Nikolaĭ Evgen'evich Alekseevskiĭ (on his eightieth birthday)

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On 23 May 1992, the outstanding experimental physicist Nikolaĭ Evgen'evich Alekseevskiĭ celebrated his eightieth birthday. He has made a fundamental contribution to the development of low-temperature physics and the physics of superconductivity and pure metals.

The first scientific publications of this graduate of the Leningrad Polytechnical Institute (1936) belong to the period when he worked at the Ukrainian Physicotechnical Institute, where, on the initiative of I. V. Obreimov and L. V. Shubnikov, the first cryogenic laboratory in the Soviet Union was created. Here, together with Shubnikov and Khotkevich, Alekseevskiĭ studied the properties of the disruption of the superconducting state of metals and alloys simultaneously affected by a transport current and an external magnetic field. His great capacity for work, multiplied by his inventiveness and his desire to delve as deeply as possible into the essence of the observed phenomena made it possible for Alekseevskiĭ to obtain a number of important results in the first two years after graduating from the institute. The results include experimental confirmation of the Silsbee hypothesis on the nature of disruption of superconductivity by a current, the observation of the nonequilibrium character of the generation of an intermediate state under the influence of a current, and an increase in the critical magnetic field of superconducting films as their thickness decreases.

In 1938 Alekseevskiĭ was sent to Moscow to work on a probationary basis at the newly created P. L. Kapitsa Institute of Physical Problems. In 1942 he is listed as a senior scientist in the staff list of the institute. In 1949 he became the head of the laboratory. In this period, along with developing original methods to study the effect of hydrostatic pressure, elastic deformations, and other factors affecting the superconducting parameters of simple metals, Alekseevskiĭ began a series of experiments to clarify the conditions for the generation of superconductivity in alloys and compounds. The data which he obtained indicated that there is an optimum electron concentration, and alloys and compounds with maximum critical temperature values T_c grouped around this optimum. As a result of a purposeful search, Alekseevskiĭ succeeded in observing superconductivity in a number of alloys made of nonsuperconducting components. It was found that in several of them T_c increases during multilateral compression. These results received international recognition, and in 1951 Alekseevskiĭ was awarded the N. D. Papaleksi Prize. Among his methodological achievements one should especially note the mass-spectrometer created under his direction in the first years after the war. This mass-spectrometer had an inhomogeneous magnetic field, which increased the resolution of the instrument by nearly an order of magnitude.

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In the late 50s Alekseevskiĭ and his colleagues began a systematic study of the anisotropy of the magneto-resistance of single crystals of pure metals in strong magnetic fields at low temperatures. Carefully designed experiments led to excellent results and actually served as the basis for a new direction in the physics of metals. The first experimental data determined the topological properties of the Fermi surfaces of many metals. It was found that the Fermi surfaces of the majority of metals are open, and a different magneto-resistance (a quadratic increase or saturation) is determined by the type of trajectory of the current carrier (open or closed) and the relation between the number of electrons and holes, that is, it depends on whether the metal is compensated or not. This series of experiments was awarded the State Prize. Further development of this direction of research led to the discovery of a new quantum phenomenon in several metals: coherent magnetic breakdown, in which the macroscopic characteristics of the metal are sensitive to the phase of the wave function of the current carriers tunneling from one sheet of the Fermi surface to another.

The breadth of his scientific interests, his excellent knowledge of the current literature, his ability to switch rapidly from one direction to another, his rare intuition, and tireless research have significantly contributed to the fact that in his later years Alekseevskiĭ continues to provide

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steadily first-class results. In 1965 he and N. V. Ageev synthesized an Nb-Al-Ge triple system with a then record critical temperature, $T_c > 20$ K. A major contribution to the solution of the problem of practical use of superconductors to create strong magnetic fields was Alekseevskiĭ's 1966 proposal of a diffusion method of preparing a flexible tape coated with Nb_3Sn. A number of top priority results were obtained by Alekseevskiĭ and his colleagues in the study of A-15 phases, molybdenum chalcogenides, heavy fermion systems, and high-temperature superconductors.

Physical experimental methods which Alekseevskiĭ developed and improved are also in widespread use. Using the principle of adiabatic demagnetization, he was the first in the country to obtain a temperature below 0.1 K (1946). His ingenious solution to the complex problem of cooling samples below 1 K with simultaneous exertion of one-axis or multilateral pressure of several kilobars has won admiration.

The active participation of Alekseevskiĭ in scientific organizational work in councils and commissions at various levels has fostered the development of low-temperature physics and superconductivity in our country. Alekseevskiĭ was one of the initiators of the creation in 1968 of the International Laboratory of Strong Magnetic Fields and Low Temperatures at Wroclaw (Poland) and he is the permanent chairman of its scientific council.

The fruitful scientific activity of N. E. Alekseevskiĭ has been recognized with four orders and three medals. In 1960 he was named a corresponding member of the Academy of Sciences of the USSR.

We wish N. E. Alekseevskiĭ good health, energy, and new interesting scientific results.

Translated by C. Gallant