

## Igor' Nikolaevich Meshkov (on his 90th birthday)

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January 7, 2026 was the 90th birthday of Igor' Nikolaevich Meshkov — academician of the Russian Academy of Sciences (RAS), professor, chief researcher at the Laboratory of High-Energy Physics (LHEP) of the Joint Institute for Nuclear Research (JINR), and research supervisor of the NICA Accelerator Complex and Positron Annihilation Spectroscopy projects.

I.N. Meshkov is an outstanding specialist in the field of charged particle beam physics, the physics and technology of accelerators, high-energy physics, and the physics of plasma and radiation methods of metal working; a candidate of the physical and mathematical sciences (1970); a doctor of the physical and mathematical sciences (1975); a professor (1979); and a corresponding member of RAS (1991) and academician of RAS (2019).

Igor' Nikolaevich was born in Moscow on January 7, 1936, graduated from the Physics Department of M.V. Lomonosov Moscow State University (MSU) in 1959, and that same year began working at the Institute of Nuclear Physics of the Siberian Branch (SB) of the USSR Academy of Sciences in Novosibirsk, where he rose from senior laboratory assistant to head of laboratory. Igor' Nikolaevich is one of the circle of G.I. Budker's prominent disciples.

I.N. Meshkov is widely known to the scientific community for the creation and development of the electron cooling method (jointly with A.N. Skrinsky, N.S. Dikansky, V.V. Parkhomchuk, and others). The ideas and elaborations suggested by him are being used in charged particle storage rings with electron cooling in many setups. With his determining participation in the first electron cooler, EPOKHA, the energy recuperation scheme was realized, electron beams with low transverse temperatures in a gun with resonance optics were formed, and, in 1975, proton beam cooling on the NAP-M storage ring was experimentally demonstrated for the first time in the world.

Igor' Nikolaevich took an active part in the creation of electron cooling systems on the NAP-M storage ring at INR SB RAS (USSR), on the antiproton storage ring LEAR in CERN (Switzerland), in the Enrico Fermi Laboratory (USA), on the COSY synchrotron in the Jülich Research Center (Germany), on the HIMAC medical synchrotron (Japan), on the S-LSR storage ring (Japan), and on the NICA accelerator complex (JINR).

In 1989, in Lipetsk, Igor' Nikolaevich founded a branch of the Institute of Nuclear Physics — the Physics and Technology Center. The main focus of the center's activity was the development of up-to-date technologies using charged particle beams in metallurgical production. The center also conducted a series of experiments on radiation-



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chemical purification of gases irradiated with electron beams and carried out work on studying the physics of beam-plasma discharges, including those with electron-beam injection into ionospheric plasma in rocket experiments using an 'on-board' accelerator. Under Igor' Nikolaevich's guidance, a method for electron cooling of ion beams was developed, including the formation of intense electron beams. An electron cooling system was designed for the LEAR synchrotron-storage ring (CERN), where antiprotons and lead ions with parameters required in the LHC project were cooled.

In November 1993, Igor' Nikolaevich began working at the Joint Institute for Nuclear Research. From 1998 to 2003, he was a chief engineer at JINR. Beginning in 1998, the magnetized beam storage ring for positronium and antihydrogen generation was worked out and built under his leadership.

In 2006, the project of a unique superconducting heavy ion collider, NICA, aimed at investigating phase transitions



In NAP-M control room, discussing experiments on electron cooling. From left to right: D.V. Pestrikov, V.V. Parkhomchuk, I.N. Meshkov, 1976. (Photo from archive of V.V. Petrov.)

in quark-gluon plasma, was begun under the scientific supervision of Igor' Nikolaevich Meshkov. At the present time, Igor' Nikolaevich is actively involved in implementation of the NICA mega-project. Together with his colleagues, he developed a method of optimization of the complex parameters, worked out the project, and completed its construction.

Under I.N. Meshkov's scientific supervision, work was done in 2016 to commission the Linear Accelerator of Heavy Ions (LUTY). In 2022–2023, work was successfully done to commission the new superconducting synchrotron-booster, one of the key accelerator elements of the NICA complex. In February 2023, the longest run of the first stage of the NICA accelerator complex in the history of HEPL was held, and the first physical experiment was conducted on the BM@N (Baryonic Matter at Nuclotron) facility. During the run, more than 550 million events were collected in an experiment studying the interaction of xenon ions accelerated to energies of 3.0 and 3.8 GeV per nucleon with a fixed cesium–iodine CsI target. Effectively used during the run was the booster's electron cooling system, developed at the INP SB RAS in close collaboration with Igor' Nikolaevich Meshkov and designed for the first time in Russia for rapid cooling of heavy ions. The booster's electron cooling system made it possible to double the intensity of the beam extracted from the Nuclotron to the BM@N. In the course of further examination of the cooled beam formation in the booster, a sevenfold accumulation of xenon ions with their tenfold injection into the synchrotron was reached under his scientific supervision.

Under the scientific supervision of Igor' Nikolaevich Meshkov, a cycle of work on the installation of the NICA collider, which was started in 2021, was completed in the late 2025. Upon completion of this work, magnetic fields were generated in the superconducting structure of the collider, and the xenon nucleus beams from the nuclotron were injected into the collider.

I.N. Meshkov taught at Novosibirsk State University (NSU) from 1963, where he became professor in 1979, and from 1984 to 1993 he was head of the General Physics Department. His textbook on electrodynamics (in co-authorship with B.V. Chirikov) is widely known. From 1989, Igor' Nikolaevich also taught at the Lipetsk Polytechnic Institute



1975. I.N. Meshkov (foreground) was captain of team (second row from left to right: R.A. Khusainov, V.I. Prokopenko, I.V. Kompaneets) that traversed Shchurovsk Peak in Matcha Mountain knot (Tajikistan).

This is one of many expeditions to various mountain regions of USSR organized by Novosibirsk Alpine Club Vertikal, of which I.N. Meshkov was President for many years.

(Photographer: V.S. Ponomarev.)

and was professor and head of the Physics Department. Beginning in 1995, I.N. Meshkov has been teaching at the graduate school and the JINR Educational and Scientific Center. In 1998, on the basis of the JINR Educational and Scientific Center, he created the Department of Electronics of Physical Facilities at the Moscow Institute of Radio Engineering, Electronics, and Automation (MIREA). In 1998–2013, I.N. Meshkov was head of the Department of Electronics of Physical Facilities at MIREA and an honorary employee of MIREA. Graduates from this department work at JINR, the Raduga Machine-Building Design Bureau, and other research and production enterprises in Dubna. Since 2017, Igor' Nikolaevich has been a professor at the Department of Information and Nuclear Technologies at Saint Petersburg State University (SPbSU).

I.N. Meshkov has trained 15 candidates and 5 doctors of physical and mathematical sciences. His students are working successfully at JINR and at leading accelerator centers around the world. He is the author of over 500 publications in leading journals and presentations at international conferences and is a member of the editorial board of the journal *Physics of Elementary Particles and the Atomic Nucleus*. From 1995 to 2012, he was chair of the Scientific Council of the Nuclear Physics Department of RAS on the issue of Charged Particle Accelerators.

Igor' Nikolaevich was a professional mountaineer (Master of Sports of the USSR, two-time bronze medalist of the USSR Championship in mountaineering), participated in

a number of the most difficult ascents, and holds the title of Snow Leopard (1981), which is awarded to climbers who have conquered the highest peaks on the territory of the former USSR, namely, the Peak of Communism (7495), Pobeda (7439 m), Lenin (7134 m), and Korzhenevskaya (7105 m).

For his contributions to Russian and international science, I.N. Meshkov received prestigious state awards and the European Physical Society Prize, “For outstanding work in the field of charged particle accelerators.” In 2019, Igor’ Nikolaevich Meshkov was elected academician of the Russian Academy of Sciences. He is a laureate of the Russian Federation State Prize (2001) for the series of studies “The method of electron cooling of heavy charged particle beams,” and a laureate of the Prize of European Physical Society in the field of accelerator technology (2004). In 2004, he was awarded the gratitude of the president of the Russian Federation for his services to the development of Russian science, for his long-term fruitful activity, and in connection with the 300th anniversary of the Russian Academy of Sciences.

Friends and colleagues wish Igor’ Nikolaevich good health and prosperity, and the conquest of new heights in science and life!

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