

**INTERNATIONAL CONFERENCE
"PROBLEMS OF THEORETICAL PHYSICS"
October 8–11, 2012, Kyiv, Ukraine**

On October 8–11, 2012, the International conference "Problems of theoretical physics" dedicated to the centennial of the birthday of the outstanding physicist-theorist Oleksandr Sergiyovych Davydov was held at Bogolyubov Institute for Theoretical Physics of the National Academy of Sciences of Ukraine (Kyiv). The conference was organized by Institute of Physics of the NAS of Ukraine, Bogolyubov Institute for Theoretical Physics of the NAS of Ukraine, Taras Shevchenko National University of Kyiv, and Lomonosov Moscow State University. The President of the NAS of Ukraine B.E. Paton was the honorary chairman of the organizing committee. The chairmen of the conference were the Director of Bogolyubov Institute for Theoretical Physics of the NAS of Ukraine A.G. Zagorodny, the Director of Institute of Physics of the NAS of Ukraine L.P. Yatsenko, and the Vice-Rector of the Lomonosov Moscow State University V.V. Belokurov.

More than 80 scientists from 10 countries—in particular, from Germany, Russia, France, Spain, Romania, Moldova, Singapore, Lithuania, Great Britain, and Ukraine—took part in the conference. During the conference, more than 40 oral reports and 40 posters were presented in five thematic sections: "Solid state theory", "Physics of biological macromolecules", "Statistical physics and kinetics", "Nuclear physics", and "Nonlinear phenomena".

During the work of the section "Solid state theory" the problems of exciton theory were considered, in particular, the Davydov splitting. A substantial attention was also given to electron and elastic processes in fullerenes (in particular, in graphene), the collective phenomena in ionic conductors, superconductivity, and superfluidity. In general, the reports made during the section showed that the exciton physics, which developed in the works by O.S. Davydov, remains a challenging direction of researches.

In the course of the section "Physics of biological macromolecules" the physical bases of biological functioning of macromolecules under the natural conditions are considered the same as the technological applications of biomolecules with use of their specific properties of composition and structure. In

particular, the large attention in the reports was paid to the role of nonlinear excitations of the soliton type in transport and structure-deformation processes that occur in DNA molecules. The other issues considered in the section included the processes of radiation-induced damage of biological macromolecules, migration of excitations, quenching and regulation of light-accumulating photosystems, and thermodynamic properties of water and aqueous solutions. The presented results of researches confirmed, in whole, O.S. Davydov's ideas concerning the importance of nonlinear processes in the mechanisms of functioning of biological macromolecules.

At the section "Statistical physics and kinetics" the participants heard the reports on the problems in various domains of modern statistical physics and kinetics. In particular, a wide range of problems dealt with plasma physics, transport processes in micro- and macroscopic quantum-mechanical systems, description of anomalous diffusion processes, and various aspects of the theory of fluids.

The section "Nuclear physics" included the reports concerning various aspects of nuclear physics and physics of elementary particles. Among the issues considered at the conference, there were the problems of cluster structure in light nuclei (pioneered by O.S. Davydov), decay of atomic nuclei, effective delta-interaction in quantum systems, properties of quark and neutron matters, and rare meson decays.

At the section "Nonlinear phenomena" the reports concerned, in particular, O.S. Davydov's idea about the relation between a quantum-mechanical quasiparticle and elastic lattice vibrations (Davydov's soliton) and applied this concept to the explanation of the processes of energy and charge transfers in macromolecules. The other discussed problems included the nonlinear mechanisms of track formation in mica films, kinetic processes of atom absorption by deformed bodies, resonance tunneling in electromagnetic fields, the formation of strange attractors in the cell dynamics, and the role of irradiation in the restoration of biological objects.

*Organizing committee of the Conference
"Problems of theoretical physics"*