

## Nikolaĭ Aleksandrovich Borisevich (on his sixtieth birthday)

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The prominent Soviet scientist Nikolaĭ Aleksandrovich Borisevich—president of the Academy of Sciences of the Belorussian SSR, academician, Hero of Socialist Labor, and recipient of the Lenin and State Prizes—turned 60 on September 21, 1983.

His name is intimately related to the development of spectroscopy, luminescence, quantum electronics, and infrared technology. His research is at the leading edge of Soviet and world science.

Borisevich was born to the family of a peasant in the Luchnoi Most settlement, Berezinskii District, Minsk Province. A youth during the Great Patriotic War (World War II), he went to the defense of his native land, participated in the underground work of the Young Communist League, and fought in a guerrilla detachment and in the ranks of the Soviet Army. His services in battle were honored with the Order of the Patriotic War, Degree I; two Orders of the Red Star; and many medals. It was not until December 1945 that he began his studies in the physicomathematical department at V. I. Lenin Belorussian State University. Twenty years after completing work at the University he was elected president of the Academy of Sciences of the Belorussian SSR (1969).

His scientific work began when he was a graduate student at the S. I. Vavilov State Optical Institute, working in the laboratory of Academician A. N. Terenin under the guidance of professor B. S. Neporent. Even in his early research, on the luminescence of the vapor of complex molecules—research which culminated in his successful defense of a candidate's dissertation—Borisevich obtained results which have substantially improved our understanding of the intramolecular and intermolecular energy-conversion processes involved in optical excitation.

In 1954 he returned to Minsk and became one of the organizers of the Institute of Physics, Academy of Sciences of the Belorussian SSR. Serving as a deputy director of the Institute (1955-69) and a laboratory supervisor, he promoted the formulation of major research problems. Here his talents as a physicist and a scientist in general were clearly seen. In 1965 he defended his doctoral dissertation. In 1966 he was chosen a corresponding member, and in 1969 an academician, of the Academy of Sciences of the Belorussian SSR.

Borisevich is a scientist with a broad range of scientific interests and a keen sense of the new. Common threads running through his work are the ability to formulate the most fundamental and the most urgent problems, a profound approach to their solution, and a determination to guide fundamental research in a direction which will serve practical needs. These characteristics naturally led to one of his greatest accom-



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ishments: For founding and developing the new scientific field of the "Spectroscopy of free complex molecules," he was awarded the Lenin Prize in 1980.

His work has fundamentally altered our understanding of luminescence and the properties of excited states of complex molecules. He derived a statistical theory of photophysical processes, opening up new paths for describing the energetics and dynamics of intramolecular and intermolecular interactions. He introduced many new concepts of fundamental importance (the inversion frequency, selective energy, effective energy, and the temperature of excited molecules), and he developed novel optical methods for determining these properties. He solved the problem of anti-Stokes luminescence which had been formulated earlier by Vavilov. His results in this stage of his research are reflected in his original monograph *Excited States of Complex Molecules in the Gas Phase* (1967).

He carried out some fundamental research on the role of triplet states in the conversion of absorbed radiant energy by complex molecules. He discovered and studied thermally activated retarded and cooperative fluorescence, proposed and studied laser stimulation of these processes, developed methods for determining the rates of intramolecular and intermolecular redistributions of vibrational energy, and determined the mechanism for intermolecular donor-acceptor energy transfer in the gas phase.

Of major importance in spectroscopy, photochemistry, and quantum electronics was the discovery by Borisevich and Neporent of the stabilization-labilization

of electronically excited polyatomic molecules (diploma, 1977). This discovery made it possible to control effectively the stability of electronically excited states and to study intermolecular energy exchange. This effect is widely used in the conversion of radiant and electrical energy by gas-phase systems. New paths for the development of research on complex molecules were opened up by Borisevich's discovery of the polarization of fluorescence, his discovery of the optically induced anisotropy of the vapor of complex molecules in the gas phase, and his development of the fundamentals of the luminescence of electrically excited complex molecules. He has made a major contribution to quantum electronics and laser spectroscopy. He was the first to achieve emission from complex molecules in the gas phase (1973); he has developed a new type of laser with a continuously tunable output frequency. Several of his studies dealt with the analysis of the major factors determining whether laser action was possible in complex molecules and the control of the spectral and energy characteristics of lasers. Working with subtle picosecond-spectroscopy methods, he uncovered previously inaccessible mechanisms for ultrafast relaxation of electronic and vibrational excitation energy in complex free molecules, and certain features of their rotational motion. Since the early 1960s, when his laboratory became actively involved in laser work, these studies have been preceded by original research on the nonlinear, plasma-optics, and frequency-polarization characteristics of atomic gas lasers.

Borisevich has obtained important results in infrared spectroscopy. These results include determining the nature of the vibrational bands of complex molecules in various states of aggregation and certain characteristics of vibrational and rotational relaxation. He has also solved an important problem in infrared technology: Working from a study of the scattering of light by two-component disperse systems, he developed some unique wide-band, narrow-band, and cutoff dispersion and dispersion-interference filters for a broad region of the infrared spectrum. The results of this research were put in systematic form in his monograph *Infrared Filters* (1972). These filters are now in large-scale production. In 1973 this research was recognized with a State Prize of the USSR. Optical filters of this new type are widely used in a variety of scientific and technological fields. They have been used to develop miniature infrared apparatus.

Borisevich has founded a major scientific school. His keen sense of the new, his goodwill, his creative generosity, his high scientific cultural level, his personal example as a communist scientist, and his untiring labor have always attracted young scientists and

inspired his entire collective to creative effort. For ten years he taught at Belorussian State University. He has guided a large number of candidates and doctors of science from essentially their undergraduate years.

His scientific activity has been recognized widely. In 1972 he was elected as a corresponding member, and in 1981 as a full member, of the Academy of Sciences of the USSR. He has been elected a foreign member of the Czechoslovak Academy of Sciences and the Slovenian Academy of Sciences and Arts. The Polish Academy of Sciences has awarded him the Nikolaus Copernicus medal. He has ably combined his scientific work and his training of scientific cadres with scientific-organizational and community work. As president of the Academy of Sciences of the Belorussian SSR, he is very active in a variety of ways. His organizational talent has strongly influenced the development of science in Belorussia.

Borisevich plays an active role in the community and political life of his country. Since 1969 he has been a deputy of the Supreme Soviet of the USSR, and since 1971 a member of the Central Committee of the Communist Party of Belorussia. He is chairman of the Committee on State Prizes of the Belorussian SSR in the field of science and technology, and he is a member of the Committee on the Lenin and State Prizes of the USSR. He has participated in the work of nine General Conferences of the International Atomic Energy Agency as head or deputy head of the Belorussian delegation. He is a member of the Council on the Problem of Luminescence and of the Executive of the Council on Spectroscopy of the Academy of Sciences of the USSR; editor-in-chief of the journal *Doklady Akademii Nauk BSSR* (Proceedings of the Academy of Sciences of the Belorussian SSR); and a member of the editorial boards of other All-Union and international journals. For his services in the development of science and in the introduction of new scientific results in the economy Borisevich has been awarded the high rank of Hero of Socialist Labor, three Orders of Lenin, and Orders of the October Revolution and of the Red Banner of Labor.

Borisevich is an energetic and goal-oriented man, brimming with new ideas, and in robust health. His friends, colleagues, and students and the scientific community of our country sincerely congratulate him on his 60th birthday and wish him good health and new creative accomplishments in his multifaceted scientific and community activities.

Translated by Dave Parsons