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In memory of Viktor Iosifovich Belinicher

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As a result of the tragic air disaster of the Tel Aviv – Novosibirsk flight, Professor Viktor Iosifovich Belinicher, outstanding physics theorist, Doctor of Physicomathematical Sciences, died on October 4, 2001.

V I Belinicher was born on November 7, 1945 in Sverdlovsk. He first enrolled in Ural State University but then transferred to the Physics Department of Novosibirsk State University from which he graduated in 1967. In 1971 V I Belinicher completed the post-graduate course at the Mathematics Institute of the Siberian Branch of the USSR Academy of Sciences, specializing in theoretical physics under the guidance of D V Shirkov. His thesis for Candidate of Physicomathematical Sciences on elementary particle theory was maintained in 1973. In 1982 V I Belinicher defended his DSc thesis on the theory of photogalvanic effects in crystals. From 1973, V I Belinicher worked at the Institute of Automation and Electrometry of the Siberian Branch of the USSR Academy of Sciences (USSR SO AN) and since 1988 at the Institute of Semiconductor Physics of the USSR SO AN (now SO RAN).

V I Belinicher made a decisive contribution to the development of the theory of the bulk photogalvanic effect. In this phenomenon, light irradiation of homogeneous materials generates an electric current that does need a driving electric field nor involves momentum transfer from photons to electrons. The theory developed by V I Belinicher and his co-authors explained the generation of persistent current which was observed earlier in lithium niobate and later in other ferroelectrics.

V I Belinicher initiated experiments that observed polarization-dependent photoelectric effects in semiconductor crystals. This led to the discovery and theoretical study of a surface analogue of the bulk photogalvanic effect — that is, the surface photocurrent. Another unusual phenomenon discovered and explained by V I Belinicher and a team was the effect of resonance entrainment of electrons, being a consequence of the role played by the low photon momentum under the resonance conditions for the energies of the electron and the optical phonon.

The review of the theory of the photogalvanic effect, published by V I Belinicher and B I Sturman in *Physics – Uspekhi*, gained wide popularity.

V I Belinicher together with V S L'vov generalized L V Keldysh's quantum diagram technique to the case of spin operators and later on extended it to the Hubbard model with a finite number of states per site.

V I Belinicher together with V S L'vov suggested a scale-invariant form of the theory of hydrodynamic turbulence. Starting from an analogy with certain problems in the theory of disordered semiconductors, they were able to find a transformation (now known as the Belinicher – L'vov transformation) which removes divergences in all orders of perturbation theory. The new formulation of the theory of turbulence agrees with the classical phenomenological scaling suggested by A N Kolmogorov as early as 1941. This result made it possible to investigate hydrodynamic turbulence by regular methods. The approach thus developed became the basis for an intensive study of the scaling problem in turbulence.

Viktor Iosifovich Belinicher
(07.11.1945 – 04.10.2001)

While working at the Institute of Automation and Electrometry, SO RAN, V I Belinicher took active part in the applications-oriented project concerned with the acoustic tomography of the oceans. He not only discussed the physics and mathematics of the project but also mastered the programming of conveyer processes (a very labour- and time-consuming and profoundly nontrivial job) and wrote the software support for the multichannel system of collecting and processing the experimental data flow in real time. This takes more than an ordinary physics theoretician to be capable of such a technical job which took several years of his time. Furthermore, not everyone would be able to return

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after this job to 'pure' theoretical physics, which V I Belinicher did.

From the end of the 1980s until the very latest period V I Belinicher was actively researching problems connected with strongly correlated electron systems. These problems, many of which were familiar for some time, had to be reinterpreted in connection with the discovery of high-temperature superconductors (HTSC) and related systems with unique properties. In this field V I Belinicher was working on three fundamental problems: the construction of a realistic electron model of the copper-oxide crystal plane and the calculation of the observed properties of HTSC compounds in the framework of this model; the spin-polaron aspect of HTSC and the nature of the superconducting state, and the microscopic theory of two-dimensional antiferromagnetism.

V I Belinicher devoted much of his time and energy to teaching at the Novosibirsk State University and also to working with students and young scientists. His guiding of the scientific youth was not 'general' in any way, quite the opposite: V I Belinicher always participated in solving problems in a most active fashion. He had an impeccable pedagogical perception: he knew when a particular student was ready to make the next step in his or her career. V I Belinicher never gave his students textbook-type, previously solved problems. All problems had a relation to the reality of scientific research, which made it into essentially the best training foundation for future scientists.

The ability to combine intensive individual research and the active work of a scientific adviser required that V I Belinicher showed a certain degree of strictness and discipline. This in turn created within the team an atmosphere of absolute priority of science and gave his students an experience of constructive scientific discussion. The fact of joint work with this highly talented, very energetic and optimistic human being was perhaps the most valuable for Viktor Iosifovich's pupils and colleagues.

V I Belinicher was a brilliant theoretician who mastered to perfection the most complicated techniques of theoretical physics. His work on the photogalvanic effect, turbulence and strongly correlated electronic systems was widely recognized and is regularly cited in the scientific literature. He was invariably attempting to raise the standards of his work and, even though he had to solve problems of different levels of complication in his life, he tended (especially in recent years) to concentrate on the most complex and profound problems in physics.

Viktor Iosifovich was full of energy and plans. The tragedy over the Black Sea interrupted his work at its peak.

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