Анатолий Иванович Ларкин (1932–2005)

This special issue of JETP is dedicated to the memory of Prof. A. I. Larkin, whose 80th anniversary was celebrated in October 2012. Prof. Larkin was an outstanding scientist who made major contributions to a wide range of fields in theoretical physics, including nuclear physics, quantum field theory, plasma physics, and above all, solid state physics. He has made seminal contributions to practically all subfields of condensed matter theory. His works on superconductivity, phase transitions, mesoscopic physics, and strong correlations dominated the development of these fields for decades. Over the years, Prof. Larkin collaborated with many scientists around the world and supervised about a dozen students who later became successful theoretical physicists. In this issue, we publish 16 papers on a broad range of subjects of condensed matter theory written by Prof. Larkin's former students, coworkers, and colleagues.

In the first paper of this issue, V. L. Pokrovsky outlines the main subjects of Larkin's scientific career, with the particular emphasis on his contribution to the theory of phase transitions. Other papers discuss recent advances in the areas of condensed matter physics that interested Prof. Larkin. In particular, the phase transition in a class of magnetic ferroelectrics materials is discussed in the contribution by S. A. Pikin and I. S. Lyubutin. The paper on dry friction by A. I. Larkin and D. E. Khmelnitskii is based on an unpublished preprint of the Landau Institute (1979). It was prepared for publication by D. E. Khmelnitskii.

Prof. Larkin once said that for him to stop working on superconductivity would be tantamount to deserting a combat. We therefore feel it is appropriate that many papers in this issue discuss modern aspects of the theory of superconductivity. The paper by L. N. Bulaevskii and Shi-Zheng Lin addresses the properties of vortices in various conditions in magnetic superconductors, and the paper of N. B. Kopnin, I. M. Khaymovich, and A. S. Mel'nikov discusses low-dimensional proximity-induced superconductors. The peculiarities of slab-shaped superconductors are discussed in the contribution of E. N. Brandt, G. P. Mikitik, and E. Zeldov. Rich physics of Josephson vortices in layered superconductors is discussed in the review of A. E. Koshelev and M. J. W. Dodgson. A Ginzburg–Landau description of superconductors with κ close to 1 is presented by Yu. N. Ovchinnikov. Finally, the paper of M. A. Skvortsov and M. V. Feigel'man emphasizes the relevance of Larkin's ideas for the general theory of gap smearing in disordered superconductors.

Another field of condensed matter physics to which Prof. Larkin was returning many times in the course of his carrier is strongly correlated electron systems. In this issue, we publish the paper of M. Dzero and V. Galitski that expounds the theory of topological Kondo insulators and argues that samarium hexaboride belongs to this class of materials.

In the 1970s, Prof. Larkin was greatly interested in the physics of one-dimensional systems. In this issue, K. A. Matveev reviews recent results on equilibration of Luttinger liquids. Statistical mechanics of a one-dimensional Coulomb gas is mapped onto PT-symmetric non-Hermitian quantum mechanics in the paper by T. Gulden, M. Janas, P. Koroteev, and A. Kamenev, who solve this problem by the algebraic topology methods. Quantum hydrodynamics of the fractional quantum Hall states is discussed by P. Wiegmann.

Prof. Larkin's interest in the general problems of localization and interference effects in weakly disordered metals resulted in a series of remarkable papers in 1980s. He has returned to these problems again and again later in his life. One of his major contributions was the prediction of the universal negative magnetoresistance of two-dimensional materials. Similar interference effects give rise to the magnetic field dependence of the localization length in the variable-range hopping regime, which is calculated by L. Ioffe and B. Spivak, who employ the mapping to the directed polymer problem. Wandering of a directed polymer in a random potential at finite temperatures is discussed by S. E. Korshunov, V. B. Geshkenbein, and G. Blatter. Transport in three-dimensional topological insulators in the presence of disorder is reviewed by B. Skinner, T. Chen, and B. I. Shklovskii.

We are grateful to all the authors for their contributions to this special issue of JETP.

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