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IN MEMORY OF IVAN SERHIYOVYCH DOTSENKO



On January 14, 2026, Ivan Serhiyovych Dotsenko, Professor of Taras Shevchenko National University of Kyiv and a famous Ukrainian theoretical physicist who dedicated his life to scientific research and teaching theoretical physics to subsequent generations of scientists, passed away.

Ivan Serhiyovych was born on October 23, 1940, in the village of Chornolis'ke, Stavropol Territory. His childhood was spent in poverty and hardship. Ivan Serhiyovych's father, Serhiy Kalynovych Dotsenko, spent the years from 1943 to 1953 in Stalinist camps.

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As a result of denunciation, he was convicted under the notorious Article 58 for anti-Soviet agitation. In the 1980s, Serhiy Kalynovych was completely rehabilitated by the General Prosecutor's Office of the USSR.

In 1967, Ivan Serhiyovych graduated from T.G. Shevchenko State University of Kyiv and worked at this university from 1970 until the last days of his life. As the head of the department of quantum field theory in 1988–2003, he played a decisive role in the development of the department and the training of specialists in theoretical physics. Later, he worked as a professor of the department.

Ivan Serhiyovych's professional and pedagogical achievements were repeatedly marked by state and university awards. He was twice awarded the title of "Excellence in Public Education". In 1996, he became the winner of the competition for the title of Soros Associate Professor; in 2000, he was awarded the "Honorary Certificate of the Cabinet of Ministers of Ukraine"; and in 2001, he was recognized as the best teacher at the department of physics. He also received numerous commendations from the university rector.

In 1973, Ivan Serhiyovych defended his dissertation for the PhD degree in Physics and Mathematics on the topic "High-energy scattering of hadrons by nuclei and the nuclear structure" under the supervision of Academician of the National Academy of Sciences of Ukraine O.G. Sitenko. In 1996, he defended his doctoral dissertation on the topic "High-energy scattering of hadrons by nuclei and electromagnetic transitions in nuclei".

The scientific interests of Ivan Serhiyovych covered, on the one hand, fundamental problems of theoretical nuclear physics and, on the other hand, mod-

ern directions in quantum informatics and symmetry methods (group-theoretical methods) in condensed matter physics. Characteristic features of his scientific approach were methodological rigor, deep attention to the role of symmetries, and an aspiration to formulate physically transparent criteria that allow moving from general principles to specific calculable consequences.

In his works published in the Ukrainian Journal of Physics, I.S. Dotsenko presented a number of results that are important for both the development of methodological tools and the use of applied calculations. In an article devoted to three-nucleon systems in the doublet state, he showed that within the framework of the standard isospin formalism, only two spatial components of the wave function out of six for the $(2p, n)$ reaction and four for the $(2n, p)$ reaction are independent. He also derived relationships for constructing a total antisymmetric wave function using those two components, formulated systems of equations for the doublet state of the nuclei ^3He and ^3H , presented a separate equation for their quartet state, and, most importantly, proved the equivalence of physical characteristics calculated in the approaches with and without isospin, which opened a way to simplify precision studies of small-nucleon systems.

In a series of works on quantum correlations, the role of noise in the states of two-photon and two-qubit systems and in quantum information protocols was considered. A convenient two-parameter description of the density matrix was proposed for entangled two-photon states with white and color noise admixtures, and on this basis, the dependence of the stability of the Bell inequality violation (CHSH) on the noise type was analyzed, and conditions under which quantum correlations are preserved or destroyed were found. For the “entanglement exchange” problem, namely, the teleportation of entangled states in a four-qubit system, the corresponding density matrices were constructed for the initial and final pairs of qubits, the redistribution of the particles in the pure state and noise admixtures was analyzed, conditions for the entanglement preservation and destruction during the transition from the initial to the final state were established, and the von Neumann entropies of these states were compared.

A conspicuous contribution to the theory of many-particle entanglement was made by his results on detecting quantum correlations using the Mermin and

Ardehali criteria. Formulas for calculating the corresponding correlation functions in arbitrary n -qubit states and a criterion for violating inequalities by specific states were obtained; a class of states “insensitive” to the standard Mermin and Ardehali operators was revealed, and modified operators were proposed, the set of which expands the class of n -qubit states where the presence of quantum correlations can be detected.

In later works, carried out in collaboration with his colleagues, Ivan Serhiyovych developed the symmetry approach to the classification of collective excitations in graphite and single-layer graphene. For the first time, projective classes and standard factor systems of symmetry space groups were determined, according to which vibrational and electronic states at high-symmetry points of Brillouin zones are classified; projectively equivalent irreducible representations were found; multiplication tables for spinor representations were constructed; and distributions of vibrational excitations over the symmetry types were given for all corresponding points. Additionally, compatibility conditions were determined for irreducible projective representations of various projective classes in the system of subordination of space groups and wave vector groups, and spin-dependent splittings of electronic excitations were analyzed taking into account the time rotation symmetry: it was shown that such splittings can be significant in materials with the corresponding symmetry (in particular, in transition metal chalcogenides), but they are small for graphene and graphite due to the weak spin-orbit interaction of carbon.

Ivan Serhiyovych was not only a perspicacious, consistent, and systematic researcher, but also an outstanding teacher. During his long-term work at the Faculty of Physics of Taras Shevchenko National University of Kyiv, he lectured the courses in mathematical and theoretical physics, maintained high standards of mathematical education culture, and trained more than one generation of students and young scientists. For many years, the courses “Mathematical Physics” and “Quantum Mechanics of Particles with Spin” lectured by Ivan Serhiyovych were his scientific and pedagogical signature courses and set a high standard for teaching theoretical physics at the department.

Ivan Serhiyovych Dotsenko paid great attention to working with gifted youth. He maintained close ties

with the Ukrainian Physics and Mathematics Lyceum (UPML) of KNU, repeatedly traveled to various cities of Ukraine to hold All-Ukrainian Physics Olympiads for schoolchildren, and conducted qualifying rounds of entrance exams at the UPML. From 1983 to 2002, he was a member of the jury of the All-Ukrainian Physics Olympiad.

The memory of Ivan Serhiyovych Dotsenko will be preserved in his scientific works, in the students he educated, and in the tradition of the department that he headed for many years. Colleagues noted his com-

plete honesty, nobility, and adherence to principles; these traits were an integral part of his scientific and human character. He was a true Man of Honor.

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