

Oleg Igorevich Korablev (on his 60th birthday)

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May 15, 2022 was the 60th birthday of corresponding member of the Russian Academy of Sciences (RAS), head of the Planetary Physics Department at the Space Research Institute (IKI) of RAS, doctor of physics and mathematics, well-known specialist in the field of planetary studies and space instrument engineering, Oleg Igorevich Korablev.

O I Korablev was born in 1962 in the town of Khimki, Moscow region. Having finished Moscow secondary school No. 21 in 1979, he entered the physical department of M V Lomonosov Moscow State University (MSU) (Department of Radio Physics) and graduated from there in 1985 as a physics major. Since 1981, he has taken part in research conducted at the quantum radio physics and oscillations sections of the physical department of MSU.

In 1985, O I Korablev began working at the Space Research Institute of the USSR Academy of Sciences (now IKI RAS) as an engineer and then a junior researcher. During these years at IKI, he participated in the interpretation of data from the Soviet automatic interplanetary Vega stations for the exploration of Venus and Halley's comet and also in the preparation of the *Auguste* infrared spectrometer for the *Phobos* project aimed at Mars. Since 1989, after the successful beginning of the operation of the *Phobos-2* spacecraft, O I Korablev has participated in the examination of the Martian atmosphere. According to the data from the *Auguste* experiment, he carried out priority measurements of the vertical distribution of the important components of Mars's atmosphere, namely, carbon dioxide, dust, and water vapor. In 1992, O I Korablev defended his thesis "Spectroscopic exploration of Mars's atmosphere in the IR range by translucence on the *Phobos-2* spacecraft" for the degree of candidate of phys.-mat. sciences in the specialty Heliophysics and Solar System Physics at IKI RAS under the guidance of doctor of phys.-mat. sciences V A Krasnopolsky.

Political events in the early 1990s influenced the scientific community, and many prominent scientists left the country. Korablev's research adviser — Vladimir Anatol'evich Krasnopolsky, an outstanding specialist in the field of atmosphere chemistry, departed in that period. In 1992, O I Korablev, then a young candidate of sciences who had just defended the thesis, became head of the Laboratory of Spectroscopy of the Upper Atmospheres of Planets and Comets of the Planetary Physics Department at IKI RAS (V A Krasnopolsky's former laboratory).

From 1992 to 1996, O I Korablev's laboratory focused on research related to the *Mars-96* project. Korablev became the Russian research supervisor of the international SPICAM experiment, being the creator of the infrared (IR) channel of the instrument or device. Unfortunately, the *Mars-96* station



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could not be carried into an interplanetary trajectory because of an acceleration block failure, and on November 16, 1996, the station was destroyed when entering Earth's atmosphere five hours after launching. After the misfortune with *Mars-96*, the European Space Agency decided to include in the program their own mission to Mars. This was how the *Mars Express* project retained close connections to space experiments that existed in *Mars-96*. From 1997, O I Korablev occupied himself with the creation of an IR spectrometer based on an acousto-optical filter intended for the *Mars Express* project. It was a revolutionary decision at that time, especially for the exploration of Mars. It was a necessary step, since on the small *Mars Express* there was not enough room for the 46-kg SPICAM, while acousto-optics allowed an IR channel weighing less than 1 kg. At the same time, Korablev became engaged in working out new experimental methods for examining the gas composition of planet atmospheres. In 2003, using the results of investigations on the *Phobos* spacecraft, the preparation of *Mars-96* and *Mars Express* and new designs, he defended his thesis "New methods of spectroscopic examination of planet atmospheres from spacecraft" for the degree of doctor of phys.-mat. sciences in the specialty Planetary Research at IKI RAS.

From 2003, after the launch of the *Mars Express* project, O I Korablev took up exploration of the Martian surface and atmosphere. The SPICAM instrument detected auroral glows on Mars and new atmospheric glows, and obtained the global distribution and the vertical ozone structure in the atmosphere. Water vapor in the atmosphere was monitored for many years and the vertical distribution of water vapor and the singlet oxygen glow were analyzed. The group of scientists organized by Korablev at IKI was simultaneously preoccupied with preparing the *Venus Express* experiment, where, along with the IR channel, they exploited a high-resolution priority echelle spectrometer with an acousto-optic tuneable filter (AOTF). This device was used on the *Venus Express* spacecraft in 2005–2015 to measure anew the D/H ratio and the profiles of sulfur compounds, water vapor, and aerosol distribution. Ozone was found in the Venusian atmosphere, and a large array of data was obtained on the structure of the atmosphere, glows, and trace components.

Since 2002, O I Korablev has been deputy director of IKI RAS for scientific work (planetary exploration), and since 2005, after the death in 2004 of Professor Vasilii Ivanovich Moroz — the founder of the Department of Physics of Planets and Small Bodies of the Solar System — also acting head of the department.

Following the idea of a high-resolution spectrometer with AOTF, created for the *Venus Express* spacecraft, O I Korablev proposed in 2005 and then implemented a spectrometer for measuring the content of greenhouse gases (including CO₂) in Earth's atmosphere. The RUSALKA experiment was carried aboard the ISS in 2009–2012, and now its continuation at the DRIADA unit is being prepared. With the experience of his work in the scientific group of the ENVISAT spacecraft (GOMOS experiment) and *Mars Express*, O I Korablev extended the interests of his group to geophysical research and developed an ozone monitoring system in Earth's atmosphere for the *Geofizika* program.

Since 2007, O I Korablev has placed great emphasis on the *Phobos-Grunt* project. He was at the head of two spectrometric experiments aimed at confirming (or rejecting) methane detection in Mars's atmosphere and took part in the preparation of some other equipment. In 2011, the *Phobos-Grunt* spacecraft repeated the tragic fate of *Mars-96*. But fortune did not avert its face completely, and in early 2012 the European Space Agency (ESA) proposed to Roscosmos a joint implementation of the *ExoMars* project. O I Korablev proposed and then headed a complex of unique spectrometric high-resolution ACS devices for the exploration of Mars's atmosphere aboard the *ExoMars* orbital apparatus. Devices of this class were proposed for work on the red planet's orbit for the first time.

In 2012, O I Korablev became deputy research supervisor of the *ExoMars* program (Roscosmos-ESA). He also proposed placing an infrared AOTF spectrometer (similar to SPICAM) on the ESA rover (planetokhod) and became research coordinator of the *ExoMars* 2022 landing ground facility. Since 2014, O I Korablev has been head of the Department of Planetary Physics at IKI RAS and at the same time deputy director of IKI RAS for the implementation of the *ExoMars* project, and since 2019 a chief research fellow of IKI RAS as well.

In 2016, O I Korablev was elected a corresponding member of RAS.

The orbital *ExoMars* satellite *TGO* (*Trace Gas Orbiter*) was launched in April of 2016, and the ACS system at the

ExoMars TGO satellite has been conducting observations since 2018. O I Korablev and his scientific group obtained some new results on small components of Mars's atmosphere and the mechanisms of atmospheric losses. A lower limit on methane was established and a new chemically active gas, hydrogen chloride, was revealed, which can rapidly destroy methane. This may resolve the contradiction between the observations of methane on the Martian surface and in the atmosphere.

In addition, O I Korablev is a supervisor of two experiments of the *Bepi-Colombo* project, is responsible for the equipment for the *Luna-25*, 26, 27 projects, and is engaged in the preparation of promising projects and experiments for planetary exploration. In 2016–2019, he was a member of the joint Russian-American scientific group for justification of the *Venus-D* project, and from 2020, deputy research supervisor of the *Venus-D* project.

Since the start of his scientific work, O I Korablev has published over 200 scientific papers in peer-reviewed Russian and foreign publications (14 papers in *Science* and *Nature*; the total number of publications is over 500). He is a deputy chairman of the dissertation council of IKI RAS in the specialty of Planetary Research, a member of the Academic Council of IKI RAS (from 2001), and chair of the subsection Planets and Small Bodies of the Solar System section of the RAS Space Council. In 2012–2021, O I Korablev was chair of Scientific Commission B, and now he is a representative of the Russian Federation in COSPAR (Committee on Space Research). He is an academician of the International Academy of Astronautics (from 2020), a member of the editorial board and from 2021 a deputy editor-in-chief of the journal *Astronomicheskii vestnik* (*Solar System Research* in English translation), and a laureate of the COSPAR medal and Ya B Zel'dovich medal of RAS (1998) and the Prize for Science and Technology of the Union State (2021). For many years, Korablev has been delivering lectures on hardware and methods of cosmic planetary research to students at the Moscow Institute of Physics and Technology (MIPT) and MSU.

We wish Oleg Igorevich a happy birthday and hope he has new remarkable experiments on interplanetary stations and in Earth's orbit, and prominent scientific results and discoveries. We also wish him sound health and personal happiness and well-being!

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