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PERSONALIA

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Mikhail Vissarionovich Sadovskii (on his 60th birthday)

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Mikhail Vissarionovich Sadovskii, academician, head of the Laboratory of Theoretical Physics of the Institute of Electrophysics, the Urals Branch of the Russian Academy of Sciences (UrB RAS), celebrated his 60th birthday on 25 February 2008.

His entire life is inseparable from the Russian Academy of Sciences. He was born in Sverdlovsk, into the family of a brilliant expert on metal physics, later academician of the USSR Academy of Sciences, V D Sadovskii. In 1971, Mikhail Vissarionovich graduated from the Physics Department of the Urals State University, where he carried out his first research work under the guidance of theoretician P S Zyryanov, very well-known in the Urals. In 1971 – 1974, he enrolled in the postgraduate course of the Theory Department of the Lebedev Physical Institute of the USSR Academy of Sciences (FIAN) and remained in close contact with his colleagues there in subsequent years. His science supervisor was L V Keldysh, who suggested for Sadovskii's work a field that was not in vogue at the time, the theory of electrons in disordered systems, which dictated the direction of his research for many years to come.

From 1974 till 1987, M V Sadovskii was a research scientist at the Institute of Metal Physics of the Urals Research Center (URC) of the USSR Academy of Sciences, and after 1987 he was the permanent head of the laboratory he set up himself, the Laboratory of Theoretical Physics of the Institute of Electrophysics of the UrB RAS. During the toughest period 1993 – 2002, he took up the post of Deputy Director of this institute. Since 1991, M V Sadovskii has also been professor of the chair of theoretical physics of Urals State University.

M V Sadovskii has published more than a hundred papers, including four monographs and fundamental review articles. The principal avenues of his research, already shaped during his postgraduate years at FIAN, is the electron theory of disordered systems, the theory of metal – dielectric phase transitions, and the theory of superconductivity.

His earlier work was devoted to the effect of disorder on Peierls structural phase transitions in quasi-one-dimensional systems and to electronic properties of such systems in conditions of well-developed fluctuations of charge density waves. He proposed a number of exactly solvable models of such systems, including an original model of the evolution of the electron spectrum and electromagnetic response depending on the degree of short-range ordering of charge density waves; this model demonstrated the formation of the pseudogap and the transition to non-Fermi-liquid behavior. In recent years, these papers have again attracted the attention of theoreticians in connection with the problem of describing the pseudogap in HTSC compounds.

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Mikhail Vissarionovich Sadovskii

Topics that later attracted M V Sadovskii's attention were the theory of electron localization in disordered systems, which is the most important mechanism of the metal – dielectric transition. He was one of the first to apply the arguments based on the idea of scaling to this problem, and also the instanton approach. He also noticed a profound analogy between the problem of the electron in the random field created by chaos and the problem of the description of an unstable scalar field theory with the asymptotic freedom property; he carried out a fundamental analysis of problems that arise here, including the formulation of the general localization criterion. In the framework of the instanton approach, he proposed (simultaneously with and independently of J Cardy) a regular method for calculating the 'tail' of the electron state density in a disordered system, which essentially generalized the early results obtained by I M Lifshits. Simultaneously with D Vollhardt and P Woelfle, he also proposed a multidimensional ($2 < d < 4$) generalization of the self-consistent localization theory that became a most important practical tool for solving problems of localization in disordered systems.

M V Sadovskii (together with L N Bulayevsky) was able, for the first time, to generalize the theory of 'dirty' superconductors to the case of systems with very short free path lengths in the vicinity of a metal–dielectric localization transition. Thus, they predicted the possibility, in principle, of superconductivity in the state of the Anderson dielectric, and explained the observed anomalies in the temperature dependence of the upper critical field H_{c2} (positive curvature, violation of the Gor'kov relation for dH_{c2}/dT).

M V Sadovskii also paid much attention to studying the role of effects of disorder in superconductors with 'exotic' types of pairing (d-pairing, 'odd' pairing). The effect of disorder was treated in this work from the standpoint of using effects of disorder as an efficient method of identifying the type of pairing. Thus, he proposed an original explanation of the relative stability of d-pairing when superconductors with compact Cooper pairs undergo disordering; this allowed removing one of the main contradictions between theory and experiment in the physics of high-temperature superconductors.

In recent years, he has published a series of papers that look into the nature of the pseudogap state of high-temperature superconductors, one of the most important fields in the physics of HTSC systems. Among other things, he generalized the previously suggested one-dimensional models of the pseudogap to two dimensions, first studied specific features of superconductivity in the pseudogap case caused by short-range fluctuations of the dielectric type (antiferromagentic or of the charge density wave type), and constructed a theory of optical conductivity in the pseudogap state.

Recently, he suggested a new approach to the physics of strongly correlated systems that allowed introducing the length scale into the dynamic mean field theory (the DMFT + Σ approximation). M V Sadovskii and his colleagues actively use this approach to describe the properties of the pseudogap state of high-temperature superconductors, including realistic calculations of their electronic properties (the LDA + DMFT + Σ method), as well as to analyze the general problem of the metal–dielectric transition in disordered systems with strong electron correlations (the Anderson and Mott transitions).

It is characteristic of M V Sadovskii to work in close contact with physics experimentalists. He actively participated in the organization and conduction of the initial stage of high-temperature superconductivity research by the Urals Branch of the RAS and continues to devote much time to these activities in connection, for instance, with the study of radiation-induced disordering in HTSC systems. For many years, he has been giving lectures to students at Urals State University. He developed a number of original lecture courses that were later published (not only in Russia). His lectures and books invariably are in great demand with students.

In 1994, M V Sadovskii was elected correspondent member of the Russian Academy of Sciences, and in 2003 became a full member. He is member of the UrB RAS Presidium, received the A G Stoletov Prize of the RAS, is Chairman of the Board of the Joint Physics Society of the Russian Federation, is a member of the American Physics Society, and is a Fellow of the Institute of Physics (Great Britain). He worked for many years on expert councils of the RFBR, and is deputy chairman of the RAS Commission on fighting pseudoscience and preventing falsification of research. He is a member of the Council of university chancellors of Ekaterinburg, and takes active part in the work of editorial boards of the journals *JETP* and *Physics–Uspekhi*.

Having reached the age of 60, M V Sadovskii continues to do intense research in the hottest fields of the theory of the condensed state. He is full of new ideas and plans. We wish Mikhail Vissarionovich all the best on this jubilee from the bottom of our hearts and wish him good health and further success in working for the good of our science.

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