

Yakov Borisovich Faĭnberg (in Honor of His 85th Birthday)



On September 7, 2003, we celebrated the 85th birthday of Yakov Borisovich Faĭnberg, an academician of the National Academy of Sciences of Ukraine. The name of this eminent scientist is inseparably connected with the development of the physics and technology of accelerators, nonrelativistic and relativistic plasma electronics, plasma physics, and controlled fusion research.

In 1940, Faĭnberg graduated from Kharkov State University with a degree in an experimental speciality “Electronuclear physics.” He took part in World War II. After demobilization, he began to work in the Theoretical Department of the Kharkov Institute of Physics and Technology (KhIPT). To put his ideas into practice and to prove them experimentally, in 1957, Faĭnberg headed the experimental laboratory and, in 1972, the experimental–theoretical department.

His more than half a century of scientific activity is indissolubly linked to the KhIPT. He carried out fundamental studies on the theory of linear accelerators. His pioneering works (together with works by V.P. Veksler and G.I. Budker) laid the foundations for collective methods of acceleration. Modifications of the method of charged-particle acceleration proposed by Faĭnberg have been widely adopted and are now considered the most promising among the new methods of acceleration. Based on his theoretical investigations and calculations, the first linear electron accelerators in the Soviet Union were built at the KhIPT. Under his leadership, the theory of high-energy linear accelerators was developed (in particular, calculations of the largest in Europe, 2-GeV linear accelerator, which was built at the KhIPT, were performed). Faĭnberg proposed and implemented a number of new ideas in this field, in particular, a fundamentally new method of simultaneous radial and longitudinal stabilization of particles in a linear accelerator—the so-called method of alternating phase focussing. Based on this method, new types of linear ion accelerators were developed. In 1996, his work was awarded the State Prize of Ukraine in Science and Technology.

Faĭnberg contributed significantly to plasma physics. The studies carried out by him and his colleagues resulted in the development of a new branch of plasma physics—nonrelativistic and relativistic plasma electronics. In 1948, he (together with A.I. Akhiezer) described and investigated the beam–plasma instability, the most widely occurring microinstability of a non-equilibrium plasma. It is difficult to overestimate the importance of this result, which has already become classical and is included in each monograph on plasma physics. He and his pupils were the first to observe beam–plasma instability and to develop methods for controlling it. They were the first to discover a new type of gas discharge, beam–plasma discharge, and developed a new collisionless method for plasma heating—beam heating.

Together with his colleagues, he carried out the first theoretical and experimental investigations of the interaction of relativistic electron beams with plasmas and demonstrated that this interaction is very efficient. These investigations led to the development of a new line of research—relativistic plasma electronics—which resulted in the creation of high-power microwave oscillators and lasers.

Faïnberg made a great contribution to the development of fundamentally new high-current inductive plasma accelerators of electrons and ions.

In his scientific work, fundamental studies have always been closely connected with applied problems (in particular, defense problems). It should be noted that, under his leadership, efficient defense systems were developed for the Defense Ministry. Faïnberg has conducted important organizing work: he is the chairman of the Scientific Council on Plasma Electronics and New Acceleration Methods of the National Academy of Sciences of Ukraine. He created a powerful scientific school of plasma electronics and new methods of acceleration (more than 25 doctors and 35 candidates

of sciences), which is now well known all over the world. For more than 25 years, he conducted pedagogical work at Kharkov State University, at which he created special courses on accelerator physics, plasma physics, and plasma electronics. For his major contributions to science and the training of qualified specialists, Honored Scientist of Ukraine Ya.B. Faïnberg was awarded the Order of the Red Banner of Labor and several medals.

The scientific community heartily congratulates Yakov Borisovich on his eighty fifth birthday and wishes him good health and long years of fruitful work and creative achievements.

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