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PETR GEORGIEVICH STRELKOV (OBITUARY)

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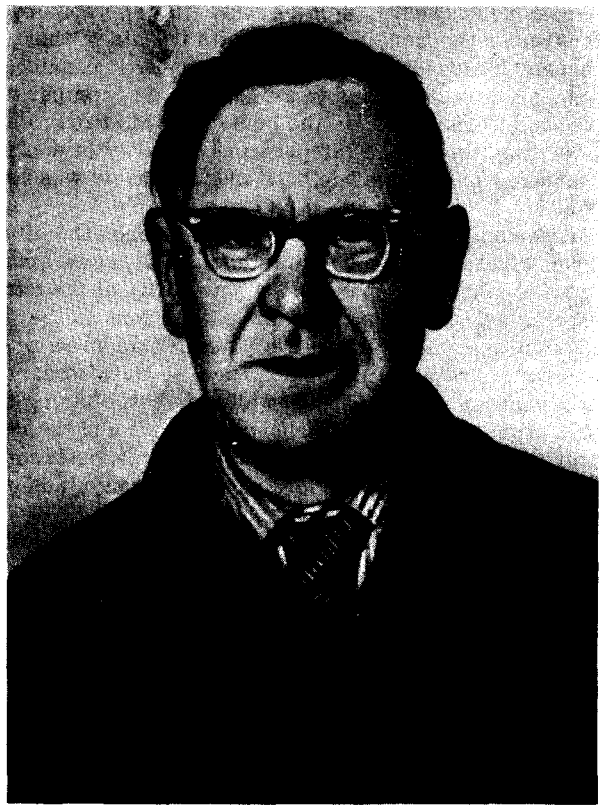
CORRESPONDING Member of the USSR Academy of Sciences, Petr Georgievich Strelkov, famous physicist, prominent specialist in the field of experimental heat physics, died on November 11, 1968.

Strelkov was born on October 16, 1899 in St. Petersburg. He began working at the age of 19 in the city of Cherepovets. For two years from 1918 to 1920, he worked as orderly, laboratory assistant, and high-school teacher. In 1920, he moved to Petrograd and entered the Physics and Mechanics Department of the Polytechnic Institute. Even during the first years at the Institute, he began scientific experimental investigations at the laboratory. He was so fascinated by this work that rather than complete his studies at the Institute, he joined in 1923 as junior assistant the Leningrad Physico-technical Institute, and began active experimental work. Strelkov devoted the first years to methods of growing metallic single crystals and to related questions of thermal control. In 1931 he began a cycle of investigations of thermal expansion of ionic crystals and metals at temperatures near the melting point. He discovered that in many cases an anomalous growth of the thermal expansion coefficient can be observed long before the melting temperature. Strelkov turned many times in later years to the study of this phenomenon, named pre-melting, and showed that it is related to the presence of impurities and the formation of point defects in the crystal lattice. The basic characteristics of Strelkov's scientific work are already evidenced in these first studies. He paid special attention to the reliability and precision of the obtained experimental results. Strelkov discovered skillfully the sources of systematic errors—the principal enemies of experimental physicists. Thanks to his inventiveness, he created a number of original instruments for investigations in physics, which were distinguished by their great simplicity and high precision.

In 1936, P. L. Kapitza invited Strelkov to help organize the Institute for Physics Problems. Here Strelkov contributed studies of the Zeeman and Paschen-Back effects in the emission spectra of zinc, mercury, cadmium, calcium, copper, and silicon in strong magnetic fields. It was shown in this work that the shift of spectral lines is linear in the magnetic field up to 320 kOe. The experiments performed by him at the end of the 30's on the properties of liquid helium at temperatures below the λ point were part of his dissertation "Radiometric Effects in Helium" for which he received in 1940, without having a candidate's degree, the title of Doctor of Physical and Mathematical Sciences.

During the difficult years of World War II, Strelkov devoted his energy and inventiveness to the creation of materials and instruments needed for the front. He worked out the manufacturing technology of bacteriological filters. For this work he was awarded a state Prize. Strelkov took a most active part in work on



organizing the manufacture of penicillin in the Soviet Union.

From 1938 to 1946, Strelkov worked also in the Division of Low Temperature Physics of the Physics Department of the Moscow University as senior instructor and later as a professor. He took part in the organization of special practical work in the low temperature physics.

After the conclusion of the war, Strelkov continued working at the Institute for Physics Problems. He began work on a wide-range program, initiated by him, on the thermodynamic properties of matter at low temperatures, a program to which he devoted the next twenty years of his life. This program included first of all the development of precision apparatus for the measurement of temperature, heat capacity, and thermal expansion.

Strelkov developed an original dilatometer in which small displacements are transformed into the rotation of a thin needle on which a mirror has been clamped. Research with such dilatometers was conducted at both low and high temperatures. One of the most important results of these investigations was the discovery of a minimum on the plot of the temperature dependence of the coefficient of expansion of silicon, which turned out

to be a distinguishing feature of crystals with a diamond lattice.

Strelkov also contributed much original work to methods of measurement of heat capacity at low temperatures. Thanks to the high precision achieved, Strelkov and his group of scientists obtained important results in the study of the temperature dependence of heat capacity at low temperatures. He showed that the heat capacity of solid oxygen increases at low temperatures precisely according to a cubic law. Results obtained by Strelkov in a study of the temperature dependence of the heat capacity of substances with a layered structure confirmed the theoretical predictions of I. M. Lifshitz. Using mercury and certain other substances, Strelkov demonstrated that slight impurities can lead to the appearance of an additional maximum on the heat capacity plot near the melting point. For a number of years, systematic investigations were made, under his leadership, of the temperature dependence of the heat capacity of a large number of substances, and the obtained data were used to calculate their thermodynamic functions. This work had important applications.

One of the main problems encountered by Strelkov while completing his program was the question of temperature scales. In the mid 40's there was no commonly accepted temperature scale below 90°K. To solve this problem, a low-temperature laboratory was set up at his initiative by the Committee on Weights and Measures. Under Strelkov's leadership, a wide complex of investigations were conducted at the laboratory; these investigations led to the creation of a national scale of low temperatures, which differed from the thermodynamic scale by no more than 0.02°K. Subsequently, this scale was made the basis of an international temperature scale for temperatures from 10 to 90°K. In the process of working out the temperature scale, Strelkov proposed a number of original instruments, foremost among which is the now widely used platinum thermometer on a helicoidal frame. It was his idea to remove the unpleasant errors caused by the "harmful volume" in classical gas thermometers by placing a membrane in the working reservoir of the thermometer. Such a membrane serves as a differential manometer and isolates the working gas volume which is then uniformly at the same temperature. He constructed such a thermometer and used it to graduate a group of platinum resistance thermometer standards in the range of temperatures from 10 to 90°K.

Strelkov devoted much efforts to the development of metrology in the USSR. He propagandized the idea of the indissoluble bond between the development of precise measurement methods and their actual use in scientific investigations. He was one of the initiators in creating in 1955 the All-union Scientific Research Institute of Physico-technical and Radiotechnical Measurements, in which his idea came into being. In this institute, organized, besides a thermometric laboratory, also a laboratory for measuring the heat capacity of condensed substances at low temperatures. One of the major problems of this laboratory was the continuation of studies of the thermodynamic functions of substances, which are needed for the calculation of technological and energy reactions.

In 1955, Strelkov and his group of scientists were transferred to the Siberian Department of the Academy of Sciences. Here he organized a section of solid-state physics, which he headed until his death. Under his leadership, thermodynamic investigations were conducted on a wide front not only at low but also at high temperatures. Many important results on the behavior of substances near second-order phase-transition temperatures were obtained.

In 1962, Strelkov became ill. For two years he was unable to conduct any scientific work at all. However, after two years, despite his continuing illness, he resumed active work. Not able to visit the laboratory, he worked at home, met with scientists and his coworkers, took part in all scientific and organizational matters. His house became part of the laboratory and was always visited by many people. Strelkov helped them in their work, and they helped him to bear his illness.

The distinguishing characteristic of Strelkov's entire scientific work was the exacting reliability and high precision of the obtained results. The distinguishing characteristic of his life was romanticism. He did not pay attention to contemporary problems, and rather dreamt of the future. Because of this, he was able to organize new laboratories in buildings which seemed impossibly small and unsuitable, and infected his students with enthusiasm by beginning serious investigations almost from the very first day. These two characteristics attracted the young people to Strelkov. He had many students who admired him and were infected by his enthusiasm. He was a benevolent teacher who was happy in all success and individual thinking; he widely propagandized the achievements of his students. Many of them became candidates and doctors of science.

P. G. Strelkov was the author of more than 100 scientific papers. His work was highly esteemed by the Soviet government. He was awarded the Lenin Prize (1953), the Red Labor Prize (1943) and the Red Star Prize (1945). In 1943 he was awarded the State Prize.

Students, friends and all who knew him will always remember this leading scientist and remarkable man.

Translated by L. C. Garder