

In memory of Nikolai Nikolaevich Sibeldin

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Corresponding member of the Russian Academy of Sciences (RAS), doctor of physico-mathematical sciences, head of the Department of Semiconductor and Nanostructure Physics, long-standing head of the Department of Solid State Physics (DSSP) of the P N Lebedev Physical Institute of the RAS (FIAN), prominent pedagogue and outstanding specialist in the condensed matter physics, semiconductors, and nanostructures, Nikolai Nikolaevich Sibeldin, passed away on 24 November 2020 at the age of 77.

N N Sibeldin was born on 20 March 1943 in Moscow. On finishing school in 1960, Nikolai Nikolaevich entered the Moscow Engineering Physics Institute (MEPhI), and after defending his graduate work in 1967, which he had carried out at FIAN under the guidance of B G Zhurkin, continued his research activity at FIAN in the Laboratory of Semiconductor Physics under the guidance of Academician B M Vul, in Professor N A Penin's group. It should be noted that, along with research work, Nikolai Nikolaevich took an active part in FIAN's sports life and, in spite of his small stature, played volleyball and soccer successfully, and even took part in the Moscow City Championship on FIAN's team.

Nikolai Nikolaevich was a brilliant experimentalist. This talent of his was especially pronounced in the 1970s, in the period of active work of many experimental groups studying electron-hole liquid (EHL). In 1968 at FIAN, Academician L V Keldysh suggested and grounded the idea of a possible existence of EHL in semiconductors, and already the next year N N Sibeldin and his colleagues designed a unique facility to examine the optical properties of semiconductors by the light scattering method. In this device, low-intensity infrared radiation scattered by electron-hole drops was amplified 20 times by a quantum amplifier of light before being detected by a photoreceiver. As a result, they were among the first to establish directly the reality of the EHL presence in germanium (Ge) during exciton condensation under strong optical excitation and helium temperatures below critical. N N Sibeldin and his colleagues measured the drop sizes and concentration depending on temperature and the optical excitation front steepness and the coefficient of their surface tension. As a result of these studies, the presence of EHL drops and their sizes and density were directly found. This research underlay Nikolai Nikolaevich's candidate thesis, which he defended successfully in 1975.

During the next ten to fifteen years, Nikolai Nikolaevich took an active part in experimental investigations of exciton condensation to a new state of matter, namely, an electron-hole liquid in the form of moving drops consisting of degenerate neutral plasma of constant density. During these years, he obtained important results on the kinetics of the



Nikolai Nikolaevich Sibeldin
(20.03.1943 – 24.11.2020)

birth and growth of electron-hole drops and specific features of electron-phonon interaction in a nonequilibrium system consisting of an electron-hole liquid and an exciton gas. Important was the experimental discovery of the increase in excitons and EHL drops by phonon wind. In the course of these studies, Nikolai Nikolaevich and his colleagues revealed the main mechanisms of phonon wind generation, established that the increase exerts a considerable influence on the condensation kinetics, and determined the sizes and shape of an exciton-drop cloud.

In these studies, N N Sibeldin found by light diffraction the formation of first-sound shock waves in liquid helium upon the excitation of a germanium plate surface by laser pulses and used this phenomenon to analyze phonon propagation through these plates. Nikolai Nikolaevich Sibeldin and his colleagues also managed to discover magnetically stabilized EHL in a direct-band InSb in a magnetic field with an intensity of over 20 kOe. In 1993, Nikolai Nikolaevich used these results to defend his doctoral thesis, "Phonon wind and the dynamics of electron-hole liquid drops."

In the early 1990s, a new area of solid state physics — nanophysics — began developing rapidly, and Nikolai Niko-

laevich started actively studying semiconductor quantum-dimensional type I and type II structures. At the same time, he made great efforts to develop the semiconductor nanos-structure program. This program was guided by Academician Zh I Alferov and, at the beginning, was implemented in the framework of the Ministry of Science and Technology. It then became an RAS Presidium program and substantially fostered maintenance and development of this area. For many years, Nikolai Nikolaevich's activity as academic secretary of this program was effective, objective, and impartial, and in many respects promoted the correct choice and estimation of projects involved in the program. He strived to minimize the bureaucratic load on its management.

In 2008, as recognition of his scientific achievements, N N Sibeldin was elected a corresponding member of the Russian Academy of Sciences.

Nikolai Nikolaevich was always known for his adherence to principles, both in science and in everyday life. He advocated consistently high principles of independent scientific search and the best traditions of Russian science at FIAN. N N Sibeldin always had his own opinion and a distinct civil position. This was particularly clear during implementation of RAS reform. Nikolai Nikolaevich was among the first members of the RAS to declare his rejection of the advertised reform of science and signed a statement that he was not going to enter a new academy provided that the old one was liquidated ('application 74-x'). He also joined the July 1 Club, which united members of the Russian Academy of Sciences in opposition to its evisceration in the name of 'reform'. Nikolai Nikolaevich made a considerable contribution to the club's work owing to his clear mind, principle stance, constancy, and certainty of statements.

Nikolai Nikolaevich was head of FIAN's Department of Solid State Physics for many years, organized the scientific activity of colleagues, and defended their interests fearlessly. His erudition, intelligence, dedication to the cause, and tactfulness provided a constructive, tranquil, well-disposed, and creative atmosphere, ensuring in many respects the successful work of the department.

Nikolai Nikolaevich was an advocate of FIAN's traditions originating from the times of Sergei Ivanovich Vavilov and fought selflessly for their retention. Later, this was rather difficult and required his great fortitude and endurance.

Nikolai Nikolaevich was exclusively well-disposed and kind to people, but at the same time was far from sentimental. He understood people perfectly well and knew how to talk and whom to talk to. His absolute moral rectitude along with resoluteness and adherence to principles brought him the highest authority and contributed to his advances in scientific and organizational activity. All those who were lucky enough to meet this brilliant man will to the end of their lives retain thankful memories of him.

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