

## PERSONALIA ON THE 55<sup>TH</sup> BIRTHDAY OF SERGEI PAVLOVICH KRUCHININ



In 2012, the famous physicist-theorist, Professor Sergei Pavlovich Kruchinin, Ph.D. in Physico-Mathematical Sciences, a leading scientific researcher of the N. N. Bogolyubov Institute for Theoretical Physics of the NAS of Ukraine, Head of the Chair of Applied Physics at the National Aviation University, celebrates his 55<sup>th</sup>, birthday.

S. P. Kruchinin was born on February 6, 1957 in the town of Krasnyi Luch in the Lugansk region. In 1979, he graduated from the Physical Faculty of the T. G. Shevchenko Kiev State University and started his post-graduate course at the Chair of Theoretical Physics in Kiev under the guidance of Professor G. F. Filippov who developed the theory of nonaxial nuclei jointly with A. S. Davydov, Academician of the NAS of Ukraine. Having defended his Candidate degree thesis entitled *Coupling of Collective and Internal Degrees of Freedom in Few-Nucleon Systems* in 1986, Sergei Pavlovich was invited by A. S. Davydov to work in his group. Since that time, the scientific and scientific-organizational activities of Sergei Pavlovich have been closely connected with A. S. Davydov and the Institute for Theoretical Physics.

In 2002, S. P. Kruchinin defended his Ph.D. thesis entitled *Thermodynamical Effects in High-Temperature Superconductors* in the major of *Theoretical and Mathematical Physics*.

S. P. Kruchinin has published significant original works in the fields of nuclear physics and many-particle systems, solid-state physics, superconductivity, theory of nonlinear phenomena, nanophysics. He is the author and co-author of more than 80 scientific works which have been published in leading scientific journals. He has been using advanced mathematical methods to solve the posed problems.

In the article *On the Nature of Resonances Observed in Photonuclear Reactions* (*Nuclear Physics*, 1986, S. P. Kruchinin, jointly with G. F. Filippov), the coupling of collective and cluster degrees of freedom in light nuclei was studied, and the nature of resonances in photo-nuclear reactions observed in experiments was explained.

Since the time high-temperature superconductors were discovered, S. P. Kruchinin has intensively studied their physical properties. In particular, it is worth noting the work carried out jointly with A. S. Davydov *Interlayer Effects in the Newest High- $T_c$  Superconductors* (*Physica C*, 1991), where the theory of the non-monotonous dependence of the critical temperature of superconductivity on the number of cuprate layers in the elementary cell of high-temperature superconductors was developed. This work has remained up to date in connection with the search for new superconductors operating at room temperature.

The investigation of high-temperature superconductivity mechanisms is one of the priority directions of the studies to which Sergei Pavlovich has been paying much attention. In the work *Functional Integral of Antiferromagnetic Spin Fluctuations in High-Temperature Superconductors* (*Modern Phys. Letters B*, 1995), S. P. Kruchinin proposed a continual model of a spin-fluctuation mechanism for high-temperature superconductors and calculated the thermodynamic properties of superconductors with  $d$ -pairing.

The experimental discovery of superconductivity in magnesium diborides stimulated a new stage of studies for Sergei Pavlovich such as the development of a multiband model of superconductivity. In this field, one of the works by S. P. Kruchinin jointly with H. Nagao, namely *Multiband Superconductivity* in *Int. J. Mod. Phys.*, 2002, should be mentioned.

Kruchinin's works on superconductivity were included in the monograph *Modern aspects of Superconductivity: Theory of Superconductivity* (*World Scientific*, Singapore, 2010, jointly with H. Nagao) which shows the contemporary status of the problems of high-temperature superconductivity.

In the last years, S. P. Kruchinin has been working intensively in the theory of nanosystems and new materials. The important work performed jointly with N. N. Bogolyubov (jr.) Corresponding Member of the Russian Academy of Sciences, *Method of Intermediate Problems in the Theory of Gaussian Dots Placed in a Magnetic Field* (*Condensed Matter Physics*, 2006) should be noted, where the spectrum and eigenfunctions of a system of quantum dots with the Gauss interaction in a magnetic field were calculated. It was shown that such systems were of significant importance for nanotechnologies.

A number of works by S. P. Kruchinin are devoted to hybrid "superconductor-ferromagnetic" nanosystems. In the article *Interactions of Nanoscale Ferromagnetic Granules in a London Superconductor* (*Supercond. Sci. Technol.*, 2006, jointly with J. Annett), the interaction of ferromagnetic granules in a London superconductor is studied, and it is shown that such a system is characterized by temperature-dependent spin-orientation phase transitions.



It is also the works on the theory of nanotransistors, quantum computers, and composites with radioactive inclusions which were published in the last years that are worth noting.

S. P. Kruchinin has found much time to train scientific personnel. He is the Head of the Chair of Applied Physics at the National Aviation University (Kyiv). This chair was established by A. P. Shpak, Academician of the NAS of Ukraine in 2002. Its main scientific trends have been the physics of nanosystems and the physics of modern energy systems.

Sergei Pavlovich was the organizer of six international conferences on the current problems of high-temperature superconductivity and nanosystems which were held in the town of Yalta. These conferences promoted the development of international cooperation, including Russia and Ukraine. Five books in *Springer* and one book in *World Scientific* publishing houses were published under his guidance.

S. P. Kruchinin was the leader of many international projects supported by the Ministry of Education and Science of Ukraine, INTAS, CRDF (USA), Royal Society (Great Britain), DFG (Germany), JSPS (Japan), *etc.*

S. P. Kruchinin is Academician of the International Academy of Creation (Russia, 2007), member of the New York Academy of Sciences (USA, 1998), and member of the International Association of Mathematical Physics (France, 1996).

The scientific community and colleagues cordially congratulate Sergei Pavlovich on this significant occasion and wish him good health and many new creative achievements.



