Yuriĭ Vasil'evich Sharvin (on his sixtieth birthday)

A. F. Andreev, A. S. Borovik-Romanov, N. V. Zavaritskiĭ, P. L. Kapitza, I. P. Krylov, I. L. Landau, and A. I. Shal'nikov

Usp. Fiz. Nauk **128**, 739–740 (August 1979)

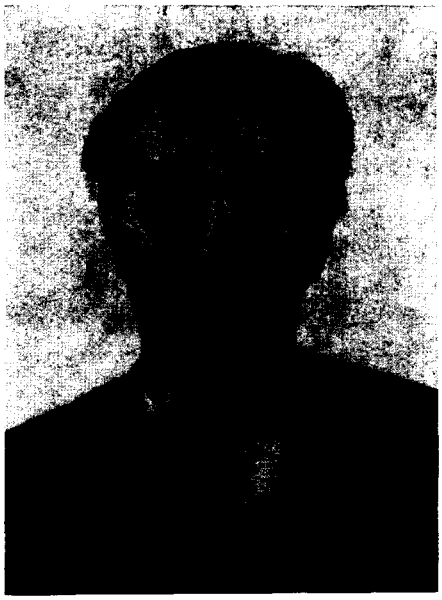
PACS numbers: 01.60. + q

Yuriĭ Vasil'evich Sharvin, a prominent Soviet experimental physicist and a Corresponding Member of the USSR Academy of Sciences, observed his 60th birthday on 24 June 1979.

Sharvin was born in Moscow into the family of a professor of chemistry. On graduation from Moscow State University as a physics major, he began his working and scientific career in the x-ray laboratory of the L. Ya. Karpov Physicochemical Institute. He moved later to the Institute of Physics Problems of the Academy of Sciences of the USSR where he continues to work today.

Beginning with his first scientific papers, which were published in 1945, Sharvin's research activity has been associated with one of the most interesting areas in modern physics—the physics of low temperatures. His first success came with experiments to measure the depth of penetration of a magnetic field into superconductors, which he carried out in the early 1950's. At that time, the penetration-depth problem was under wide discussion, and Sharvin's results were highly topical. His measurement technique was a magnificent example of the experimenter's art, and its high sensitivity made it possible to measure the very weak dependence of penetration depth on magnetic field.

During the same years, Sharvin's attention was drawn to the problem of intermediate-state structure. The theoretical conceptions developed by L. D. Landau in 1937 had given a model of this state in the form of alternating regions of normal and superconductive phases. However, there were a number of contradictions and obscurities both in the genral understanding of structure and in its details, and they required experimental study. No proven measurement procedure existed. The first experiments in this area had been made by A. I. Shal'nikov, who used a bismuth sensor to measure local magnetic fields, and by Shal'nikov and K. A. Tumanov with a ferromagnetic powder. Sharvin developed a method for observing the structure of the intermediate state directly by applying an extremely finely divided ferromagnetic powder to the specimen after the latter had made the transition to the intermediate state. Sharvin scored a first with his remarkable photographs of alternating normal and superconductive layers, which appeared later in monographs and textbooks on superconductivity. His technique for visual study of structure was subsequently used very widely in the work of other physicists, not to mention foreign laboratories.



YURIĬ VASIL'EVICH SHARVIN

This subtle procedure for study of the intermediate state opened the way to a long series of studies that won Sharvin wide recognition. The surface tension at the phase boundary, the anisotropy of this value, and its temperature dependence in various superconductors were measured. These studies of the fundamental properties of superconductors were of great scientific importance.

During the 1960's, Sharvin began to develop a new experimental microcontact procedure, which was originally to be used in observing the focusing of electrons in normal metals. However, as often happens in science, a good idea bears much fruit, and not only that which is expected. In 1965, in the course of point-contact experiments, Sharvin observed an unexpected phenomenon and studied it in subsequent finely reasoned and brilliantly executed experiments that led to discovery of the dynamic intermediate state of superconductors. This state is characterized by motion of superconductive and normal domains under the action of an electric current flowing through the specimen. The first experiments to study dynamics led to the discovery of a whole field of magnetohydrodynamic phenomena in superconductors, the study of which has engaged Sharvin and his students to this day. Many new and interesting phenomena of fundamental importance were discovered in the years that followed. The law governing the reflection of carriers in metals from the boundary with the superconductive phase, according to which reflection is accompanied by an electron-hole transition, was investigated experimentally. A new type of mixed surface state that arises when superconductivity is broken down by a strong current was observed, and the existence of a new "wave" resistance mechanism of the in-

 0038-5670/79/080677-02$01.10

termediate state was demonstrated experimentally. The theory of the intermediate state was developed concurrently with Sharvin's experimental work and to a large degree under his influence. This area of superconductor physics is now a well-ordered and generally established entity, thanks to an organic combination of theory and experiment.

Another area in which Sharvin's scientific career unfolded was the electronic properties of normal metals. In 1959, he proposed and used a new noncontact method for measurement of the residual resistance of pure metals. This method has since been widely used to determine impurity contents in very pure specimens. Sharvin's most interesting and original work was done on the observation of electron focusing in metals with the aid of microcontacts. It was found that electron beams can be focused in pure metals, in an analogy to longitudinal β focusing in a vacuum. The Sharvin microcontact technique has been developed in subsequent studies by his successors and students into a whole "metals" division of electron optics and one of the most interesting and promising trends in contemporary metal physics; it has also been used in tunnel spectroscopy, a new direction of research taken by a group of physicists at Khar'kov in recent years.

Sharvin is a scientist of broad views and widely varied interests. Not only does he have a profound understanding of the fundamental problems confronting basic science; he also attaches great importance to practical applications of scientific developments. A number of methodological advances that Sharvin came up with in the course of his fundamental research have come into widespread practical use in our country's cryogenics laboratories. An extremely sensitive method that he developed for determining small oxygen concentrations in gases has found practical applications in engineering.

As a Professor at the Moscow Physicotechnical Institute (MFTI), Sharvin is engaged in extensive pedagogical activities. For many years, he has taught a course in low-temperature physics for students in the senior courses of the MFTI and has supervised the work of senior undergraduate and graduate students. His graduates are at work in cryogenics laboratories at many scientific institutions, both in Moscow and in other cities of our country, remaining in close touch with their mentor.

Sharvin's far-ranging scientific-organizational and community activities take up much of his time and energy. He is Chairman of the Scientific Council of the Academy of Sciences of the USSR on the problem of "Low-Temperature Physics," a member of the scientific councils of three leading scientific institutions of the USSR, and a member of the editorial board of the journal "Fizika Nizkikh Temperatur" (Soviet Journal of Low Temperature Physics).

Sharvin is a scientist of world stature who is well known in all of the foremost low-temperature laboratories. He was a member of the Commission of the European Physical Society for many years. He was among the organizers of and an active participant in many international conferences and symposia that have been held in our country and abroad. In spite of these heavy obligations, Sharvin, motivated by love for and interest in actual physics, finds time for experimental work in the laboratory. He assembles instruments himself with a great deal of skill and inexhaustible inventiveness, combining the talents of a master glass blower, a machinist, and an electronics technician in the style that makes a first-class experimental physicist. Sharvin's clear and profound understanding of the complex problems of modern physics is helpful not only to him, but also to all his colleagues, both the theoreticians and the experimenters, the "old hands" and the "juniors," with whom he is always eager to discuss interesting results.

The friends, students, and colleagues of Yurii Vasil'evich Sharvin wish him good health and further successes in his productive career.

Translated by R. W. Bowers