

## Isaak Konstantinovich Kikoin (Obituary)

A. P. Aleksandrov, S. T. Belyaev, E. P. Velikhov, Yu. M. Kagan, B. B. Kadomtsev,  
and V. A. Legasov

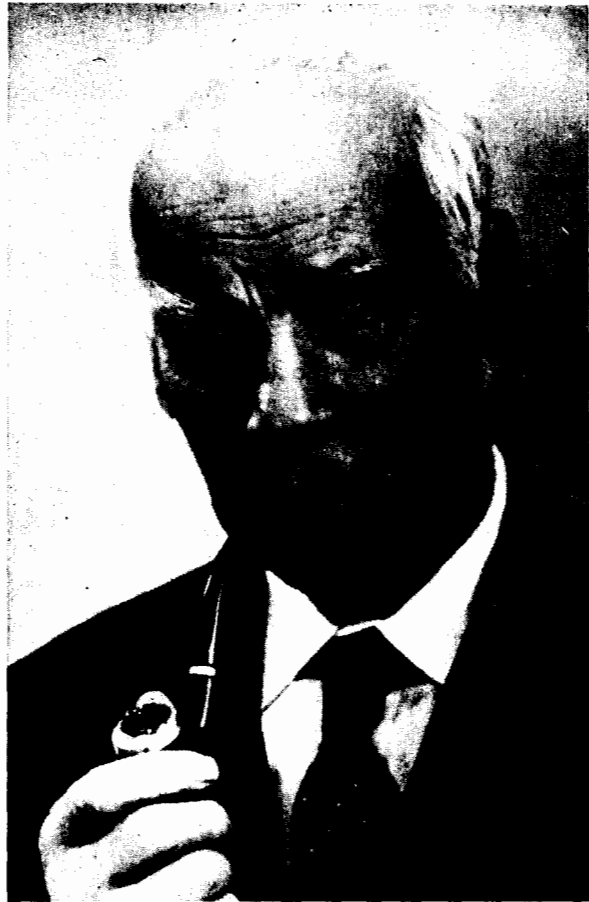
*Usp. Fiz. Nauk* **149**, 347–348 (June 1986)

A year and a half has elapsed since the death (on 28 December 1984) of the prominent Soviet physicist Academician Isaak Konstantinovich Kikoin. This period of a year and half has forced us to recognize the magnitude and the irreplaceability of our loss. I. K. Kikoin belonged to that constellation of scientists which since the 1930s determined the face of Soviet physics, whose contribution to the development of science, to the fixing of the most important directions of modern technology, to the physics education in our country is of lasting significance.

I. K. Kikoin was born on 29 March 1908 in the city of Zhagare of the Lithuanian SSR into the family of a school teacher. He received his education within the walls of the Leningrad Polytechnical Institute, from which he graduated in 1930. While still a second year student he began working in the famous Leningrad Physico-Technical Institute, and already in 1929 his first publication appeared on the role played by conduction electrons in ferromagnetism. Soon after graduating from the Institute Kikoin carried out a series of very clever investigations, distinguished by their mastery of the experimental method, of the Hall effect and the resistance in a magnetic field of liquid metals (1931–1933). In this cycle of papers which have become classical he disproved the experimental results of Nernst and Drude and demonstrated that the quantum theory of electrical conductivity, created not long prior to that, applies also to liquid metals. From that time on he began to think constantly about the nature of the origin of electron conductivity in matter in the absence of crystalline order. But more than thirty years elapsed before he succeeded in carrying out his famous experiments with mercury vapour in the supercritical state (1965–1967). Within the framework of these experiments Kikoin demonstrated for the first time how in such a field a transition occurs from a dielectric state into a metallic state as the density is increased. These papers were of fundamental significance for the theory of metal-dielectric phase transitions and for the general theory of conductivity in irregular systems.

In 1933 Kikoin (together with M. M. Noskov) discovered a new phenomenon—the photomagnetic effect in semiconductors, which is now known by his name. This effect is widely used in semiconductor physics right up to the present day.

In 1936 Kikoin transferred to Sverdlovsk where a new scientific center was being created—the Ural Physico-Technical Institute. To this period belong his papers on the Hall effect in ferromagnetic and paramagnetic metals (1936, 1940). In these papers he had unambiguously established



ISAAK KONSTANTINOVICH  
KIKOIN  
(1908–1984)

the existence of the anomalous Hall effect which is determined not by the magnetic field, but by the magnetization. This result was of essential significance for the entire physics of kinetic phenomena in magnetic metals.

From his researches of the prewar period we should note particularly the series of subtle experiments (1938–1940) in which Kikoin for the first time succeeded in measuring the gyromagnetic ratio in superconductors.

From the early days of World War II Kikoin took an active part in the solution of problems of importance for industry. His first work in this field—the creation, using an original principle, of an ammeter for measuring very heavy currents—won for him the State Prize of the USSR.

Kikoin was among the first physicists who began in 1943 together with I. V. Kurchatov work on developing atomic science and technology. He participated actively in the creation of the laboratory which later became the Institute for Atomic Energy and where he worked until the end of his life. Kikoin became the scientific director of one of the leading branches of the laboratory. During this period another facet of his talent became clearly pronounced—the knack to unite laboratory investigations with design and technological developments. Taking upon himself tremendous responsibility he provided the scientific guidance in the creation of a new, and unique in its level, branch of industry which even today remains one of the outstanding achievements of the scientific-technical revolution.

In mid-1950s Kikoin again returned to problems of solid state physics. He discovered and carried out a detailed investigation of the anisotropy of the photomagnetic effect in single crystals of germanium and silicon (1956–1965), he discovered the photopiezoelectric effect in semiconductors (1964), he observed for the first time quantum oscillations of the photomagnetic effect (1966). In carrying out in recent years (1977–1984) research on the interaction of charged particles with semiconductors, he observed new phenomena which have received the name of radiative electromagnetic and piezoelectric effects. During these years the circle of Kikoin's interests included a number of other problems associated, for example, with plasma physics, with kinetic phenomena in gases, with the physics of nuclear reactors of a new type. In all these directions he obtained fundamentally new results.

Kikoin's scientific activity is inseparable from his pedagogic activity. He devoted a truly significant part of his life to

physics education, to the preparation and training of scientific youth. He was a teacher in the true sense of this word, accessible and benevolent, but at the same time demanding and devoted to principle. His lectures in the course of "General physics" in Leningrad, Sverdlovsk and Moscow exerted considerable influence on the formation of physical thinking among many physicists of the intermediate and younger generations. Regarding it as his civic and moral duty Kikoin devoted more than twenty years to the problem of education in schools. As in all his other projects he did not waste time on generalities, but sat down to write modern textbooks on physics for schools, became the editor and, in fact, a consultant on textbooks prepared by other authors. He initiated a unique physics-mathematics journal for school pupils "Kvant" (quantum) (began publication in January 1970) and for 15 years continued to be its Editor-in-chief. For many years he headed the organizational committee of the All-Union School Olympiads. Together with A. N. Kolmogorov he organized the first in our country physics-mathematics school which selects gifted senior students from schools outside Moscow. Kikoin's entire activity in this field is an example of the highest service to the people.

For outstanding service to his country I. K. Kikoin was twice awarded the title of Hero of Socialist Labor, received seven Orders of Lenin, and the Order of the October Revolution. He also was the recipient of the Lenin and six State prizes, the highest award of the Academy of Sciences of the USSR—the M. V. Lomonosov gold medal, and also the I. V. Kurchatov and P. N. Lebedev medals.

Translated by G. M. Volkoff