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PERSONALIA

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Aleksandr Aleksandrovich Kaplyanskii (on his 80th birthday)

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Aleksandr Aleksandrovich Kaplyanskii, Full Member of the Russian Academy of Sciences (RAS), member of the *Physics–Uspekhi* editorial board, had his 80th birthday on 14 December 2010. Aleksandr Aleksandrovich is a brilliant scientist of world renown in optical spectroscopy and the physics of semiconductors and dielectrics. He is one of the founding fathers of a new field in solid-state physics — optical piezospectroscopy.

A A Kaplyanskii's entire career in science has been inextricably linked to the A F Ioffe Physical-Technical Institute (FizTekh in *Russ. abbr*.). He enrolled in postgraduate courses at FizTekh in 1953, after graduating with honors from Leningrad State University. The young scientist worked on his thesis for Candidate of Physicomathematical Sciences under the guidance of the outstanding expert in spectroscopy, the discoverer of the optical spectrum of excitons in semiconductors, Corresponding Member of the USSR Academy of Sciences E F Gross. It was only natural that A A Kaplyanskii's thesis dealt with the detection and study of line structure of the edge of fundamental absorption in semiconductors, caused by the optical excitation of excitons. This paper presented proof by a direct spectroscopic method of the participation of excitons in the photoconductivity of semiconducting crystals.

After the student defended his thesis (in 1957), the teacher's parting wish was: "Now look for a direction of your own in physics." Aleksandr Aleksandrovich says that the advice was fairly easy to follow. At the end of the 1950s, he started to actively study the spectra of dielectric crystals doped with rare-earth elements and transition metals, which attracted much attention at that time since solid-state lasers had just been invented. In 1958, A A Kaplyanskii discovered a new phenomenon in optical spectroscopy: a reversible splitting of spectral lines of impurity centers when crystals were subjected to uniaxial elastic deformation. This phenomenon (the 'Kaplyanskii splitting') formed the basis of the piezospectroscopic method for determining the local symmetry of point defects in crystals. Later on, Kaplyanskii's group conducted similar studies using an electric field instead of strain (pseudo-Stark splitting of impurity center lines).

In 1960, Aleksandr Aleksandrovich experimentally discovered the phenomenon of optical anisotropy of cubic crystals [from observations of the spectra of crystals of cuprous oxide Cu_2O in the range of exciton resonance]. This discovery played a significant part in the development of modern crystal optics. A A Kaplyanskii's observation of the reversible splitting of lines — this time of exciton transitions in the spectrum of Cu_2O in response to elastic strain — laid the foundation of the piezooptics of semiconductors. In 1966, A A Kaplyanskii with a team of coauthors received the Lenin Prize for their results in the physics of excitons in semiconductors.

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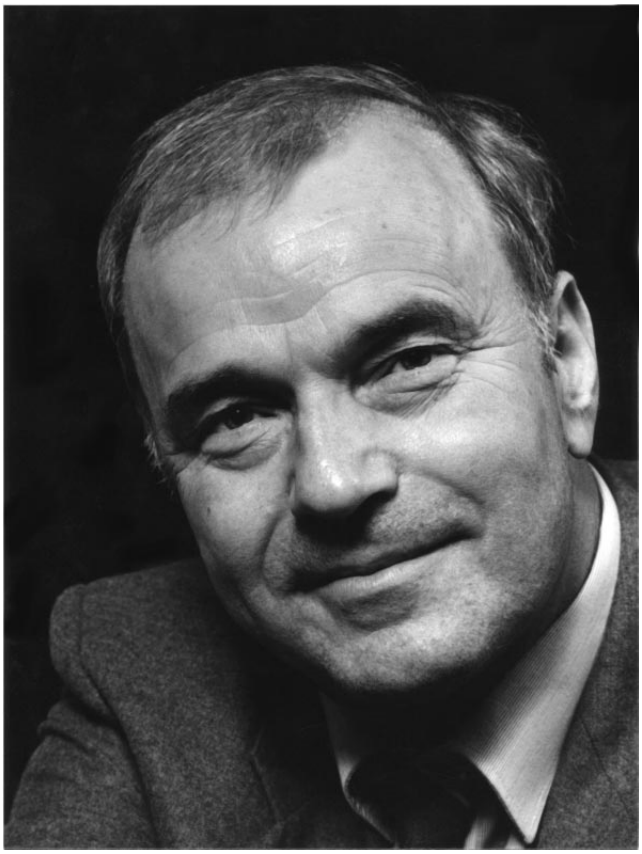

Aleksandr Aleksandrovich Kaplyanskii

In 1967, A A Kaplyanskii submitted his DSc thesis, "Piezospectroscopy of crystals". The tome with his thesis is still kept in his office and continues to overwhelm the imagination with its bulk. Many a seeker of highest scientific honors among Aleksandr Aleksandrovich's students has had the opportunity of looking into this monster volume and taking part in discussing studies that were well supported by experimental data. (Despite this widely known qualifying strictness concerning the work of Kaplyanskii's coworkers, his scientific school prepared about 10 people with DSc and about 15 with CandSc degrees in physics and mathematics; the exact count was lost long ago.)

In 1973, A A Kaplyanskii and Yu F Markov began spectroscopic studies of a new class of ferroelastics, viz. halides of univalent mercury possessing uniquely high anisotropy of elastic and optical properties. An analysis of the spectra of Raman scattering revealed a ferroelastic phase transition and established its mechanism. New manifestations of the lattice dynamics with soft modes were found, which made mercury halides widely accepted model objects for the spectroscopic study of the general properties of structural phase transitions in crystals.

In 1975, P P Feofilov, A A Kaplyanskii, and V N Medvedev were awarded the USSR State Prize for developing new methods for the investigation of impurity centers and defects in crystals.

In a series of projects that A A Kaplyanskii and coworkers started as far back as 1975, they used optical methods to study ultrahigh-frequency (terahertz) acoustic phonons. They investigated the propagation modes of phonons, their scattering on lattice defects and on the surface, their interaction with the electron energy levels of impurities and with excitons, and their anharmonic interactions.

In 1983, A A Kaplyanskii in collaboration with S A Basun and S P Feofilov found a new photoelectric phenomenon in doped dielectrics: spontaneous formation (under exposure to light) of stable domains of a strong electric field in ruby crystals. Experiments revealed negative absolute electric conductivity of optically excited ruby in full agreement with theoretical predictions. A subsequent comprehensive analysis of the microscopic mechanism of this phenomenon stimulated A A Kaplyanskii and coworkers to conduct in the 1990s an extensive program of research into a variety of phenomena associated with photoionization of impurities and photoinduced charge transfer in dielectrics, ferroelectrics, and photorefractive crystals. This work was conducted jointly with the University of Hamburg (Germany) and Georgia State University (USA). The basic microscopic processes were established, which govern both the photochemical properties of hole burning in the inhomogeneously broadened profile of spectral lines of impurity ions in crystals and the properties of the photovoltaic effect in ferroelectrics.

In 1995, Aleksandr Aleksandrovich and coworkers started extensive development of a new research field covering structured dielectric materials. Doped rare-earth ions or ions of the iron group elements play the role of spectroscopic probes in nanoscale dielectrics. This feature made it possible to observe a number of important effects that characterize all nanoparticles, including dimensional quantization of acoustic oscillations in nanocrystals (Lamb modes).

Aleksandr Aleksandrovich pays great attention to the training of scientific personnel. In his capacity as Professor at St. Petersburg State University, he is heading affiliated Chair of Solid State Physics.

A A Kaplyanskii is the editor-in-chief of the journal *Fizika Tverdogo Tela* (*Solid State Physics*). For many years he represented science for this country on permanent committees of international conferences on phonon physics, luminescence, defects in dielectric materials, and dynamic processes in the excited states of solids.

A A Kaplyanskii has been awarded prizes by a number of international conferences and received the Humboldt Research Award (1997). In 2005, he received the award of the St. Petersburg Government and RAS St. Petersburg Scientific Center for the study of electronic and vibrational states in crystals by optical spectroscopic methods. In 2008, A A Kaplyanskii, S A Basun, and B V Novikov were awarded the RAS A F Ioffe Prize for a series of papers, ''Spectroscopic studies of photoelectric phenomena in crystals''.

In 1987, A A Kaplyanskii was elected Corresponding Member of the USSR Academy of Sciences, and in 2003 Full Member of the Russian Academy of Sciences. In 1999, he was awarded the Badge of Honor, and in 2010 the Order of Friendship.

We extend our best to Aleksandr Aleksandrovich Kaplyanskii on his jubilee, and wish him good health and new achievements advancing Science.

E B Aleksandrov, Zh I Alferov, S N Bagaev, T T Basiev, A G Zabrodskii, V V Kveder, L V Keldysh, B V Novikov, V V Osiko, R A Suris, V B Timofeev, I A Shcherbakov