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YURIIVANOVYCH SHYMANS'KYI (1928–1998)
(to the 90th anniversary of his birthday)



July 10, 2018 marks the 90th anniversary of the birthday of the outstanding Ukrainian scientist in molecular physics, one of the founders of the physics of liquid state in Ukraine, Professor, Dr. Sci. in physics and mathematics, Academician of the Academy of Sciences of the Higher Schools of Ukraine Yuri Ivanovich Shymans'kyi.

Yuri Ivanovich was born in Kyiv in 1928 in a family of teachers. His father Ivan Yevgenovych Shymans'kyi taught higher mathematics at the Kyiv Hydrometeorological Institute, and his mother Lyudmyla Mykolaivna Krasylnykova-Shymans'ka was a teacher of the French language.

From 1946 to 1951, Yuri Ivanovich studied at the Faculty of Physics of the T.G. Shevchenko State University of Kyiv (KSU). In 1951–1954, he was a post-graduate student at the Chair of Molecular Physics of the KSU. His scientific adviser was Prof. O.Z. Golyk. The first scientific works of Yuri Ivanovich were

devoted to the study of the latent evaporation heat of liquids, as well as the viscosity, density, and critical temperature of binary alcohol solutions. In 1954, having analyzed the literature and his own experimental data, he proposed an original empirical relationship for the temperature dependence of the liquid evaporation heat, known at present as the Shymans'kyi equation (later, he theoretically substantiated this equation and published it in 1958). In 1955, he defended his Ph.D. thesis “The structure and physical properties of binary alcohol solutions”. In 1958, he was awarded the title of Associate Professor of the Chair of Molecular Physics.

Further scientific researches of Yuri Ivanovich were devoted to the experimental study of critical phenomena and the gravitational effect in high-temperature molecular fluids and liquid solutions, using the Toepler optical method, the microprism method, and the original version of the flotation method with free microfloats, as well as to the development of fundamental ideas concerning the evaporation and condensation growth of liquid droplets under various conditions. The method of microfloats improved by Yuri Ivanovich has supplemented the arsenal of classical methods used while studying critical phenomena. Those researches resulted in the Dr. Sci. dissertation “Research of quasistatic transformations in one-component and binary systems near the liquid-vapor critical point and quasistationary liquid-vapor phase transitions in some substances and solutions”, which Yuri Ivanovich defended in 1969. In 1970, Yu.I. Shymans'kyi was awarded the title of Professor of the Chair of Molecular Physics.

At that time his scholarly friendship with leading scientists from different republics of the Soviet Union, who worked in the field of investigations of a liquid state of substances, professors R.I. Krichevsky,

M.O. Anisimov, V.P. Skrypov, E.V. Mathisen, Yu.R. Chashkin, I.K. Kamilov, I.R. Yukhnovsky, Yu.P. Bragoi was of great importance in the scientific activity of Yuri Ivanovich. Very creative was the friendship with Professor I.Z. Fisher from Odessa University. I.Z. Fisher was one of the founders of the statistical theory of liquids. Yurii Ivanovych often visited Odessa, participated as a speaker at the famous Fisher's seminars at the Department of Theoretical Physics of the Odessa University. For hours, they discussed the problems of the matter in the critical state, vapor condensation, and liquid state stability. Yurii Ivanovych wore very often a Ukrainian embroidered shirt and spoke pure Ukrainian.

In 1970–1998, Yu.I. Shymans'kyi was intensively engaged in the improvement of previously used techniques. He developed and applied new methods for studying the critical state of liquids, namely, the light scattering method and the method of neutron absorption and scattering. He together with his co-authors developed the theory of the gravitational effect in one-component and binary systems, and applied the scaling approach to analyze experimental data. On the basis of experimental data concerning the study of gravitational effect with the help of optical and neutron research methods, Yurii Ivanovych with his collaborators and students determined the critical indices α , β , and γ , as well as the amplitudes of power relations, in the fluctuation theory of phase transformations. Till his last days, Yurii Ivanovych determined the values of critical indices more and more exactly, sometimes going against the whole physical community. It was not his mistake. He recognized well that the values of critical indices depend, to some extent, on the choice of system's order parameter. This circumstance is especially important for binary and multicomponent solutions. Therefore, he spared no effort and time to construct the optimal order parameter of the system. His work devoted to establishing the character of singularity for the rectangular diameter of coexistence curves gained the world recognition.

He proposed the extended scale equations to describe coexistence curves and isotherms in a vicinity of the critical point. Yu.I. Shymans'kyi is an author of the classical theory for the temperature dependences of the evaporation heat, density, and isochoric heat capacity near the critical state. Yurii Ivanovych made a significant contribution to the formation of modern

concepts of the isomorphic behavior of individual substances and their mixtures near their critical state. He also continued fundamental researches of the evaporation and condensation of droplets, the mechanisms of various transformations in disperse systems. He performed a thorough study of the nucleation rate in a Wilson chamber, analyzed the evaporation and condensation kinetics of liquid droplets in a wide pressure interval, developed a theory for the influence of the temperature in the near-surface liquid layer on the kinetics of a phase transition in aerodynamic systems, carried out a number of researches of composite materials and a number of model researches dealing with the fractal mechanisms of particle growth in disperse systems. Those works by Yu.I. Shymans'kyi revived the Ukrainian scientific school aimed at studying the phase transformations and critical phenomena. Yurii Ivanovych was a scientific adviser of 14 Ph.D. and Dr.Sci. theses.

The works by Yu.I. Shymans'kyi are widely known and cited in the world scientific literature. His name as one of the founders of the science of critical phenomena was mentioned in classical books on the theory of phase transitions and critical phenomena, such as A.Z. Patashinskii, V.L. Pokrovskii. *Fluctuation Theory of Phase Transitions* (Nauka, Moscow, 1982) [A.Z. Patashinski, V.L. Pokrovski, *Fluctuation Theory of Phase Transitions* (Pergamon Press, Oxford, 1982)]; M.A. Anisimov. *Critical Phenomena in Liquids and Liquid Crystals* (Nauka, Moscow, 1987) [M.A. Anisimov, *Critical Phenomena in Liquids and Liquid Crystals* (Gordon and Breach, Philadelphia, 1991)], and D.Yu. Ivanov. *Critical Behavior of Non-Ideal Systems* (Wiley-VCH, Weinheim, 2008).

Professor Yu.I. Shymans'kyi worked at the T.G. Shevchenko State University of Kyiv from 1953 to 1998. In 1978–1989, he headed the Chair of Molecular Physics. In 1983–1998, he was a scientific supervisor of the problem laboratory of aerodispersive systems. In 1970–1973 and 1981–1985, Yurii Ivanovych was a Dean of the Faculty of advanced training of the higher-school teaching staff at the Kyiv University. He was active in the public work at both the University and the faculty. He paid a large attention to the scientific youth.

After the revival of the National University of Kyiv-Mohyla Academy, Prof. Yu.I. Shymans'kyi headed the Chair of Physics and Mathematics at this University (in 1993–1998). At the Chair, he created a powerful

teaching staff by engaging famous scientists from the academic institutions of Kyiv.

Yurii Ivanovych was a wonderful lecturer. He lectured the “Molecular physics” course at the Faculty of physics of the KSU. Yurii Ivanovych also excellently lectured the courses “Physics of phase transitions” and “Physics of gases and liquids” at the Faculty of physics of the KSU, the course of general physics at the KSU natural-science faculties, and the courses “Some issues of molecular physics and their teaching” and “Fundamentals of thermodynamics and statistical physics” at the Faculty of advanced training (the Institute of advanced training of the higher-school teaching staff). Yurii Ivanovych was very responsible for preparing his lectures and holding the pedagogical discipline. His lectures were considered by students with great attention. At those lectures, we, young teachers at that time, got lecturer’s experience, and we are all sincerely grateful to him for his “Lessons”. In 1968, he lectured at the Leipzig, and in 1969 at the Debrecen Universities. On the basis of those lectures, he, in co-authorship with O.T. Shymans’ka, wrote the textbook *Molecular Physics*, which was published after his death.

Yurii Ivanovych Shymans’kyi is an author and co-author of more than 300 scientific publications. Among them, there are the textbooks *Critical State of Pure Substances* and *Thermodynamic Theory of Critical Phenomena* (in coauthorship with O.T. Shymans’ka). At different times, Prof. Yu.I. Shy-

mans’kyi was a member of the editorial board of the collection of treaties *Physics of Liquid State*, the interdepartmental collection of treaties *Physics of Aerodynamic Systems*, and the journal *Bulletin of Higher Educational Institutions. Physics*.

Yurii Ivanovych Shymans’kyi was a highly intelligent person, with a good sense of humor. He was an outstanding scientist and pedagogue, and made a considerable contribution to the formation and development of molecular physics.

The kind blessed memory left after Yurii Ivanovych will be preserved in the hearts of his disciples, friends, colleagues, and everybody who knew him.

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