Nikolaĭ Aleksandrovich Borisevich (on his seventieth birthday)

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Usp. Fiz. Nauk **163**, 117–119 (September 1993)

On 21st September 1993, academician Nikolaĭ Aleksandrovich Borisevich celebrated his seventieth birthday.

Borisevich was born in a small village of the Minsk area. During the period of the Second World War he was an undercover agent, a partisan and later served in the ranks of the active army.

In 1950, Borisevich graduated from the Belorussian State University, and in 1953, completed his graduate work at the State Optical Institute in Leningrad. Since that time, his scientific activity has been associated with the Institute of Physics of the Academy of Sciences of Belarus, and then with the Institute of Molecular Atomic Physics of the Academy of Sciences of Belarus, where he in the course of many years was in charge of the laboratory. Since 1987, he was also in charge of the laboratory of the P. N. Lebedev Physics Institute of the Russian Academy of Sciences.

N. A. Borisevich is a physicist with a broad range of scientific interests who laid the foundation of a number of original scientific directions in the field of molecular spectroscopy and luminescence, laser physics, and infrared technology.

The publications of N. A. Borisevich made a significant contribution to our understanding of the processes of emission and absorption of radiation by free complex molecules. He and his pupils constructed a statistical theory of photophysical processes in complex molecules, which describes the energy considerations and the dynamics of intra and intermolecular interactions. The introduction by him into molecular spectroscopy of previously unknown characteristics and parameters of complex molecules and the experimental methods developed by him for determining them enabled him to increase in a radical manner the information content of spectroscopic data concerning the physical-chemical properties of complex molecules. The investigations of the effect of the medium on the spectroluminescence characteristics of complex molecules led to the discovery of the phenomenon of stabilization-labilization of electronically excited polyatomic molecules by external gases (certificate of discovery No. 186, 1977). It was established that in the case of interaction of electronically-excited complex molecules with other molecules and atoms an exchange of energy occurs without altering the probability of emission of a photon, but accompanying this there is a great change in the probability of nonradiative transitions, which depends on the stored vibrational energy of excited molecules. This discovery is widely used in spectroscopy, luminescence, photochemistry and quantum electronics for controlling the stability of excited molecules and for the study of processes of intermolecular energy exchange.

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Borisevich obtained a universal relationship connecting all the basic spectral characteristics of complex molecules; the problem of anti Stokes fluorescence has been solved which was under discussion for a long time; a new concept of the "temperature spectra of excited molecules" was introduced, that characterizes the degree of deviation of the vibrational energy stored in excited molecules from the equilibrium one, and this enabled one, in particular, to develop an original optical method of determining the vibrational specific heat of molecules. The delayed fluorescence of vapors of complex molecules in the case of the usual, and later in the double, laser excitation, including the multiphoton ones, was discovered and investigated. The results of this cycle of investigations have been brought together in the monograph "Excited states of complex molecules in the gas phase."

 1063-7869/93/090865-03$10.00

On Borisevich's suggestion, a search was made for the polarized luminescence of free complex molecules. Now he and his pupils have theoretically and experimentally unambiguously proved the existence of polarized luminescence and of optically induced orientational anisotropy of free complex molecules, and have studied their principal regularities. The investigations were carried out in high temperature vapors and in the supersonic jets with the vibrational temperatures of the molecules being of the order of several Kelvin degrees. On the basis of the results obtained, a number of polarization method for analyzing the structure of complex molecules and of their complexes has been developed.

N. A. Borisevich and his students have carried out systematic investigations of the interaction of electrons with complex molecules. In particular, a study was made of the efficiency of direct transformation by complex molecules of electrical energy into light energy, orientational anisotropy, and polarization luminescence induced in complex molecules by electrons with a specific direction of propagation have been observed.

Considerable interest has been attracted by the research carried out by Borisevich and collaborators with the aid of original methods created by them of electron vibrational and rotational relaxation in complex molecules in the pico- and femtosecond time ranges. A separate cycle is composed of research carried out in picosecond time intervals of structural transformations of molecules including free radicals. The results obtained concerning ultrafast photophysical and photochemical processes in complex molecules will undoubtedly be included among the achievements of world science.

For the creation of a new scientific direction—the spectroscopy of free complex molecules—a Lenin Prize was awarded in 1980 to N. A. Borisevich, B. S. Neporent, and also to Borisevich's students—V. V. Gruzinskiĭ and V. A. Tolkachev.

In the laboratory headed by N. A. Borisevich even before the discovery of the generation of radiation by solutions of complex organic compounds it was shown theoretically that there exists the possibility of such generation and its principal properties were described, in particular, the possibility of changing the frequency of the radiation. A particularly important result in this direction is the generation of radiation by the vapors of complex molecules obtained for the first time by Borisevich and his pupils and the creation based on this development of a new type of laser with a tunable frequency of radiation. In order to control the frequency and power of this kind of lasers the previously discovered phenomenon of stabilization-labilization of molecules with electron excitation has been utilized. The generation of radiation of nanosecond and picosecond duration by complex molecules in the gas phase have also opened up new possibilities for investigating spectroscopic properties of such molecules, and their interaction with the medium. Borisevich and his students have shown that the introduction into the resonator of a gas laser of an absorbing medium with certain definite characteristics enables one to obtain a single frequency regime of generating considerable power, the physics of this phenomenon has been elucidated and also pioneering work has been carried out on the laser spectroscopy inside the resonator.

Borisevich's investigations of the region infrared spectroscopy and technology have also turned out to be very fruitful. Here first of all one should note the effective solution of an important problem-the spectral filtration of infrared radiation. A detailed study of the scattering of radiation by densely packed dispersed systems has made it possible to construct new classes of infrared filters—dispersive and dispersive-interference ones. These filters cover the infrared range of the spectrum from 4 to 100 μm. Using such filters prototypes of devices for widespread spectral analysis of the molecular composition and quality of different substances and products have been produced in Borisevich's laboratory. Mass production both of filters and of devices using them has been organized. The State Prize of the USSR (1973) has been awarded to N. A. Borisevich together with V. G. Vereshchagin for the investigation of the scattering of radiation and the creation of a new class of optical filters for a wide range of the infrared spectrum. The results of these investigations have been incorporated in the monograph "Infrared filters."

N. A. Borisevich has created a scientific school widely known all over the world. He has supervised more than 40 candidates of science, seven of his students are doctors of science and two of them are corresponding members of the Academy of Sciences of Belarus.

Academician N. A. Borisevich is a talented organizer of science. He has played an important role in the organization and development of the Institute of Physics of the Academy of Sciences of Belarus. In 1969, he was elected president of the Academy of Sciences of the Belarus SSR. Borisevich worked 18 years (until March 1987) as president. Since May 1992, he is the honorary president of the Academy of Sciences of Belarus. During the time of his tenure of the position of president the Academy of Sciences of Belarus has undergone the greatest development and has taken its place among the leading scientific centers.

The personal outstanding contribution to science and the selfless scientific organizational activity of N. A. Borisevich have been highly esteemed. He has received the title of Hero of Socialist Labor, has been awarded four Orders of Lenin, and other industrial and military orders.

A sensitive, attentive and demanding teacher, a talented scientist and organizer of science, Nikolaĭ Aleksandrovich is accorded deserved authority and respect of the scientific society of the Belarus republic and abroad. In 1972, Borisevich has been elected corresponding member, and in 1981 a full member of the Academy of Sciences of the USSR. He is an academician of the Academy of Sciences of Belarus, of the European Academy of Sciences, Arts and Literature, a foreign member of the Czechoslovak Academy of Sciences and of the Slovenian Academy of Sciences and the Arts; the Polish Academy of Sciences has awarded to him the N. Copernicus medal, the Czechoslovak Academy has awarded to him the Gold Medal "for his services to science and to humanity," the Slovenian Acad-

emy has awarded to him the medal "for exceptional services to science." He is a member of the board of editors of a number of foreign and Russian journals, and for many years has been the editor of Doklady of the Academy of Sciences of the Belarus SSR.

The man whose jubilee we are celebrating is today still full of new creative ideas, and solves scientific and scientific-organizational problems with his inherent energy. We warmly congratulate Nikolaĭ Aleksandrovich on the occasion of his seventieth birthday, and wish him health, and new creative success.

Translated by G. Volkoff