

PERSONALIA PACS number: **01.60. + q**

Ibragimkhan Kamilovich Kamilov (on his 80th birthday)

DOI: 10.3367/UFNe.0186.201601g.0107

November 20, 2015 was the 80th birthday of the Honored Scientist of the Russian Federation, the prominent physicist and organizer of science, Corresponding Member of the Russian Academy of Sciences (RAS), Ibragimkhan Kamilovich Kamilov.

In 1961, I K Kamilov graduated from the postgraduate course at the Faculty of Physics of Lomonosov Moscow State University (MSU). From 1973 to 1975, he worked on a Doctor of Science degree at the Faculty of Physics of MSU. When working at Dagestan State University (DSU), he united a team of like-minded people — talented young researchers utterly devoted to science. It is precisely they who later formed the backbone of the now world-famous Dagestan school of physicists.

At DSU, I K Kamilov made his way from teacher to professor, Head of the Department of Solid State Physics, and Vice Rector for scientific work.

For advances in his work, he was awarded the badge "For Excellent Achievements in Higher Education of the USSR" and the honored diploma of the Ministry of Higher Education of the Russian Soviet Federal Socialist Republic (RSFSR). The research area headed by him, which involved the field of defense, was included in the long-term plans of fundamental research of the USSR Academy of Sciences, the RSFSR Ministry of Higher Education, and the USSR State Committee for Science and Technology.

In 1988, he was elected Director of the Physics Institute of the Dagestan Branch of the USSR AS, the only one in the South of Russia, which then experienced a serious organizational crisis. I K Kamilov made great efforts toward its reformation.

An important role in the scientific activities of I K Kamilov and his school was played by studies on magnetism, ferroelectricity, semiconductor physics, solid-state thermal physics, physical thermodynamics, including magnetothermodynamics, and fluctuation phenomena in magnets and high-temperature superconductors in liquids.

The main scientific activity of I K Kamilov was concentrated on one of the fundamental problems of modern physics — the physics of phase transitions and critical phenomena in condensed media, in which the critical indices and amplitudes characterizing the type of spin ordering and the rules of behavior of physical quantities in the neighborhood of a critical point acquired particular meaning. Experiments on ferro- and ferrimagnets, manganites, and multiferroics in conventional and incommensurate ferroelectrics made it possible to finally establish that the critical state is realized not only in a liquid–vapor system, but also in solids. Its fundamental characteristics could also be examined. At that time, such a conclusion was thought to be not quite obvious and even contradicting the concepts of Landau classical thermodynamic theory.

Uspekhi Fizicheskikh Nauk **186** (1) 107 – 108 (2016)
DOI: 10.3367/UFNr.0186.201601g.0107
Translated by M V Tsaplina

Ibragimkhan Kamilovich Kamilov

On the basis of detailed studies of static and dynamic critical phenomena in ferro- and ferrimagnets, I K Kamilov and coworkers proposed in their work a unified approach to allowance for interactions perturbing the ordering interaction of spins. They were the first in the world to establish the universality classification of static and dynamic critical behavior of real magnetic-ordered crystals. Then, it was shown that in actual finite-dimensional ferro- and ferrimagnets, the external magnetic field may come forth as ordering, disordering, and random fields. Such an approach allowed establishing the main rules of the magnetic field effect on second-order phase transitions, and revealing a number of multicritical points and a set of crossover phenomena. In the context of these studies under the scientific guidance of I K Kamilov, Mössbauer spectroscopy was successfully used at the Institute for revealing the character of spin ordering and effective fields in crystals under study.

An important line of inquiry of Kamilov's work is the study of new problems in magnetoelasticity and, particularly, in phase transitions and critical phenomena in compressible magnets. He has investigated experimentally magnetoelasticity in a critical region and formulated a static similarity theory (scaling) of magnetoelasticity, established new specificities in critical behavior of dynamic magnetoelasticity and the magnetic field effect on them, and revealed a magnetic analogue of the Landau–Khalatnikov mechanism above the Curie point in a magnetic field.

His work on the construction of magnetic phase diagrams and the study of static, dynamic, and crossover phenomena in weak magnetic fields gained wide-ranging fame. He developed an essentially new method of determining spontaneous magnetization, spontaneous magnetostriction, susceptibility in a zero field, and Curie points ('kink' method) based on the phenomenon (first revealed by him in the lower neighborhood of the Curie point) of constancy of magnetic susceptibility, magnetization, magnetostriction, and the magnetooptic Faraday effect in a wide temperature range in magnetic fields weaker than demagnetization fields. This work of his laid the foundation for another new scientific discipline in magnetism, namely, the physics of magnetoordered crystals in weak magnetic fields. The whole suite of research conducted, including the pioneering work on the study of critical phenomena, allowed I K Kamilov and his colleagues to be the first in the world to realize the most thorough verification of universal similarity laws, to confirm the validity of the conclusions concerning the modern theory of critical and crossover phenomena (scaling, renormalization groups, and ϵ expansion), and to construct a number of new scaling equations of state. This work by I K Kamilov paved the way for a new area of science, namely, the physics of the magnetic (solid-state) critical state.

Important results were obtained on the electron energy structure of semiconductors in the metal–semiconductor and Mott–Anderson transition regions. I K Kamilov is one of the authors revealing and investigating a new class of semiconductors — quasigapless semiconductors.

I K Kamilov and colleagues made the first experimental attempts to reveal Cooper pair convection in yttrium ceramics, which had been theoretically predicted by V L Ginzburg, and to examine elasticity of the conduction electron collisions with a single-crystal (tungsten) surface, which agrees with the corresponding theoretical predictions made by A F Andreev. I K Kamilov and his colleagues analyzed the behavior of a substance in strong electric fields. In particular, the prediction of the Franz–Keldysh theory on the effect of a strong electric field on semiconducting gallium arsenide transparency was confirmed experimentally.

I K Kamilov and his colleagues carried out systematic experiments examining nonequilibrium phase transitions, nonlinear dynamics, and chaos in electron–hole plasma and in an acousto-electronic semiconducting system. Many-valuedness of volt–ampere characteristics (VAC) in high-frequency tunnel diodes, deterministic stochastic resonance in a semiconducting bistable system, and new scenarios of order–chaos–order transitions in electron–hole plasma of semiconductors were discovered and investigated for the first time.

Among the results obtained, we should mention the discovery of the Ettingshausen effect in semiconductors in a transverse magnetic field, which is responsible for the autosoliton motion and the occurrence of diamagnetism in a longitudinal magnetic field.

I K Kamilov established the mechanism of thermal rectification in semiconductors and proposed an essentially new way of creating a rectifying junction — a thermostimulated diode in a homogeneous semiconductor without an ordinary p–n junction and capable of rectifying high currents in the presence of a large temperature gradient in the volume of a homogeneous semiconductor in the neighborhood of the inversion point of the Hall coefficient sign.

An important stage of research in the work done by I K Kamilov and his disciples is associated with the use of computational physics methods for the analysis of phase transitions and critical phenomena in model systems.

Owing to I K Kamilov's contribution to the development of the contemporary physics of phase transitions and critical phenomena, the domestic scientific school founded by him plays one of the leading roles in this area and received official status as the leading scientific school of the Russian Federation, and the Physics Institute of the Dagestan Scientific Center of the Russian Academy of Sciences (PI DSC RAS) became a major international center in this field of research.

For the first time in the Republic of Dagestan, I K Kamilov founded the basic chair of Magnetism and Phase Transitions Physics, a scientific and educational laboratory having duel attachment to the Physics Institute and DSU. He is one of the founders and a co-sponsor of the Physical and Technical lycée in the capital of the Republic of Dagestan. Thus, following the experience of Academician Zh I Alferov, functioning in PI DSC RAS is an educational–scientific complex: lycée–department–academic institute, one of the first in Russia.

The scientific results obtained by research scientists of the Institute under the guidance and with the direct participation of I K Kamilov won international recognition. He was elected a member of the Royal, the American, and a number of other physical societies.

I K Kamilov is the author or co-author of more than 700 scientific publications, including seven monographs and a number of high-cited reviews. I K Kamilov has given numerous talks at many international and Russian scientific conferences held both in Russia and abroad.

On the initiative of I K Kamilov, international conferences (more than 20) on phase transitions and critical and nonlinear phenomena in condensed media, and also international satellite seminars on magnetic phase transitions mainly devoted to the memory of outstanding Russian physicists have been continually held for many years and have already become traditional.

For 11 years, I K Kamilov was Head of the Presidium of DSC RAS, which was in deep crisis in those years. During his directorship, qualitative changes occurred there. On his initiative, the construction of a new laboratory building of the Physics Institute of DSC RAS was begun and completed. It meets the requirements for conducting modern experiments.

I K Kamilov combines scientific–organizational and public work. He is a member of several science councils and divisions of the Russian Academy of Sciences and for many years was a member of the Central Committee of the All-Union Lenin Young Communist League commission for awarding Lenin Komsomol Prizes in physics. I K Kamilov takes part in public work both in the Republic of Dagestan and in the Russian Academy of Sciences. He set as a member on the Board of Directors and the Coordination Council of the RAS, and headed the Science and Technical Council of the Republic of Dagestan.

He has received the orders Badge of Honor and Friendship, several medals, and diplomas from the Republic of Dagestan, Presidiums of the USSR Academy of Sciences and the RAS.

Friends and colleagues salute Ibragimkhan Kamilovich Kamilov on this jubilee and wish him firm health, good spirits, and further advances for the welfare of Russia's science.

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