

In memory of Vladimir Moiseevich Agranovich

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Vladimir Moiseevich Agranovich — a world-famous theoretical physicist, doctor of physical and mathematical sciences, professor, chief researcher of the Theoretical Department of the Institute of Spectroscopy of the Russian Academy of Sciences (RAS)—passed away during the night of 18 to 19 April 2024 in the 96th year of life.

V M Agranovich was born on January 23, 1929 in Kiev into a family of clerks. At the beginning of the Great Patriotic War, his father went to the front, and he and his mother were evacuated to the Kuibyshev (now Samara) region, to the Bogatov station, where Vladimir continued his studies at school. In 1945, the family returned to Kiev and Vladimir entered the Physics Department of Kiev State University (KSU). After graduating from KSU in 1951, V M Agranovich worked first as a teacher at the Agroforestmeliorative technical school in the town of Znamenka (Kirovograd region) and then, having returned to Kiev, at institutes of the Ukrainian Academy of Sciences. In 1956, V M Agranovich moved to Obninsk.

V M Agranovich received the degree of candidate of sciences when in Kiev in 1955, and the degree of doctor of sciences at the Institute of Chemical Physics of the USSR Academy of Sciences in Moscow in 1961. He attained the rank of professor in 1963. In the period from 1956 to 1969, he headed the Theoretical Laboratory at the Institute of Physics and Power Engineering in Obninsk, and in 1969 he began working at the Institute of Spectroscopy of the USSR Academy of Sciences (ISAS) as the head of the Theoretical Department.

V M Agranovich was an outstanding theoretical physicist, working successfully in the field of condensed state physics. He published over 400 scientific papers, four monographs, and many chapters in collective monographs. V M Agranovich's work made a fundamental contribution to the current understanding of mechanisms of interaction between light and solids and the role of excited states (excitons and polaritons) in their optical and luminescent properties. These studies received worldwide recognition, expressed in a large number of his scientific awards and a high level of citations of his papers, which stimulated research in new areas of condensed matter physics. Many of his predictions have already been experimentally confirmed.

V M Agranovich made a fundamental contribution to the quantum theory of Frenkel excitons (the method of secondary quantization of molecular configurations, the method of kinematic exciton–exciton interaction, the theory of collective properties of excitons). He was one of the pioneers of the theory of polaritons as a coherent superposition of a photon and an exciton for organic solids. He developed the theory of



Vladimir Moiseevich Agranovich
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polaritons for one- and two-dimensional crystals and predicted the splitting of the dispersion curve of a plasmon-polariton propagating along a metal surface in resonance with vibrations in a thin transition layer. V M Agranovich predicted for materials with negative refraction the appearance of a second harmonic of radiation with respect to the pump source frequency. He proposed the conception of resonating hybrid Frenkel–Wannier–Mott excitons, which can be excited in mixed resonant organic–inorganic nanostructures. Such nanostructures can be used to create new highly efficient light-emitting diodes. This type of hybrid nanostructure has been widely described in numerous experimental studies. V M Agranovich also contributed considerably to the theory of nonlinear surface waves.

The most important feature in V M Agranovich's work was his outstanding activity in creating and maintaining international scientific relations among physicists from all continents. He was an honorary member of the Institute of Physics of Great Britain, an honorary member of the American Physical Society, and an honorary doctor of Blaise



Vladimir Moiseevich Agranovich and 2003 Nobel Prize winner in physics Vitaly Lazarevich Ginzburg discuss topical problems of modern physics on the balcony of the main building of the Russkoe Pole resort in the Chekhov district of Moscow region in summer 2004 (photo taken by A A Zakhidov).

Pascal University (Clermont-Ferrand, France). In 2002, Professor V M Agranovich was named a ‘nanoscience pioneer’ at the University of Texas (Dallas, USA), where he worked as a research scientist for 10 years.

V M Agranovich (together with A A Maradudin, Irvine, USA) founded the well-known series of collective monographs, “Modern Problems in Condensed Matter Science,” which currently numbers already 35 volumes. V M Agranovich was editor of the journal *Physics Letters A*, as well as a regional editor of the journal *Solid State Communications* for 20 years.

V M Agranovich was one of the organizers of joint seminars and conferences of scientists from the USSR with scientists from the USA, Germany, Italy, and Japan.

Vladimir Moiseevich was one of the prominent authors in the journal *Uspekhi Fizicheskikh Nauk (UFN)*, where he published over 20 reviews and papers. His (together with V L Ginzburg) monumental review, “Crystal optics with spatial dispersion, and excitons,” published in *UFN* in two parts in 1962 (see *UFN* **76** 643–682 (1962) and *UFN* **77** 663–725 (1962) [English translation: *Sov. Phys. Usp.* **5** 323–346 (1962) and *Sov. Phys. Usp.* **5** 675–710 (1963)], underlay the namesake monograph published in 1965 in the Russian language by Nauka publishers.

This monograph is the first book in the world literature devoted to an incremental presentation of crystal optics with allowance for spatial dispersion and its relation to the exciton theory. Likely for this reason, the English translation of this book, *Crystal Optics with Spatial Dispersion, and Excitons*, also appeared in 1965 through Springer Publishing House (Springer, 1965). It has been reissued several times and remains a handbook for opticians all over the world.

Another of his distinguished reviews (in co-authorship with Yu N Garshtein), “Spatial Dispersion and a Negative Light Refraction,” was published in *UFN* in 2006 (*UFN* **176** 1051–1068 (2006) and the English version: *Phys. Usp.* **49** (10) 1029–1044 (2006)).

Among V M Agranovich’s works are also the monograph *Exciton Theory* (Moscow: Nauka, 1968), the monograph (together with M D Galanin) *Electron Excitation Energy*

Transfer in Condensed Media (Moscow: Nauka, 1978) [the translations *Electron Excitation Energy Transfer in Condensed Matter* appeared through Elsevier Publishing House (Elsevier, 1982), as did the monograph *Excitation in Organic Solids* (Oxford University Press, 2009)].

Professor V M Agranovich trained many students who have now become world-famous scientists working in research institutes in many countries around the world.

He received numerous awards. Among them is the 1992 Humboldt Prize (Germany); the 1993 P L Kapitza Prize (Great Britain); the 1997 L I Mandelshtam Prize of the Russian Academy of Sciences (Russia); the 2013 E F Gross Medal of D S Rozhdestvenskii Optical Society of Russia (Russia); the 2014 Prize from the Organizing Committee of the International Luminescence Conference as recognition of V M Agranovich’s contribution to the understanding of the important role of excitons and polaritons in determining the optical properties of solids; and the 2019 S I Vavilov Medal of D S Rozhdestvenskii Russian Optical Society (Russia).

Vladimir Moiseevich’s 95th birthday was marked at the scientific seminar at the Institute of Spectroscopy of RAS, where his numerous disciples and co-authors from Russia and other countries gave scientific talks in his honor.

Despite his venerable age, Vladimir Moiseevich never missed a single institute-wide scientific seminar and was one of its most interested listeners — not a single speaker was left without his questions. It would seem that as a theoretician Vladimir Moiseevich could afford to work at home, but he preferred to think, discuss, and write papers within the walls of the institute only, in the very room that he occupied in 1969 and which was visited more than once by foreign and domestic scientific celebrities, including a number of Nobel laureates.

The memory of Vladimir Moiseevich as a wonderful person and an eminent scientist will live for a long time in the hearts of his friends, disciples, and colleagues, and his ideas will inspire new students, postgraduates, and researchers.

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