity fuze and later on exterior ballistics. Several versions of the reasons for his transfer from the very young Manhattan Project to Ordnance have been offered. I prefer the one he told me: that there was enough glamour in the nuclear weapons work to attract the best physicists in the country, but someone had to help improve conventional weapons in the meantime. That, too, was characteristic: He put his duty, especially to his adopted country, ahead of his personal preferences. The proximity fuze was a major technological advance in weapons during the war.

His earlier work with Merle Tuve had already led to the development of a major element of both offensive and defensive systems: radar. He and Tuve had revealed the presence of the Heaviside layer by echoes from pulsed electromagnetic radiation.

Breit's contributions to physics were so diverse that a full scientific biography will be needed to put them in perspective. His work was so thorough and firmly based in fundamental physics that it stands even after radical advances have occurred. His thoroughness was legend; it is not surprising that he was asked to check on the possibility of igniting the atmosphere or the oceans prior to the first test of a hydrogen bomb.

He contributed to the theory of molecular beam interaction (the Breit–Rabi equation) and to the theory of nuclear reactions (the Breit–Wigner formula). He predicted the possibility of optical pumping (the basis for lasers), developed the basic principles of several particle accelerators, initiated the study of heavy-ion nuclear reactions and of nucleon–nucleon scattering (where he demonstrated charge independence). His studies in that field, with many collaborators, occupied a significant part of his attention for over 35 years. The diversity of Briet's interests led him into most of the important areas of research in nuclear physics between 1930 and 1980. A hallmark of his work was his understanding and encouragement of experimental projects to check his theoretical calculations.

As significant as Breit's direct impact on physics has been (with 250 published papers during 60 years of work, many of them seminal, several being rediscovered today), his indirect impact through his students is remarkable. He had few peers in his devotion to the education of young physicists. I was one of those many years ago and I had the great good fortune to have been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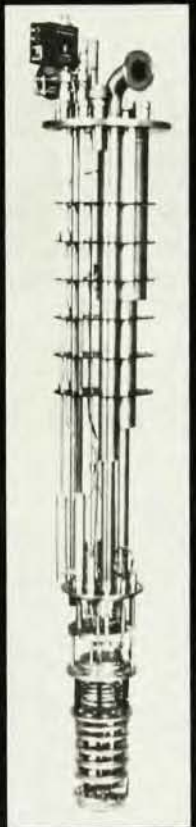

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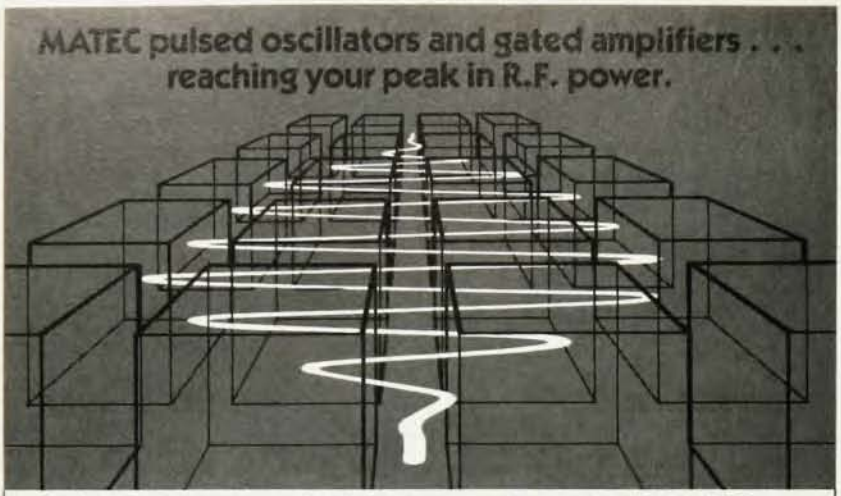


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able to continue to work with him over three decades. It was a period during which the work in several areas in which Breit was interested came of age, usually with his help.

McAllister H. Hull Jr
*University of New Mexico*

## Earle Covington Gregg

On 13 May 1983 Earle C. Gregg, highly respected in medical and radiological physics, died at his home in Chagrin Falls, Ohio. Born in Cleveland, Gregg did both his undergraduate and graduate work at Case Institute of Technology, obtaining his PhD in physics in 1949. In 1958 he was appointed professor of radiology in physics at Case Western Reserve University and physicist in the department of radiology at the University Hospitals of Cleveland. In 1978 he became chairman of the Biophysics Study Program at Case. He occupied all of these positions at the time of his death.

As a research associate at MIT (1942–43) and at Columbia (1943–46), Gregg did early work on ultrasonic absorption in liquids, on underwater acoustic transients, and on the biological effects of ultrasound. Returning to Case, he wrote a number of papers on betatron research, which included the design of a flux-forced field-biased betatron. His contributions to research on sound continued, dealing with the physical basis of pain threshold measurement in humans and on the absolute measurement of the vibratory threshold. He did fundamental research in nuclear and radiation physics on photonuclear reactions in beryllium and lithium, on the energy spectrum of electrons in aluminum produced by 18-MeV bremsstrahlung and on the scattering of high-energy gamma rays. Gregg had wide interests in imaging, both in diagnostic radiology and nuclear medicine. He contributed to information theory, image assessment, image enhancement, scanning, and tumor detection. Radiation risk analysis was also among his specialties. Biophysics was yet another area of his wide-ranging research activities. His most recent research interests included radiation mutagenesis in murine lymphoma cells, detection and delineation of soft tissue tumors with microwaves and ionization phenomena in irradiated liquids.

An Earle C. Gregg Memorial Fund scholarship fund for support of radiation research has been established at Case Western Reserve University. Contributions can be sent to the Case Western Reserve School of Medicine (Cleveland, Ohio 44106).

Edward R. Epp
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