

In memory of Iosif Solomonovich Shapiro

Iosif Solomonovich Shapiro, an outstanding physics theoretician, Corresponding Member of the Russian Academy of Sciences, head of the section of theoretical nuclear physics at the P N Lebedev Physics Institute, RAS, passed away on March 11, 1999.

I S Shapiro was born in Kiev on November 13, 1918. His family moved to Moscow by the late 1920s.

He graduated from Moscow State University in 1941, majoring in physical optics. At the same time, Shapiro completed his second year of the Shchukin Drama School where he was training as an actor. As the Soviet Union entered World War II, he was sent to a military college from which he graduated as an artillery officer. He fought at the battles of the Kursk Bulge, of Smolensk and Warsaw, and then in Germany. He was demobilized in March 1945 for further specialization in nuclear physics at Moscow State University.

I S Shapiro started his life in science as an experimenter, under the supervision of I M Frank in the Scientific Research Institute of Nuclear Physics at Moscow State University (NIIYaF MGU). His first published paper (1948, together with I M Frank) reported experimental investigation of the horizontal component of cosmic radiation at sea level. Later, however, his interests turned to theoretical nuclear physics and he became one of the leading experts in the field. In 1952, V L Groshev and I S Shapiro published *The Spectroscopy of Atomic Nuclei* — one of the best monographs on the subject.

The first theoretical results obtained by Shapiro were in relativistic wave mechanics. In 1955 he proposed the expansion of the relativistic wave function over states with definite four-dimensional angular momenta, and showed that the expansion coefficients are transformed under unitary infinite-dimensional irreducible representations of the Lorentz group. The transformation he found is known in the scientific literature by his name.

In spring 1956, I S Shapiro, before the appearance of the Lee and Yang paper, discussed the possible experimental consequences of parity violation in beta-decay of nuclei and suggested an experiment that was later independently carried out by Wu and her colleagues. Owing to the uncertainty in the relation between the Hamiltonian and energy, Shapiro did not send to print the research report of the NIIYaF MGU that contained this suggestion.

In 1958, I S Shapiro moved to the Institute of Theoretical and Experimental Physics (ITÉF) in Moscow, where he started new directions of investigation at the intersection of nuclear and elementary particle physics. In 1961 he presented the theory of direct nuclear reactions using Feynman diagrams in the nonrelativistic region. Then he moved to nuclear reactions at intermediate and relativistic energies. It was to a great extent owing to his efforts that the journal *Nuclear Physics A* started to issue the ‘Intermediate Energy’ series.



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(13.11.1918 – 11.03.1999)

In 1962, Shapiro noticed that a small separation between energy levels of opposite parity could enhance the parity nonconservation effects in nuclear reactions, and suggested searching for P-odd correlations in experiments on the capture of slow polarized neutrons by cadmium nuclei. He encouraged ITÉF experimenters to conduct the experiment, which resulted in the discovery of parity violation in nuclear forces (1964). In 1966, a similar experiment at the Leningrad Nuclear Physics Institute (LIYaF) confirmed the ITÉF results at a higher level of accuracy. Later on parity violation effects were also found in nuclear fission reactions (ITÉF, 1978).

In 1969, I S Shapiro advanced a hypothesis on the possible existence of nucleus-like systems of baryons and antibaryons. This idea stimulated the interest of many theoreticians and experimenters in interactions of slow antinucleons with nucleons and nuclei. I S Shapiro was one of the initiators of constructing LEAR — the slow antiproton storage ring at CERN. This installation made it possible to study a number

of problems in elementary particle physics using beams of slow and cold antiprotons. The physics of baryon–antibaryon systems remained central for I S Shapiro after he moved to the P N Lebedev Physics Institute, RAS (FIAN) in 1981.

A talented organizer of science, I S Shapiro devoted much time and effort to extend and raise the level of theoretical and experimental research in our country. Having been elected a Corresponding Member of the USSR Academy of Sciences in 1979, he vice-chaired the USSR (and then Russian) Academy of Sciences Council on Nuclear Physics and took an active part in the Bureau of the Academy Division of Nuclear Physics (OYaF), organizing and conducting nuclear spectroscopy conferences and OYaF sessions, and coordinating research efforts in this field. Problem-oriented international symposia and workshops on nuclear physics were held on his initiative and under his guidance. He wrote the defining document proving the need to organize the Institute for Nuclear Research at the Academy of Sciences of the USSR; he prepared the experimental program for the future meson factory.

I S Shapiro was very attentive to physics publishing. An editorial board member for many years of the journals *Nuclear Physics* and *Pis'ma v Zh. Eksp. Teor. Fiz.*, he did a great deal to raise the level of scientific publications. He developed a project of regular edition that would print reviews on topical problems in the physics of elementary particles and nuclei (*ÉChAYa*).

The all-Moscow seminar on the theory of nuclei that I S Shapiro chaired for many years played an important role. The creative and informal atmosphere of the seminar as well as the wide erudition, recognized authority and quickness of response of its leader stimulated the generation of new ideas and helped mutual understanding between representatives of different fields of study.

A gifted teacher and brilliant lecturer, Iosif Solomonovich taught physics at the leading universities of the country: Moscow State University (MGU) and Moscow Institute of Physics and Technology (MFTI), was a professor at the Moscow Engineering Physics Institute (MIFI) for more than 20 years, delivered lectures to various international schools of physics, wrote monographs and textbooks. On the initiative of I S Shapiro and V M Galitskiĭ, the first MIFI schools of theoretical nuclear physics for young scientists were organized. Many actively working physicists believe themselves to be his disciples.

Iosif Solomonovich Shapiro was a bright and multifaceted personality, with a profound interest in literature and art, who retained through his life the youthful passion for the theatre. But the true love and end-all of his life was always physics. Friends and colleagues will carry the memory of Iosif Solomonovich Shapiro as a man and scientist.

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M V Danilov, G T Zatsepin, V G Kadyshevskiĭ,
L B Okun', I L Rozental', A N Skrinskiĭ,
A E Chudakov, D V Shirkov*