

Boris Ivanovich Stepanov (on his sixtieth birthday)

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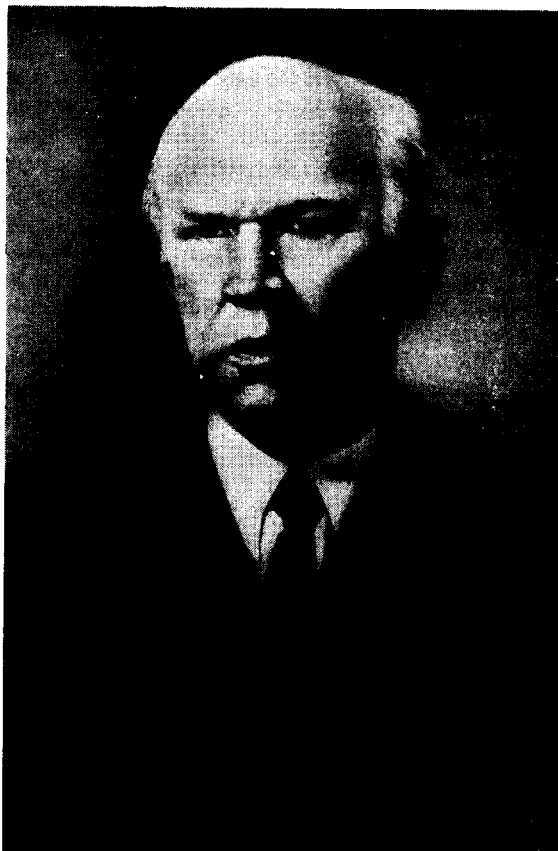
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Professor Boris Ivanovich Stepanov, a prominent Soviet scientist, a specialist in spectroscopic, luminescence, and quantum electronics, twice Laureate of the USSR State Prize, Honored Scientific Worker of the Belorussian SSR, Doctor of Physicomathematical Sciences, and Academician of the Belorussian Academy of Sciences, celebrated his sixtieth birthday on April 28, 1973.

Stepanov was born at Leningrad into a working-class family. From his graduation from the Leningrad University in 1936 through 1953, he pursued his scientific career at the State Optical Institute. During this time, he constructed a theory of the anomalies in the electronic vibrational-rotational spectra of diatomic molecules, solved a number of fundamental problems in the spectroscopy of these molecules, and interpreted an extensive body of experimental material. His research in the theory of intra- and intermolecular hydrogen bonds is of great interest.

Stepanov is one of the authors of the theory of vibration of polyatomic molecules and methods of calculating the frequencies of infrared and Raman spectra. He is to be credited with developing these methods to produce concrete results and with systematization of a large body of experimental data. The results of this fundamental work, which is held in high esteem by the world scientific community, formed the basis for a new scientific trend that has been developed extensively in the USSR and abroad. This research was summarized in Stepanov's doctorate thesis, which he defended in 1948, and in the two-volume monograph "Molecular Vibrations," which he wrote in collaboration with M. V. Vol'kenshtein and M. A. El'yashevich and which received a USSR State Prize in 1950. Subsequent development of this trend took the form of studies of the vibrational and electronic absorption and emission spectra of uranyl compounds, and then (after Stepanov moved to Minsk in 1953) pioneering work on the infrared spectra of natural polymers—cellulose, carbohydrates, polycarbohydrates, and others. With his colleagues, Stepanov submitted a complete interpretation of the spectra of these substances and developed methods for study of their structural and physicochemical properties. The results of this research are used extensively in solution of chemical-engineering problems.

Stepanov is a prominent Soviet specialist in the field of luminescence. He was the author of a quantum-chemical theory that made it possible to describe the basic luminescence laws of complex molecules and proposed effective methods for describing the luminescence-spectral properties of the molecules. He formulated a universal relation between the absorption and emission spectra of complex molecules that was subsequently extended to semiconductors. "Stepanov's relation" has become a part of the scientific literature and is of prime importance for the explanation, systematization,



and prediction of many experimental facts. A probability method developed in Stepanov's papers for calculation of the spectroscopic properties of molecules interacting with radiation is now widely used. His monographs "The Luminescence of Complex Molecules," "Introduction to the Theory of Luminescence," and "The Fundamentals of the Spectroscopy of Negative Luminous Fluxes" are ready-reference books for investigators in the fields of spectroscopy and luminescence.

In 1967, Stepanov was awarded the S. I. Vavilov Gold Medal of the USSR Academy of Sciences "For Outstanding Work in Physics" for his luminescence research.

Since the advent of the first lasers, Stepanov has been directing the efforts of his school of Belorussian physicists toward solution of fundamental quantum-electronics problems. With his students, he developed simple engineering methods for calculating the energy and time characteristics of generation in solid-state, gas, and semiconductor lasers. Consistent application of these methods has made it possible to describe all of the most essential aspects of the transformation of absorbed pumping energy into energy of the generated

radiation. The results of these studies were generalized in the two-volume monograph "Laser Design Methods" (1966 and 1968).

Stepanov's discovery of a new class of lasing compounds—organic dyes—represents a synthesis of research in the fields of complex-molecule luminescence and quantum electronics. The basis for the discovery was an analysis of the optical properties of complex molecules and theoretical prediction of all of the basic properties of the expected generation. Lasing was obtained experimentally in many (more than two hundred) solutions of organic compounds, with both incandescent-lamp and laser excitation. The new lasers have high efficiencies and many unique properties, including the possibility of smooth frequency tuning of the generated radiation over a broad spectral range from the ultraviolet to the infrared. The discovery of lasing in organic-dye solutions has promoted rapid development in a number of scientific areas, especially laser spectroscopy and laser photochemistry. For his fundamental research on lasing in organic solutions, Stepanov and his students were awarded a USSR State Prize in 1972.

Stepanov is a scientist in a full-time creative quest. Under his supervision and with his direct participation, work is being done in nonlinear optics, laser chemistry, laser spectroscopy, optical holography, the propagation of coherent radiation, and other fields. Stepanov is the author of 250 scientific works, among them five monographs.

An outstanding scientific organizer, Stepanov has the ability to direct the efforts of a large scientific staff

toward the solution of the most pressing problems. He instructs students and is the head of one of the USSR's largest physical schools—that of the Belorussian opticians.

Stepanov was one of the organizers of the Order of the Red Banner of Labor Institute of Physics of the Belorussian Academy of Sciences, which he has directed since 1957.

Stepanov has done a great deal of productive work as editor of the All-Union journal "Zhurnal Prikladnoĭ Spektroskopii" and through his membership on the High Degree Commission, the Committee on Lenin and State Prizes, the Commission on Spectroscopy of the USSR Academy of Sciences, and the Scientific Council on the Problem "Luminescence and the Development of Its Uses in the National Economy," and as a Deputy of the Belorussian Supreme Soviet.

The Communist Party and the Soviet Government have shown high regard for the services of Stepanov, a communist scientist. He has been awarded the Orders of the October Revolution, the Red Banner of Labor, and the Badge of Honor. An Honorary Doctorate from Szeged University in Hungary attests to the international recognition that his scientific achievements have won.

We heartily congratulate him on his sixtieth birthday and wish him new created achievements.

Translated by R. W. Bowers