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IN MEMORY OF VOLODYMYR MYKHAILOVYCH SYSOEV (1948–2019)



On November 26, 2019, a well-known physicist-theorist, Dr.Sci. in physics and mathematics, Professor at the Department of Molecular Physics of the Faculty of Physics of Taras Shevchenko National University Volodymyr Mykhailovych Sysoev passed away after a serious illness.

Volodymyr Mykhailovych Sysoev was born on March 4, 1948, in the city of Kostyantynivka, the Donetsk region. When still a schoolboy, he revealed an outstanding ability in mathematics and a keen interest in physics, large curiosity, and strong purposefulness. Many times, he was a winner of the regional Olympiads in physics and mathematics. That is why he was one of the firsts who were recommended for the admission to a specialized boarding school with a physico-mathematical profile in Kyiv, which he finished with a gold medal in 1966.

The same year, V.M. Sysoev entered the Faculty of Physics at Taras Shevchenko State University of Kyiv. In 1971, he graduated with honors from the Department of Theoretical Physics of this faculty. During his education, Volodymyr Mykhailovych attracted the attention of a well-known physicist-theorist, the founder of the Department of Molecular Physics, Professor Oleksandr Zakharovych Golik, who invited the talented student to the graduate school. In 1975, after completing his postgraduate studies at the Department of Molecular Physics, Volodymyr Mykhailovych began to work as a junior

and, later, a senior researcher at Taras Shevchenko State University of Kyiv. In 1984, he began his lecturing activity as an assistant at the Department of Medical and Biological Physics of O.O. Bogomolets Medical Institute of Kyiv. In 1988, Volodymyr Mykhailovych entered the doctorate program at Taras Shevchenko State University of Kyiv. After successfully graduating from it in 1991, he worked as a senior and, later, a leading researcher at the scientific and research department of the Kyiv National University.

In 1996, Volodymyr Mykhailovych returned to lecturing at the Department of Molecular Physics as an associate professor and, since 1998, as a professor. He excellently lectured the general course in molecular physics for first-year bachelor students, and the courses “Modern State of Critical Phenomena” and “Modern Problems in Physics” for master students. Special courses created and lectures by him, such as “Physics of phase transitions”, “Non-equilibrium thermodynamics”, “Fluid physics”, “Physics of solutions”, “Fundamentals of mathematical modeling in medical physics”, and others, became classic. Besides that, the courses “Methods of fractal geometry in problems of molecular physics” and “Theory of catastrophes and its application to problems of modern physics” were lectured to the postgraduate students of the Faculty of Physics.

The imagery of Volodymyr Mykhailovych’s mentality, his sense of humor, his friendly attitude to students, his deep understanding of physics, and his ability to explain the most complicated teaching material using expressive analogies as an example found their reflection in the respectful attitude of the students. His lectures invoked interest and respect to physics in all his students who regarded Volodymyr Mykhailovych as a genuine classical professor. That is why he received a diploma as the best lecturer at the Faculty of Physics in 2011.

In 1975, Volodymyr Mykhailovych defended the thesis “Correlation functions in a vicinity of the critical point of anisotropic liquid” for the Ph.D. degree in physics and mathematics. In this dissertation, a comprehensive theoretical study of the behavior of

not only an inhomogeneous, but also anisotropic liquid near the boundary of stability of the system has been carried out for the first time. In his doctoral dissertation “Equations of state for dense gases and liquids. Molecular theory and applications”, which was defended in 1991, Volodymyr Mykhailovych obtained world-class scientific results. In particular, he developed a new variant of thermodynamic perturbation theory, derived new integral equations capable of describing the asymptotic behavior of the radial distribution functions, and obtained the equations of state in a vicinity of the critical point. Furthermore, he proposed and developed a model of ordered structures in chemical systems and obtained a criterion for the penetration depth into the metastable region. In the dissertation work, the possibility of a Universe mini-inflation in the course of the confinement phase transition was also analyzed with regard for the possibility of a realization of metastable states corresponding to a supercooled quark-gluon plasma.

The scientific interests of Volodymyr Mykhailovych were focused on general thermodynamics and statistical physics, physics of liquids and phase transitions, the study of order-parameter correlation functions in a vicinity of the critical point, and so forth. He made a substantial contribution to the development of the theory of the equations of state for dense gases and liquids with their application to the processes of creation of the Universe and formation of coherent structures in chemical reactions. He also fruitfully worked at the development of the theory of fire extinguishing powders; elaborated the theory of superfluidity in nuclear matter; studied the equation of state for a highly inhomogeneous liquid, the influence of irradiation on the physical properties of liquids, and the dependence of the surface tension of a droplet on its radius; and developed the theory of thermal conductivity in liquids and solids. Under his supervision and with his direct participation, a theory of diffusion in membrane systems was created. Volodymyr Mykhailovych also actively researched the functional forms of model intermolecular potentials on the basis of the equation of state, as well as self-diffusion phenomena at high pressures.

V.M. Sysoev has published more than 400 scientific papers, including articles in leading international professional journals (*Physical Review*, *Molecular Liquids*, *Astronomische Nachrichten*, *Zeitschrift für Physik*, and others). He co-authored such text-

books for Universities as *Molecular Physics* (Znan-nya, Kyiv, 2006), *Physics of Phase Transitions* (Kyiv University, Kyiv, 2010), and the book *Thermodynamics of Melts* (Institute for Safety Problems of Nuclear Power Plants, Chernobyl, 2014). Under his supervision, several dissertations were defended for the Ph.D. and Dr.Sci. degrees in physics and mathematics. For many years, Volodymyr Mykhailovych had been a member of specialized scientific councils at Taras Shevchenko National University of Kyiv, F.D. Ovcharenko Institute of Biocolloidal Chemistry of the NAS of Ukraine, and the Institute of Engineering Thermophysics of the NAS of Ukraine. For many years, he has been a referee of the *Ukrainian Journal of Physics* and other scientific editions.

Volodymyr Mykhailovych was not only an outstanding scientist and a wonderful teacher. He was also a bearer of valuable human qualities. An extraordinary responsibility for his affair, a creative approach to the work, personal modesty, a kind attitude to his colleagues, and his willingness to help were inherent in him. V.M. Sysoev was a person of encyclopedic interests, which went far beyond his professional duties. He liked and understood arts, in particular, poetry, classical literature, and music. Volodymyr Mykhailovych played several musical instruments and could sing beautifully. His sense of humor never left him. He was a highly respected person and had authority among his colleagues in scientific and lecturing activities, as well as among his numerous students and disciples.

Volodymyr Mykhailovych is survived by a daughter and a son, whose successes he was always proud of.

Now that Volodymyr Mykhailovych has passed away from us, everyone who knew him realizes that the acquaintance with him was a real gift of fortune. The memory of V.M. Sysoev – a wonderful lecturer, an outstanding scientist, and a genuine Teacher endowed with remarkable human qualities – will remain forever in the hearts of his relatives, colleagues, and disciples.

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