
OBITUARY

In Memory of Aleksandr Sergeevich Kingsep (February 18, 1944–January 29, 2010)

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Aleksandr Sergeevich Kingsep, an eminent scientist, a remarkable educationist, a principal researcher at the Kurchatov Institute, a professor at the Moscow Institute for Physics and Technology (MIPT) and Moscow Engineering Physics Institute (MEPhI), and the author of 190 scientific works, passed away in his 66th year after an extended illness.

He belonged to the postwar Soviet generation and found his way in the 1960s—a romantic era of the Soviet physics. This generation understood science as an affair that requires applying continuous effort throughout one's life. From the very beginning of his education at the MIPT, Kingsep showed interest in theoretical physics and began to learn Landau's theoretical course. First, he studied at the Subfaculty of Elementary Particles, but, at the fourth grade, he moved to the Plasma Physics Subfaculty. After graduating from the MIPT, he began to work under supervision of L.I. Rudakov at the Kurchatov Institute, in the laboratory headed by E.K. Zavoisky. At the Kurchatov

Institute, where he occupied different positions, he worked until the end of his life. His choice of theoretical plasma physics was very successful, because this field of science was then flourishing and he joined a team that had a leading position in studying the newly discovered phenomenon of turbulent plasma heating; so there was enough work for everybody. The fact that Kingsep defended his candidate's thesis ahead of schedule showed that he found his true vocation. Kingsep took part in the development of theoretical methods for describing turbulent plasmas, but the most successful and elegant results he obtained together with experimentalists in studying the mechanisms of collective phenomena in plasma—a topic on which he continued to work after defending his thesis. He made a detailed study of such issues as nonlinear saturation of beam–plasma instability, the influence of plasma inhomogeneity on this instability, and the efficiency with which the kinetic energy of plasma bunches is converted into heat in the course of explosive instability.

The beginning of the 1970s was marked with the development of the theory of strong Langmuir plasma turbulence by Vedenov, Rudakov, and Zakharov. After it was revealed that a homogeneous plasma decays into internally coherent localized structures, the problem arose of how to describe this, evidently nonrandom turbulence, because previous theoretical methods turned out to be inadequate. The paper by Kingsep, Rudakov, and Sudan, published in 1973, became a breakthrough in solving this problem. This paper made a complete revolution in the study of strong turbulence. Recent advances in studying classical hydrodynamic turbulence rest on the “structural” approach proposed in this paper. Remarkable results in understanding mechanisms for heating of strongly turbulent plasmas that were obtained in the Soviet Union and, in particular, at the Kurchatov Institute due to the implementation of Kingsep's ideas (developed in the doctoral thesis that he defended in 1979 at the age of 35 and in his review published in *Itogi Nauki i Tekhniki, Ser. Fizika Plazmy (Advances in Science and Technology, Ser. Plasma Physics)*) are still underestimated by the foreign scientific community.

Soon after such evident success, Kingsep became drawn toward another subject of research. The theorists of the department, in which he was one of the

leaders, elaborated an approach that came to be known as electron magnetohydrodynamics (EMHD). At present, any analysis of phenomena occurring in pulsed laser plasmas, pinches, etc., involves this approach. Its application to space plasmas has also turned out to be very efficient. The acronym EMHD can now be met in the titles of papers in practically every issue of such a leading scientific journal as *Physics of Plasmas*. Three reviews written with active participation of Kingsep and published in *Reviews of Plasma Physics*, *Physics Reports*, and *Encyclopedia of Low-Temperature Plasma* were devoted to the popularization of this approach.

Kingsep felt responsible for the life of his institute. When Rudakov moved to the United States, Kingsep agreed to head the Department of Applied Physics, which grew out of the Department of Relativistic Beams. His authority permitted him to support the work of the department and to help the employees with their needs, and, at the same time, he obtained new remarkable results in the physics of pulsed plasmas and controlled fusion research.

Kingsep continuously searched for new fields of activity. Having defended his doctoral thesis, he took a bold but very successful step—he began to teach at the MITP. In this new field, he felt right at home. He was a talented teacher and a recognized leader in the theoretical team created by Rudakov. He supervised many young physicists and supported their original studies. He had to work hard, but the result was worthwhile: the work of theoretical physicists in the Department of Relativistic Beams was widely recognized. While working at the Subfaculty of General Physics at the MIPT, he demonstrated his teaching talent. He gave start to the physical careers of many students and contributed his mite in the development and maintenance of the cultural layer—the task that he considered one of the most important missions in his life. This period of his life was marked with preparing (together with his colleagues) a modern course of physics, which has been published in several editions.

After having taught for 25 years in the Subfaculty of General Physics, Kingsep moved to the Subfaculty of

the Physics and Chemistry of Plasmas, where, after B.B. Kadomtsev, he began to teach students specializing in nonlinear plasma physics. Here, he wrote a new original course of lectures, which has already been published in two editions and has become a handbook for the present and future generations of students devoting their lives to nonlinear physics. Kingsep put much effort to create a “domestic” Institute of Natural Science and Ecology at the Kurchatov Institute and transform it into a new (tenth) faculty of the MIPT. In the last year, he also agreed to teach the course of plasma physics at the 60th subfaculty of the MPhI. Continuous new propositions spoke about the common recognition of his scientific level and skill as a teacher. Becoming one of the first Soros professors, he was then repeatedly awarded this honorable title.

Kingsep always lived a bright and sanguineous life. He was distinguished for the latitude of his thought and encyclopedical knowledge. For a certain period of time, he supervised the recreation center of the Kurchatov Institute and the Institute’s newspaper. He actively participated in the “Days of Physicists.” He liked to travel, went in for aqueous tourism, took up photography and filming, knew and appreciated arts (especially music and literature), was interested in the history of the West and East, and managed several languages. He was erudite in very different fields, shared with pleasure his knowledge, and used his horizons in professional tutoring. He was an affectionate family man, brought up remarkable daughters, and raised a grandson and granddaughters.

Kingsep courageously and with dignity withstood his heavy illness. After a very complicated operation, he continued to teach lectures, chaired the dissertation council, and published a new course of lectures *Introduction in the Dynamics of Continuous Media*. He did not change his style up to the end and, even in this tragic situation, tried to help his relatives and colleagues in word and deed.

Colleagues and friends