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Grigory Ezekielevich Pikus

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who had grown up in New Mexico. When the younger Marshall returned in 1957, it was to investigate the possibility of harnessing thermonuclear reactions in a future plasma-containing fusion reactor. At that time, this secret effort was known as Project Sherwood, but the name was changed to the Magnetic Fusion Energy program when the project was declassified in 1958.

By 1959, Marshall had developed and patented a coaxial plasma gun device, which, to this day, has been a mainstay of studies in plasma injection in the worldwide magnetic fusion energy program. The coaxial plasma gun, which has come to be known as the Marshall gun, is a device for producing and hydrodynamically accelerating plasmas to a high energy by discharging an electric current through a gas between coaxial electrodes. It was used initially for injection into thermonuclear magnetic containment devices and, more recently, for space propulsion studies, plasma processing, and the modification of surfaces.

A mentor to many physicists and technicians, Marshall worked on numerous magnetic energy fusion experiments, as well as the 1969–70 Los Alamos "Birdseed" experiments to study cross-field plasma injection into Earth's upper atmosphere. All his collaborators were impressed by his deep understanding and intuitive grasp of physics and engineering concepts. He had a very practical approach to laboratory experiments and their design.

Marshall enjoyed hiking and rock climbing and was a familiar sight in town as he jogged to and from work. Before he retired formally in 1982, he had held various titles, including that of technical staff member, group leader and assistant division leader. He was one of the first scientists to be appointed a laboratory fellow in the early 1980s. After his retirement, he continued to provide advice and encouragement to his colleagues for a number of years.

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Grigory Ezekielevich Pikus

Grigory Ezekielevich Pikus, a pioneer in the theory of semiconductors, died in St. Petersburg (formerly Leningrad), Russia, on 12 April 1998.

Born on 7 May 1923 in Moscow, Grigory began his education in Minsk, where he attended high school. In the fall of 1940, he became a student in the physical-engineering department of Leningrad Politechnical University.

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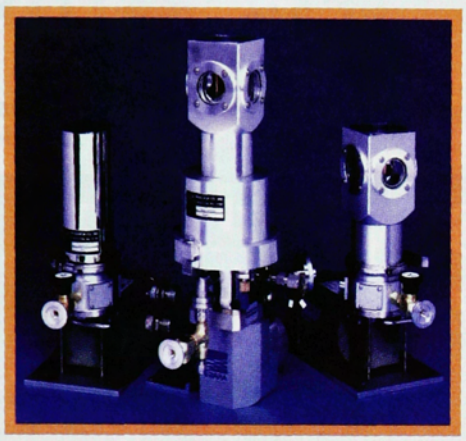

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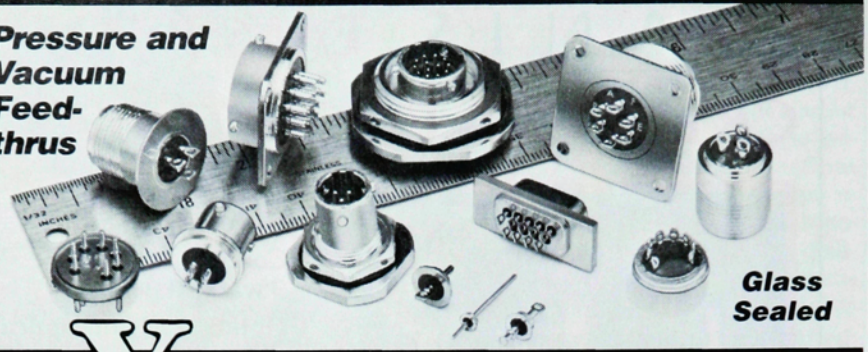

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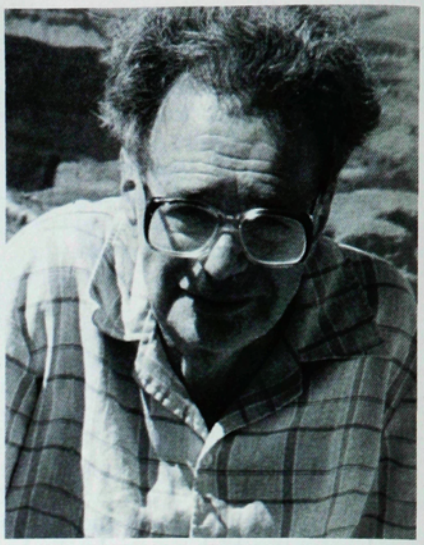

GRIGORY EZEKIELEVICH PIKUS

Germany's invasion of the Soviet Union in June 1941 interrupted Grigory's education for five years. Having joined the Red Army as a volunteer, Grigory fought in battles from Leningrad to Austria and received high military honors for his service and courage.

In 1947, he resumed his education at Leningrad Politechnical University and graduated in 1951 with a master's degree in physics. After graduation, he had to work at an electronics factory in the Siberian city of Novosibirsk. Only in August 1954, under Nikita Khrushchev's more liberal rule, could he return to Leningrad and start working at the Institute of Semiconductors, which was later incorporated into the A. F. Ioffe Physical-Technical Institute.

He remained a member of the Ioffe Institute for the rest of his life. There, he earned his PhD in physics in 1955 and his second DSc, also in physics, in 1964.

Grigory began his scientific career at the time when the theory of semiconductors developed into a branch of theoretical physics. The symmetry approach to solid-state physics, based on group-theoretical methods, became his lifelong passion. In the 1960s, he studied Hamiltonians and response functions to find new phenomena and properties that result solely from the symmetry of the problem. At the same time, he generalized the method of invariants to derive electron Hamiltonians in different points of the Brillouin zone, in external fields, under strain and other conditions. The linear-in-strain Hamiltonian for the degenerate valence band in semiconductors with diamond and zincblende lattices is known as the Bir–Pikus Hamiltonian.

Grigory started several new fields in the physics of semiconductors, the most well-known being the theories of strain-induced effects (1962), tunnel-

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ing and optical effects in crossed electric and magnetic fields (1967), and multiexciton complexes (1977–80).

In his 1972 work on optical orientation, he predicted the alignment of excitons and investigated the effect of weak localization on the optical alignment of excitons in a magnetic field in 1977 (and again in 1990). Together with his former students Gennady Bir and Arkady Aronov, he proposed a novel mechanism for electron spin relaxation, which is now known as the Bir-Aronov-Pikus mechanism.

In 1961, Grigory turned his attention to the then-mysterious material tellurium. He investigated specific features of its electronic spectrum, developed a theory of its optical properties, and proposed a novel phenomenon called the circular photogalvanic effect, which was first observed in Te and then in many other gyrotropic crystals.

His last work dealt with the theory of weak localization and negative magnetoresistance in noncentrosymmetric structures.

Grigory wrote several monographs, including the classic *Symmetry and Strain-Induced Effects in Semiconductors*. Written with Bir, it first appeared in Russian in 1972 and was translated into English and Polish. Grigory's *Basics of the Theory of Semiconductor Devices* (1965) was used as a textbook by generations of Russian physicists and engineers.

Grigory's work strongly influenced experimental investigations in several areas of semiconductor physics. He collaborated with many experimental groups in the Soviet Union and its successor countries, and, during the last years of his life, with experimenters in Western Europe.

Grigory was awarded the Ioffe Prize of the Academy of Sciences of the USSR (1987) and the USSR State Prize (1988). In 1993, he received the Alexander von Humboldt Foundation's Hanle Prize.

Grigory was blessed with wonderful students who later became his devoted friends. Unfortunately, two of them, Bir and Aronov, passed away very early.

Grigory behaved honestly and fairly—even at times when it was very difficult and dangerous to do so. His many friends, in both Russia and the West, will always feel his loss.

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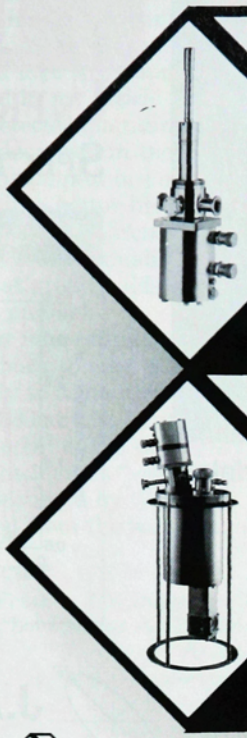

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