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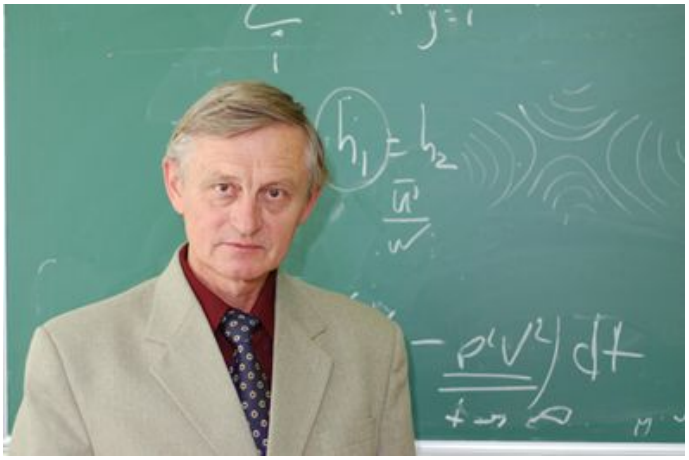
Personalia

Mykhailo Kozlovskii's 70th birthday



Our colleague, professor Mykhailo Kozlovskii, the well-known Ukrainian scientist in the field of phase transitions and critical phenomena, turns 70 on August 30, 2022. The approach for treating critical behaviour of three-dimensional systems, initiated by academician Ihor Yukhnovskii and further developed by M. Kozlovskii, forms a new direction in phase transition theory.

Mykhailo was born in the village of Lobachivka, Volyn region, Ukraine, to a family of teachers. After finishing school in 1969, he entered the Physics Department of Ivan Franko Lviv State University and graduated with honours in 1974. During 1974–1977, he continued doing research as a postgraduate student at the Lviv Department for Statistical Theory of Condensed Matter of the Kyiv Institute for Theoretical Physics (ITP) of the Academy of Sciences of Ukrainian SSR. In 1978 Mykhailo defended his PhD thesis "Behavior of thermodynamic functions near the phase transition point in the Ising model" (supervisor Prof. I. R. Yukhnovskii) and afterwards worked as a researcher and Scientific secretary at the Lviv Division of Statistical Physics of the ITP. In 1990 he defended the Doctor of Sciences thesis entitled "Thermodynamics of the phase transition in the three-dimensional Ising model within the collective variables method".

In 1990 the Lviv Division of the ITP was transformed into the Institute for Condensed Matter Physics (ICMP) of the National Academy of Sciences of Ukraine, and Mykhailo Kozlovskii headed the Laboratory of Theory of Phase Transitions. From 2006 to 2017, he worked as Head of the Department of Statistical Theory of Condensed Systems of the Institute. Currently, he is the chief researcher of this Department. In 2005, Mykhailo Kozlovskii received the title of Professor in Theoretical Physics.

M. Kozlovskii developed and applied Yukhnovsky's method to describing the phase transitions in Statistical Physics, known as the collective variables method. Within this approach he developed a method of calculation and analysis of complete expressions for thermodynamic functions of three-dimensional Ising-like systems near the phase transition temperature. Some results of this research were outlined in the book *I. Yukhnovskii, M. Kozlovskii, and I. Pylyuk, A microscopic theory of phase transitions in three-dimensional systems, Lviv: Eurosvit, 2001, 592 p.* An impact of an external magnetic field on the behaviour of three-dimensional spin systems near the critical point is highlighted in his book *M. P. Kozlovskii, The influence of an external field on the critical behaviour of three-dimensional systems, Lviv: Halytskyi drukar, 2012, 332 p.*

Along with the profound fundamental nature of Prof. Kozlovskii principal investigations area, there

was also a place for applied research. He participated in developing the optical methods of information protection and worked on topics related to the accident at the Chornobyl nuclear power plant.

In recent years, M. Kozlovskii developed a new approach to studying the phase behaviour of continuous systems of interacting particles, initiated during the participation in the international FP7-PIRSES project STREVCOMS (2014–2017). His fruitful collaboration within the framework of this project yields solutions of several physical models. In particular, Prof. M. Kozlovskii with Prof Yu. Kozitsky (UMCS, Poland) studied the Widom-Rowlinson continuous model. This model describes the phase transition of the demixing type in its pure form. The model allows repulsion between particles of different species without attraction between them. Unlike the works by other authors that only indicated the presence of the demixing phase transition in such a model, Prof. Kozlovskii was the first to find a complete solution to the continuous two-component Widom-Rowlinson model, and obtained its equations of state and phase diagram. Such a model with repulsive interaction of the Curie-Weiss type plays no less a key role for binary mixtures than the well-known Ising model for magnetic systems. This description has prospects of practical use for many existing systems. In particular, it can be the ground for developing techniques for separating fractions of substances in industrial processing.

Another paramount result is the exact solution of the first-order phase transition problem in a continuous system of particles with Curie-Weiss interaction, containing both attractive and repulsive parts. Prof. Kozlovskii and his coauthors rigorously established the presence of a sequence of phase transitions, obtained the equation of state, and described the phase behaviour of this model. Applying the Curie-Weiss potential is equivalent to the mean-field approximation, which is frequently used for studying many statistical systems. However, the mean-field approximation has many modifications, while the Curie-Weiss potential implements the idea of a mean-field from the first principles: the interaction between particles is distance-independent as if the particles are under the influence of some external field.

M. Kozlovskii also worked on an approximate solution of the fluid model with Morse interaction potential, obtained in the formalism of the grand canonical ensemble without phenomenological assumptions. Achievement of this approach is that the solution is derived without power series expansion in density, activity, or other small parameters. Consequently, the coordinates of the critical point were found. The temperature dependence of the order parameter below the critical point and the equation of state were established. The phase behaviour of this model in the supercritical region is also described.

Prof. Kozlovskii received a bunch of awards for his achievements in scientific activities. He was awarded by the National Academy of Sciences of Ukraine the insignia *For Professional Achievements (2009)* and *For Preparation of Scientific Youth (2012)*. In 2019, he received an Honorary Certificate from the Presidium of the National Academy of Sciences of Ukraine. He is a laureate of the State Prize of Ukraine in Science and Technology in 2020 (the title of the work "Management of the properties of materials in extreme conditions").

Mykhailo Kozlovskii has the traits of a leader and organizer of science. His supervision and teaching skills led in total seven researchers to receive their PhD degrees, he was also a scientific advisor to one Dr. Sci. thesis. During 1997–1999, he held the position of executive director of the Western Scientific Center of the National Academy of Sciences of Ukraine, headed at that time by I. R. Yukhnovskii.

M. Kozlovskii is a member of the Editorial Board of the Condensed Matter Physics journal and of the Ukrainian Journal of Physics. He worked as the Deputy chairman of the Scientific Council for the defence of doctoral theses at the ICMP, headed the State Examination Commission of the Faculty of Physics and of the Faculty of Electronics of the Ivan Franko National University of Lviv, was a member of the organizing and program committees of many international scientific conferences, scientific councils at the Department of Physics and Astronomy of the National Academy of Sciences of Ukraine and Western Scientific Center of the National Academy of Sciences of Ukraine.

The author of two monographs, about 300 scientific publications and patents (including about 100 articles), an outstanding theoretical physicist, teacher, and generous person, Professor Mykhailo Kozlovskii, is meeting his 70th birthday with significant achievements and in permanent scientific search. Scientific community, colleagues, collaborators, students, and friends sincerely congratulate Mykhailo on his anniversary, wish him to stay fit, inexhaustibly enthusiastic in pursuit of new research endeavours.