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TO THE 100th ANNIVERSARY OF SERGEY IVANOVICH SYROVATSKY *)

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Sergei Ivanovich Syrovatsky (03/02/1925 – 09/26/1979) is an outstanding theoretical physicist who is responsible for fundamental results in the fields of magnetohydrodynamics, astrophysics and plasma physics, author of more than two hundred scientific articles, including many reviews, and two monographs.

S.I. Syrovatsky was born in the town Bereznegovatoye, Nikolaev region, in a family of scientists. In 1941, at the age of sixteen, he went to the front, was wounded four times, awarded two Orders of the Red Star and medals, and finished the war as a guard senior lieutenant, commander of a machine gun platoon. After completing his military service, he entered the Physics Department of Moscow State University, graduating in 1951, and was enrolled in graduate school in the Theoretical department of the Lebedev Physical Institute.

S.I. Syrovatsky formulated a closed system of magnetic hydrodynamics equations in the form of conservation laws, and on its basis a classification of possible types of rupture surfaces and shock waves was carried out. These works are generalized in a classic review of S.I. "Magnetic hydrodynamics" published in the UFN in 1957.

In the field of radio astronomy S.I. Syrovatsky developed the theory of cosmic synchrotron radiation taking into account the inhomogeneous distribution, diffusion and energy losses of electrons. He indicated the mechanism of preferential acceleration of heavy nuclei and the universality of the spectrum, which can act both in the shells of supernovae and during solar flares. Many joint work of S.I. Syrovatsky and V.L. Ginzburg were devoted to the astrophysics of cosmic rays, these results were summarized in their monograph "The Origin of Space Rays" in 1963.

Since 1964, Sergey Ivanovich paid the main attention to the problems of plasma behavior in strong non-uniform magnetic fields, impulsive acceleration of particles, physics of solar flares and other flare-type plasma phenomena. S.I. showed that plasma flows with a frozen magnetic field in the vicinity of the null lines of the magnetic field result in formation of a current sheet and concentration of magnetic energy. A rapid disruption of the sheet represents a flare itself, when magnetic energy is converted into the energy of plasma, accelerated particles and radiations. Based on these ideas, a special experiment was carried out at the Laboratory of Accelerators of the Lebedev Physical Institute. The experiment confirmed the predictions of the theory. A neutral current sheet was formed in laboratory conditions for the first time. In the course of the sheet disruption, the phenomena such as solar flares were realized, accompanied by the generation of accelerated particles.

As a result, an explanation was found for phenomena of rapid changes of magnetic fields in a highly conductive medium, the emergence of accelerated particles and cosmic rays during solar flares, the generation of cosmic rays in the magnetic fields of supernova shells, non-stationary galactic nuclei and quasars.

A series of research “Dynamics of Current Sheets and Physics of Solar Activity” under the guidance of S.I. Syrovatsky was awarded the State Prize in 1982

*) abstracts of this report in Russian