in x-ray crystallography for determining molecular structures of biologically important substances.

In the early 1930s, as a student of Nobel laureate Linus Pauling at the California Institute of Technology, Harker first developed the method of locating heavy atoms in crystals using the features now known as Harker lines and Harker sections. During World War II, at the Research Laboratory of the General Electric Company, he determined the structure of the first of the boron hydrides, then being developed as potential rocket fuels. After the war, he organized one of the first protein structure laboratories in the world, at Brooklyn Polytechnic Institute, and later brought his team to Roswell Park Memorial Institute, where in 1967 they succeeded in determining the crystal structure of ribonuclease, an enzyme that hydrolyzes RNA.

A fellow of AAAS, Harker is professor emeritus in the molecular biophysics department of the Medical Foundation of Buffalo where he is now studying the nature of colored space groups, a generalization of symmetry applied to crystals.

in brief

The eighteenth Karl G. Jansky Lecturer at the National Radio Astronomy Observatory was **Arno Penzias** of Bell Labs. The lectureship honors contributions to radio astronomy.

obituaries

Peter Kapitza

Pyotr Leonidovich Kapitza, one of the most revered scientists in the Soviet Union and one of the best known Russian physicists in the world, died on 8 April 1984.

Born on 9 July 1894 in Kronstadt, the naval base near Leningrad (then called St. Petersburg), he was the son of a general in the Corps of Engineers. Kapitza received training as an electrical engineer at the Polytechnic Institute of St. Petersburg, and, after graduating in 1918, stayed on as a lecturer. But even before that he commenced research work under A. F. Joffe; he published his first papers in 1916, one of which foreshadowed the Stern–Gerlach experiment.

KAPITZA

In 1921 Kapitza came to Cambridge in England for a short visit, which, as it turned out, lasted 13 years; later (in 1966) he described this period of work as his happiest years. Ernest Rutherford, at that time Cavendish Professor, took a great liking to Kapitza, sensing in him a kindred spirit, and offered him a Clerk Maxwell studentship. His first project was a study of α-particle tracks in a strong magnetic field for which he developed a new technique of pulsed magnetic fields; he achieved 32 T in pulses lasting 10 ms.

This experiment was Kapitza's only incursion into nuclear physics. Having built the magnet, he used it as a tool in the area of his major interest, the study of physical properties of matter in strong magnetic fields. Topics of papers published between 1924 and 1932 include electrical conductivity, magnetostriction and the Zeeman effect in such fields. These studies led him on to low-temperature physics, which became his second major area of interest. Again, he entered the new subject by designing the tools for it, in this case a new technique of liquefaction of helium by an adiabatic method. His helium liquefier was for many years the mainstay of cryogenic laboratories.

The research accomplishments of that period gained Kapitza wide recognition. He was elected a Fellow of the Royal Society in 1929 and appointed Research Professor. He also became the Director of the Mond Laboratory in Cambridge—designated for research in magnetic and low-temperature physics. However, he was not to reap the fruits of the plans carefully laid by him for that laboratory.

In 1934, while on his annual trip to Russia to visit his mother, his passport was withdrawn and he was not allowed to return to England. This had a very

depressing effect on him and kept him away from scientific work for several years, but his spirits were bolstered by frequent letters from Rutherford who urged him to get back to research as the best remedy for his troubles. Heeding this advice, Kapitza accepted the appointment as director of a new Institute for Physical Problems set up by the USSR Academy of Sciences, of which he became a full member in 1939. Kapitza himself designed the building of the Institute, formulated its organization and selected the research team. Rutherford arranged the sale of the equipment of the Mond Laboratory so that Kapitza could continue with his line of research.

Most of the work of the Institute during the ensuing decade was in low-temperature physics, chiefly on the properties of liquid helium. The main achievement in that period was the discovery of the superfluidity of helium below the lambda point. A full theoretical explanation of this phenomenon was given by L. D. Landau, whom Kapitza persuaded to join his Institute, and who received a Nobel Prize in 1962 for this work. Kapitza himself had to wait until 1978 before his own contributions were formally recognized by a Nobel Prize.

In 1946 Kapitza was again in trouble, this time apparently in connection with the Soviet atom bomb project. He was removed from the directorship of the Institute and put under house arrest in his dacha, where he was kept until after Stalin's death. Although in 1941 Kapitza had already spoken publicly about the possibility of the atom bomb, he did not take part in the project. The popular version in the West is that he refused on political or moral grounds; according to Herbert York, however, it was due to a difference of opinion on technical issues. The version given by his Soviet biographer, Academician A. S. Borovin-Romanov, is that "the method for the production of oxygen proposed by Kapitza was unjustly condemned."

But even during the period of arrest Kapitza managed to carry out valuable research in a small domestic laboratory set up in his dacha, publishing papers on such diverse subjects as the nature of ball lightning, the formation of sea waves by the wind and the stability of a pendulum with a vibrating suspension. At that time he also started work on high-power electronics, a subject to which he later devoted much effort. In 1955 he was reinstated as director of the Institute and resumed the work on low-temperature physics. In his later years Kapitza also developed an interest in plasma physics and in methods of producing high temperatures for thermonuclear reactions.

His interests always extended be-

yond physics. He held strong views on many subjects: science and technology; education and organization of research; philosophy and politics; international relations and the social impact of science.

Kapitza firmly believed in the unity of science and technology and was himself the best embodiment of that unity, always producing the tools for his fundamental research. He shared with Rutherford a predilection for simple approaches to problems. His favorite quotation was from the Ukrainian philosopher, Skovoroda: "We must be grateful to God that he created the world in such a way that everything simple is true, and everything complicated is untrue."

Kapitza was always conscious of the need to train new generations of scientists and devoted an immense effort to the education of young people and the encouragement of creative talent. A powerful figure in the Academy of Sciences—a member of its presidium—he often criticized its performance and bureaucracy. He was particularly scathing about the lack of debate at sessions of the Academy. In Cambridge he had established what became known as the Kapitza Club, where young physicists gathered to discuss over dinner the developments in science, and he wished to see more opportunities for open discussion in the Soviet Union.

Always outspoken, Kapitza found himself from time to time in conflict with ideological orthodoxy, but his spirits were undaunted. His independence of mind found many expressions, one of them being his refusal in 1973 to join other academicians in condemning Andrei Sakharov.

Kapitza was much concerned about the nuclear arms race and sought ways to stop it. This brought him to Pugwash; he was an active member of the Soviet Pugwash Group and participated in Pugwash Conferences in the USSR, Sweden, France, Finland and Austria. His interest in Pugwash also stemmed from his conviction that scientists are the most likely group to tackle successfully global problems. In the Bernal Lecture, given in the Royal Society in 1976, he said: "The future of civilization depends on whether existing governments are able to provide solutions to global problems. . . . But, for this, problems must be expressed clearly and convincingly and widely discussed. This can be done mainly by scientists, since they can talk with sufficient authority on the possible solution of global problems for the benefit of mankind. Thus, we should not stand aside from the solution of such problems but realize their connection with our scientific work." One hopes this call will be heeded by the scientific community in the East and West as its tribute to the memory of a great man, big enough to span the ideological divide.

JOSEPH ROTBLAT
University of London

Elliott Waters Montroll

Elliott W. Montroll, distinguished professor in the Institute for Physical Science and Technology of the University of Maryland, died at age 67 on 3 December 1983.

Montroll received his BS in chemistry (1937) and PhD in mathematics (1940) from the University of Pittsburgh. He then embarked on a remarkably rich and varied scientific life. During World War II, as head of the mathematics group of the Kellex Corporation, he was involved with the separation performance of cascades used at the Oak Ridge uranium isotope separation plant. A joint paper with Gordon Newall (1952) deals with this nonlinear diffusion process. After some years as a peripatetic postdoctoral fellow with Joseph Mayer and Lars Onsager, he worked at the Office of Naval Research; he was head of the Physics Division (1948–1950) and Director of Physical Science (1953–1955). He was a professor in the Institute for Fluid Dynamics and Applied Mathematics of the University of Maryland (1950–1960 and 1963–1966); Director of General Sciences at IBM (1960–1963); Vice President for Research of the Institute for Defense Analyses (1963–1966); Einstein Professor and Director of the Institute for Fundamental Studies at the University of Rochester (1966–1981). He was also twice the Lorentz Professor at Leiden and the Gibbs Lecturer for the American Mathematical Society. He returned to the University of Maryland in 1981, following his retirement from the University of Rochester.

Among his many other activities, Montroll was founder and first editor of

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