
MYKHAILO PAVLOVYCH LISITSA (to his 85th birthday)



On January 15th, Academician of the National Academy of Sciences of Ukraine Mykhailo Pavlovych Lisitsa — the outstanding physicist, the expert in optics and spectroscopy, Honored Worker of Science and Engineering of Ukraine, Laureate of the State Prizes of Ukraine — was 85 years of age.

M.P. Lisitsa was born in a rural family in the village of Vysoke (the Zhytomyr region). His inherent thirst for knowledge of all the new and unusual put him on a difficult path to science. Having graduated from the Kyiv pedagogical technical school in 1938, Mykhailo Pavlovych taught the Russian language and literature at a secondary school in Fastiv (the

Kyiv region). Nevertheless, already in the next year, being irrepressibly attracted by mathematics with its exquisite logic and complexity, he became the student of the Faculty of Physics and Mathematics at the Taras Shevchenko Kyiv State University. However, the student's life of M.P. Lisitsa had not being lasted for long; and, in October 1939, he was drafted into the Red Army. Here, he met the beginning of the Great Patriotic War and, as a regiment scout, risking his life, suffering from the war horrors, revealing extraordinary bravery and fortitude that were rewarded with military decorations, had come a long way of hard time. In May 1945, near Prague, M.P. Lisitsa met the end of the war, but only in November 1945 he was demobilized. Mykhailo Pavlovych renewed his training at a new Faculty of Physics of the Kyiv State University.

Graduating from the university in 1950, the young post-graduate student of the Chair of Optics became deeply absorbed into experimental and theoretical researches of the vibrational spectra of molecular microcrystals. To achieve the results, effective polarizers of infra-red radiation were needed, and M.P. Lisitsa developed not only the exact theory of multilayered polarizers, light reflectors, and systems for coating optics, but also the technology of their fabrication. The theoretical analysis of the problem and the experimental implication of the results obtained became the dominating feature in the scientific style of the young scientist, which made him capable to solve complicated scientific problems effectively and foreknow the scenarios of how physical researches would develop. The scientific intuition of M.P. Lisitsa amazed. He was always highly sensitive to what scientific directions were the most perspective and productive, and did his best for developing them. As early as in his Ph.D. thesis, which was defended in 1954, M.P. Lisitsa had drawn a conclusion that the theory of molecular excitons developed by O.S. Davydov for electron spectra could be applied to describe the peculiarities in the

spectrum of vibrational molecular excitations. The following comprehensive research of the temperature dependences of the normal vibration spectra intensity, which molecular compounds revealed in gaseous, liquid, and solid states, had excellently confirmed this idea. In 1961, M.P. Lisitsa defended his thesis for a Doctor's degree, the results of which had initiated the extensive experimental and theoretical studies of resonance interactions in the vibrational spectra of molecular systems. These researches led to the discovery of a new phenomenon — the combined Fermi–Davydov resonance, recognized by the spectroscopists of the whole world.

Having taken up the post of the Head of the Department of Optics at the just organized academic Institute of Semiconductor Physics in 1961, M.P. Lisitsa continued to hold the professorate at the Faculty of Physics of the Kyiv State University. It is well known that Mykhailo Pavlovych lectured almost all conceivable courses on general physics, including the history of physics. The encyclopaedic extension of his knowledge enchants; as a lecturer, he enjoys the wide popularity among students and scientific researchers.

M.P. Lisitsa's scientific yield at the Institute of Semiconductor Physics was extremely abundant in new ideas, approaches, and results: the workable models of solid-state lasers have been created; the investigations of the mechanisms of coherent lasing and nonlinear optic phenomena have been started; the theory of a laser cavity with an active element has been developed; for the first time in the world practice, the semiconducting quantum dots in glass matrices were used to modulate the Q -factor of a resonator and to generate powerful light pulses; the probabilities of the two-photon and two-step transitions in pure and doped semiconductors have been determined; effective semiconductor-based frequency modulators of light have been created; the mechanisms of scattering of free current carriers in semiconductors, including germanium and silicon, have been identified. While continuing the studies of the resonance interactions in crystals with layered and chain structures, the existence of the Davydov resonance in their phonon spectra has been proved. This result has initiated a number of scientific researches at other scientific institutions over the world. The theoretical prediction and the experimental discovery of an essentially new phenomenon in nonlinear optics — the giant rotation of a light polarization plane in media with cubic symmetry — made by M.P. Lisitsa and his disciples, have gained a deep resonance among the experts. Now, this phenomenon has been

studied comprehensively in crystals with color centers. M.P. Lisitsa initiated the experiments with nano-sized structures — superthin films of atomic semiconductors and metals — and proved the existence of the quantum-size effect of a blue shift of both the absorption edge and the exciton spectrum in the case where the dimensions of quantum dots decrease. The nonlinear optical methods for determining the parameters of quantum dots in dielectric matrices have been developed. Important results were obtained by M.P. Lisitsa during last years, while studying self-organized quantum dots in semiconducting heterostructures. The dependences of the dimensions of InAs/GaAs quantum dots on the conditions of their growing by molecular-beam epitaxy and the regularities of the charge transfer between dots have been established.

M.P. Lisitsa does not avoid the problems of the physics of living matter as well. He substantiated the resonance character of the interaction between the electromagnetic waves of the millimeter range and living, in particular, human, organisms. The quantum-mechanical transitions of the vibration, rotation, inversion, and spin origin, which produce medical effects when irradiating the acupuncture points located along the meridian connected with a sick organ with millimeter waves, have been established.

The universality of the scientist's scientific interests arouses the sincere admiration. He is the author of more than 500 scientific works and possesses about 40 author's certificates of invention. In the co-authorship with his disciples, he published 6 monographies, which include the world's first "Fiber Optics" republished in English abroad. Mykhailo Pavlovych's capacity for work is remarkable. He has just published two books of the extremely popular series "Entertaining Optics" — "Atmospheric and Space Optics" and "Physiological Optics. The World of Human Beings"; nevertheless, the third book is ready for publication, and the author became thoroughly engrossed in the preparation of the fourth one.

M.P. Lisitsa has made much for the development of one of the major branches of 20th-century physics — quantum electronics. By the suggestion of the President of the Academy of Sciences of Ukraine B.E. Paton, he became the deputy of the latter in presiding over the Commission on Quantum Electronics, which promoted the fast development of researches in this new area, and, in due course, the Editor-in-Chief of a new periodical, the collection of scientific works "Kvantovaya Elektronika" ("Quantum electronics"). This issue was one of the first periodicals devoted to such a direction, and its

copies can be found in many libraries over the world. For many years, Mykhailo Pavlovych has been heading the Scientific Council “Semiconductor Physics” of the NAS of Ukraine. Nowadays, he is the deputy of the Editor-in-Chief of the “Ukrainskyi Fizychnyi Zhurnal” (the “Ukrainian Journal of Physics”) and the member of editorial boards of three other physical and one biophysical journals.

During all his scientific and pedagogical activity, M.P. Lisitsa has been paying a large attention to the training of the scientific staff with a high professional skill. Among his disciples, there are 23 Doctors of Science and more than 40 PhD’s in Physics and Mathematics. He has created a recognized school in

optics and spectroscopy, whose adherents represent Ukraine with dignity far beyond its borders. The merits of M.P. Lisitsa, both military and scientific, were awarded four orders and many medals of the Soviet Union. He was awarded a Joannes Marcus Marci medal of the Czechoslovak Academy of Sciences.

The scientific community, numerous disciples, and colleagues, as well as Editorial staff of Ukrainian Journal of Physics, sincerely congratulate Mykhailo Pavlovych with his anniversary and wish him the sound health, longevity, great success, and creative inspiration.

Thankful disciples, Colleagues