rotational energy transfer; a model for the formation of diatomic molecules in interstellar clouds; and identification of the sources of several interstellar spectral lines.

Materials scientist Barrett wins Gold Medal

The Acta Metallurgica Gold Medal for 1982 has been presented to Charles S. Barrett of the University of Denver Research Institute. The winner of this award, which recognizes outstanding ability and leadership in materials research, is chosen by an international panel of scientists from nominations received from as many as 17 countries.

Barrett has made contributions to almost all areas of metallurgy. Among his interests are the study of preferred orientations, structures of metals and alloys, development of x-ray methods, deformation and transformation in metals, low-temperature crystallography and x-ray stress analysis. He is the author of more than 180 technical papers, but is perhaps best known for the text, *The Structure of Metals*, written in the 1930s and still used as a reference by both students and metallurgists. Barrett also serves as coeditor of the annual publication, "Advances in X-ray Analysis."

After obtaining his PhD from the University of Chicago in 1928, Barrett joined the staff at the Naval Research Laboratory. In 1932 he went to the Carnegie Institute of Technology in Pittsburgh, working with a group of metallurgists under the leadership of Robert F. Mehl until 1946. He then joined the Institute for the Study of Metals (now called the Joseph Franck Institute) at the University of Chicago, where he remained until 1970 and is

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now professor emeritus. In 1970 Barrett came to the University of Denver; he now teaches physics and is Senior Research Metallurgist at the University of Denver Research Institute.

obituaries

Ilya Mikhailovich Lifshitz

Ilya Mikhailovich Lifshitz, Foreign Associate of the US National Academy of Sciences and Member of the USSR Academy of Sciences, died on 23 October at the age of 62. One of the world's greatest theoretical physicists, he was at the forefront of solid-state theory in the Soviet Union.

All of Lifshitz's life was devoted to theoretical physics. By the time he was 21, he had already defended his doctoral dissertation. He spent several decades in Kharkov, where he headed the theoretical division of the Physicotechnical Institute and the department of statistical physics and thermodynamics of the University. In 1969 he moved to Moscow to take charge of the theoretical division of the Institute of Physical Problems of the USSR Academy of Sciences and to organize a solid-state physics division in the physics department of Moscow State University. Even in Moscow he remained a Member of the Ukrainian Academy and the head of a school of theoretical physicists that he created in Kharkov.

Lifshitz is closely associated with the progress made during the last few decades in solid-state physics and its applications to technology and to important experimental discoveries. His work reshaped the quantum theory of solids, and yet always remained in very close contact with experiments.

We owe to Lifshitz the idea of deducing the energy spectrum of a solid from experimental data, by starting from the concept of quasiparticles, the elementary excitations in a solid. He showed that the Bose modes of excitation can be determined in principle from the temperature dependence of thermodynamic properties. The deduction of the Fermi branches of the excitation spectra of metals (that is, the dispersion law of the conduction electrons) is much more complicated and called for research into subtle electronic effects in a magnetic field. The geometric language he and his students developed for this program has become the language in which all those now engaged in metal physics think.

Lifshitz was the first to analyze the phonon and electron spectra of crystals with defects and, in particular, to discover local and quasilocal states. He developed the mathematical formalism that remains to this day the basis of modern research in the field. He developed the theory of twinning, one of the basic processes of plastic deformation, and the theory of diffuse–viscous flow of polycrystalline bodies. The basic results Lifshitz obtained led to an interest in quantum crystals. He showed that the defects and impurities in these bodies behave as free quasiparticles. Quantum diffusion, the result of their motion at absolute zero, was recently observed.

Lifshitz was always very interested in the theory of phase transitions. He predicted the unique phase transitions of "order $2^1/_2$," due to the (subsequently discovered) restructuring of the Fermi surface of a metal. He brought to light the unique kinetics of second-order transitions and the kinetics of the transition of a metal from the superconducting to the normal state under the influence of a magnetic field. He helped develop a theory of first-order phase transitions at low temperatures, which involve quantum tunneling processes.

Interest in phase-transition theory naturally led Lifshitz to phase transitions of polymers. As usual, his turning to a new field was accompanied by the development of a new theoretical approach. He based his investigations on the profound physical idea of regarding the polymer chain as a statistical system in partial equilibrium, with interaction in the bulk and with linear memory. Oriented towards biopolymer physics, this research now appears to cast light on the physical processes that underlie the functionings of live organisms.

This brief account is far from a complete summary of Lifshitz's activity. Physicists have not yet had an opportunity to study his last book on the theory of disordered systems, which was just published. His last article, on which he worked literally to his last day, is being readied for publication in JETP; everything is still too alive for a comprehensive summary.

We can now understand how courageous Lifshitz was to undertake pioneering work on the quantum mechanics of disordered systems at a time when theoreticians were afraid to touch this topic; to investigate the theory of galvanomagnetic effects of real anisotropic metals at a time when the aggregate experimental data were seen as "boring zoology"; and to attack the physics of polymers and biopolymers, discerning in them unique physical topics at a time when others were interested only in the biological aspect, that is, the fermenting action of each individual protein.

Lifshitz had a splendid mastery of subtle mathematical methods. Never engaging in mathematics for its own