

ity. The electrons exchange transverse momenta with the protons. This idea was demonstrated experimentally at Novosibirsk and is now being exploited intensively both at CERN and at Fermi National Accelerator Laboratory for the construction of antiproton storage rings desirable for the achievement of antiproton-proton collisions. This work, if successful, would be a memorial to only one of Budker's many creative ideas.

Not only did Budker innovate technologically, but he also introduced novel social patterns of operating a creative laboratory. Part of the effort of his institute was dedicated to the design and production of low-energy accelerators, including pulse-transformer accelerators, and of high-powered microwave tubes that could be marketed both at Soviet institutes and medical centers and also abroad. From the proceeds of these sales, Budker was able to support his program more flexibly than would have been possible through exclusive dependence on government support.

Budker was a strong exponent of increased collaboration with the West in the accelerator arts and particle physics. In this field, as in the science itself, his ideas and plans were frequently ahead of his time. His initiatives for major joint undertakings in which Western technology, particularly in data processing, would complement some of the achievements of Budker's laboratory, have not yet come to fruition. No better memorial to Budker's work could be made than a practical realization of his dream of collaboration in storage-ring physics bridging Siberia and America.

Budker was an exceedingly capable analyst and designer as well as a fearless innovator. He surrounded himself with a young group of associates and students who shared with him responsibility for major decisions at the famous "round table" council. His disciples will perpetuate much of his style and ideas, but a great driving spirit is gone.

WOLFGANG K. H. PANOFKY
Stanford Linear Accelerator Center

Walter L. Bond

Walter L. Bond, a retired member of the technical staff at Bell Laboratories, died 30 March. He was born in the state of Washington in 1903, and in 1928 he graduated from Washington State College with highest honors in physics.

From that time until his retirement in 1968, Bond was a research physicist in the Bell Laboratories research division. There his special combination of theoretical competence and mechanical skill resulted in many scientific contributions, from the large-scale production of precisely oriented and dimensioned quartz oscillator plates in the 1940's to laser construction in the 1960's.

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obituaries

In many cases Bond would personally construct the prototype of an instrument he had designed—in this way he built an automatic recording x-ray diffractometer with a plotting device and also a high-temperature powder diffraction camera.

Drawing on his knowledge of the fact that wind-blown sand is reduced to smaller particles than is possible in water-worn sand, Bond designed and built a cylindrical microsphere grinder with a tangential air blast in which single crystals could be ground to small spheres for x-ray diffraction analysis. Using a symmetrical technique for measuring the



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angle between two diffraction-maximum positions of a single crystal, Bond made possible a study of Type I diamonds that resulted in the discovery that they contain nitrogen as a major substitutional impurity.

When Bond retired from Bell Laboratories in 1968, some 25 patents had been granted to him for a wide variety of optical and mechanical tools, instruments and devices. At that time he was invited to join the staff of the Stanford University Microwave Laboratory. According to Marvin Chodorow of Stanford University, "his impact on large numbers of students and colleagues was enormous . . . He shared generously and enthusiastically his extensive knowledge, his skills, and his deep insight in solving the most difficult problems."

In November 1976 he received the Longstreth Medal of the Franklin Institute in Philadelphia for his contributions to the study of crystals.

At Stanford University he wrote his book *Crystal Technology* (see **PHYSICS TODAY**, May 1976, page 77), which is a compendium of useful information, tricks, techniques and gadgets—much of his technical expertise that colleagues had found so valuable.

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