
MYKOLA FEDOROVYCH SHULGA (to his 60th Birthday)



On September 15, Mykola Fedorovych Shulga – a known scientist in the domains of quantum electrodynamics and the physics of interaction of high-energy particles with matter, a Corresponding member of the National Academy of Sciences of Ukraine, Professor, Director of the O.I. Akhiezer Institute for Theoretical Physics of the National Scientific Center “Kharkiv Institute of Physics and Technology” (NSC KhIPT), a deputy of the general director of the NSC KhIPT – became sixty years of age.

M.F. Shulga was born in Kharkiv in 1947. After graduating from secondary school, he entered the O.M. Gorky Kharkiv State University (KhSU) in 1965. After graduating from the University in 1971, M.F. Shulga spent two years performing military service at Volgograd.

During his education at the Physico-Technical Faculty of the KhSU, M.F. Shulga executed his

first scientific work under the direction of Professor P.I. Fomin and Academician O.I. Akhiezer. This work was devoted to developing the theory of coherent bremsstrahlung of electrons and positrons with ultrarelativistic energies in crystals. Afterwards, researches in this domain of physics had been remaining at the center of Mykola Fedorovych’s scientific interests for a long time.

In 1973, he became an employee of the KhIPT and occupied the position of scientific researcher at the laboratory of theoretical physics headed by Professor I.O. Akhiezer at that time.

An outstanding role in emerging M.F. Shulga as a physicist-theorist was played by Academician O.I. Akhiezer. Active and fruitful cooperation of M.F. Shulga with this outstanding Ukrainian physicist-theorist continued 30 years.

Since 1973, M.F. Shulga’s scientific and organizational activities have been connected with the Kharkiv Institute of Physics and Technology. Here, in 1977, he defended his Ph.D. dissertation carried out under the direction of O.I. Akhiezer and, in 1985, his doctoral degree thesis. In 1981, M.F. Shulga was elected to the position of senior scientific researcher and, in 1986, to the position of leading scientific researcher. From 1986 to 1997, he headed a target theoretical and experimental department at the Nuclear Physics Branch of the KhIPT. In 1996–1997, M.F. Shulga actively participated in the establishment and development of the Institute for Theoretical Physics as a component of the NSC KhIPT and became its first director.

M.F. Shulga is the author and co-author of more than 250 scientific papers, in particular, 7 monographies and monographic reviews, which were published in leading domestic and foreign editions.

M.F. Shulga’s basic scientific interests are connected with quantum electrodynamics and the physics of interaction of high-energy particles with matter. He made a sound contribution to the formation and

development of a number of scientific branches. In particular, these are as follows.

– A quasiclassical theory of coherent radiation emission of relativistic electrons in crystals has been developed (together with O.I. Akhiezer). On the basis of this theory, the main mechanisms of radiation emission for various modes of particle channeling through crystals were established. This circumstance has played a decisive role in evaluating the parameters of radiation sources, which can be created on the basis of the processes of interaction between relativistic electrons and crystals.

– The effect of suppression of high-energy electron bremsstrahlung in a thin layer of substance has been predicted, and the quantitative theory of this effect has been developed (together with S.P. Fomin). Now this effect, which is named as the Ternovsky–Shulga–Fomin effect, is experimentally studied on the accelerator of high-energy particles at CERN (Switzerland).

– In 1986, M.F. Shulga, together with Yu.L. Bolotin, V.Yu. Gonchar, and V.I. Truten, predicted the phenomenon of dynamic chaos, when fast particles move in periodic structures of atoms. Such a prediction opens opportunities for new mathematical methods to be applied while studying the interaction between particles and crystals.

– The theory for a number of quantum-mechanic electrodynamic processes occurring in matter at high energies has been developed. A possibility was demonstrated for coherent effects to manifest themselves in the processes of scattering and creation of new particles in crystals at high energies, owing to which the efficiency of interaction between particles and atoms of a crystal lattice increases substantially. These researches reveal connections between quantum electrodynamics, on the one hand, and solid state physics, on the other hand.

A complex character is typical of M.F. Shulga's scientific researches. He not only studies problems of fundamental physics but, making use of computational physics, brings them to specific numerical results, which enables one to compare theoretical predictions with experiment and to determine the possibilities for the results obtained to be implemented in practice. For instance, M.F. Shulga and A.A. Grinenko, on the basis of computer-assisted simulation of the processes which describe the channeling of high-energy-particle beams through bent crystals, predicted the deviation and splitting of those beams owing to their multiple scattering by atomic chains in crystals. Due to this effect, a relatively simple

solution to the problem of slow extraction of beams of charged particles with ultrahigh energies from cyclic accelerators by making use of crystals and without applying cumbersome magnets becomes possible.

Initiated by M.F. Shulga, a number of experiments aiming at the verification of the effects predicted in the physics of interaction between high-energy particles and matter has been carried out on accelerators at CERN (Switzerland), SLAC (USA), MAMI and S-DALINAC (Germany), and KhIPT.

M.F. Shulga also proposed and developed a number of new mathematical methods for the description of the processes of interaction between high-energy particles and matter, such as the multidimensional quasiclassical method, the Fock method of canonical transformations, the method of functional integration, etc. In particular, in 1984, on the basis of the path integral method, the theory of Landau–Pomeranchuk–Migdal effect concerning the suppression of bremsstrahlung of ultrarelativistic electrons in matter was developed (together with M.V. Laskin and O.S. Mazmanishvili).

In the late 1990s, stimulated by O.I. Akhiezer and M.F. Shulga's initiative, theoretical studies in the physics of fast neutron reactors operating in the slow nuclear burning regime were started at the KhIPT. These works have been intensively continued by M.F. Shulga together with Yu.P. Melnik, V.V. Pylypenko, and S.P. Fomin.

The scientific results of Mykola Fedorovych have been widely recognized. M.F. Shulga is the Winner of the O.S. Davydov Prize of the NAS of Ukraine (2000) and the State Prize of Ukraine in the field of science and engineering (2002).

M.F. Shulga fulfills the active scientific and organization work as a member of program committees of a number of international scientific conferences (ICAS, RREPS, Channeling). He was also one of the organizers of the International Conference on Supersymmetry and Quantum Field Theory (Kharkiv, 2000) and the Chairman of the organizing committee of the International Conferences on Quantum Electrodynamics and Statistical Physics (Kharkiv, 2001 and 2006). In 2004, M.F. Shulga was elected Vice-President of the Ukrainian Physical Society.

M.F. Shulga is a member of the Scientific council of the NAS of Ukraine on the problems of nuclear physics and atomic engineering and the Scientific council of the CIS countries on the problems of application of nuclear physics methods in adjacent fields, as well as a member

of a number of scientific councils at the NSC KhIPT and the V.N. Karazin Kharkiv National University. He is a member of the editorial boards of “Ukrainian Journal of Physics”, “Issues of Atomic Science and Engineering”, and “Bulletin of the V.N. Karazin Kharkiv National University”.

Large attention is paid by Mykola Fedorovych to the training of high-skilled physicists. Among his disciples, there are 8 Ph.D.'s and 4 Dr.Sci.'s in physics and mathematics.

At the V.N. Karazin Kharkiv National University, M.F. Shulga is lecturing for many years on quantum electrodynamics in matter at high energies (for theorists) and cooperative effects in electrodynamics (for experimenters). The scientific seminar “Modern problems of physics”, which was organized following M.F. Shulga's initiative in 2004 and can be attended by every scientist living in Kharkiv, continues

its active functioning under the M.F. Shulga's direction.

High human qualities and his talent of physicist-theorist gained to Mykola Fedorovych the deserved authority and the great respect.

Sincerely congratulating Mykola Fedorovych on his 60th anniversary, we wish him sound health, happiness, creative enthusiasm, and new achievements in science.

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