



To the 110th Anniversary of the Birth of Boris N. Petrov, Vice President of the USSR Academy of Sciences

In 2023, the scientific community celebrates the 110th anniversary of the birth of Boris Petrov, a great scholar in automatic control, theoretician of rocket and space technology, science organizer, and Vice President of the USSR Academy of Sciences.

Boris Petrov, in full Boris Nikolaevich Petrov, was born on March 11, 1913, in Smolensk. Having graduated from a high school in 1930, he left for Moscow. After studying at a factory apprentice school, from October 1932 to September 1933, he worked as a turner. In 1933, Boris entered Moscow Power Engineering Institute (MPEI) at the Electromechanical Department. In 1939, he graduated with honors from MPEI. Petrov's graduation work entitled *Automatic Regulation of Boilers with Pulverized Coal Furnace* was written under the guidance of his teacher, Academician Victor S. Kulebakin. The work was recognized as outstanding. In 1939, by Kulebakin's suggestion, Boris entered the Commission for Automation and Remote Control, the USSR Academy of Sciences. The same year, based on the Commission, the Institute of Automation and Remote Control (IARC) was established. (Nowadays, it is known as the Trapeznikov Institute of Control Sciences, the Russian Academy of Sciences (ICS RAS).) Petrov worked at the Institute all his life and made a career from Junior Researcher to Director. In October 1940, Boris entered the postgraduate program of IARC; his scientific supervisor was Vadim A. Trapeznikov. During the Great Patriotic War, IARC was evacuated to Ulyanovsk, where Petrov actively studied the problem of automatic product rejection. In 1945, Boris submitted for defense his candidate's dissertation in engineering entitled *Analysis of Automatic Copying Systems* and was immediately awarded the higher degree of Dr. Sci. (Eng.). After the dissertation defense, he led active R&D and educational activities. Petrov early earned a great reputation among leading scientists and had outstanding organizational

skills. It was noticed by the USSR Academy of Sciences: in 1947, on the recommendation of the Bureau of the Section of Engineering, he was appointed Acting Director of IARC. In 1949, Boris became Head of the Department of Aircraft Automatic Control Systems at Ordzhonikidze Moscow Aviation Institute (MAI). He headed the Department until the end of his life and trained many famous scientists and experts in aerospace technology.

Petrov's main scientific works were devoted to the theory of dynamic objects control, particularly the theory of invariance of automatic control systems, the theory of adaptive and terminal systems, nonlinear servomechanisms and variable structure systems, automatic control systems for aircraft and spacecraft, and the design of high-precision measuring devices.

Petrov's fruitful activities were highly appreciated in the USSR and abroad. He was entitled the Hero of Socialist Labor and was awarded the Lenin Prize and two State Prizes as well as many other domestic and foreign orders. Boris was Full member of the International Academy of Astronautics and Foreign Member of the Czechoslovak, Hungarian, Bulgarian, and Polish Academies of Sciences. The Lenin Prize (1966) was awarded for his participation in the design and manufacture of Voskhod-1 and Voskhod-2 multi-manned spacecraft, their launches, and the implementation of the world's first human walk in open space; for his participation in the design and manufacture of Luna-9 and Luna-10 automatic interplanetary stations, their launch, and soft landing on the surface of the Moon, the transmission of photographic data of the lunar panorama to Earth, and the injection of the world's first artificial satellite of the Moon into lunar orbit.

Petrov was an active organizer of IFAC International Symposia on Automatic Control in the Peaceful Uses of Spaces, held in Norway (1965), Austria (1967), France (1970), Italy (1973), the USSR (1974), German Federal Republic (1975), and England (1979). From 1966 to 1980, he was Chairman of the Interkosmos Council for International Cooperation and Use of Outer Space. As Chairman of Interkosmos at the USSR Academy of Sciences, Academician Petrov took an active part in the organization and implementation of the Apollo-Soyuz Test Project, the joint experimental manned flight of Soyuz-19 spacecraft (the USSR) and Apollo spacecraft (USA). He was a leading scholar and an outstanding science organizer. Since 1963, Petrov was permanent Academician-Secretary of the Section of Mechanical Engineering and Control, the USSR Academy of Sciences; in 1979, he was elected Vice President of the USSR Academy of Sciences.

Petrov's entire scientific life was connected with IARC (ICS). Nowadays, the Institute develops the main modern theoretical branches in the control of space objects, aircraft, and dynamic objects that were initiated by him. They include the theory of terminal and adaptive control of space objects under normal and abnormal operating conditions with different levels of a priori and current information. In the 1970s, Petrov posed the problem of developing formal models and methods for designing information and control systems of spacecraft and their software. Based on a unified methodology, formalization methods and means as well as algorithms and programs were developed to design optimal modular real-time data processing systems. The theory of optimal control with a vector criterion was further developed to design algorithms for implementing the desired motion trajectories of dynamic objects. In addition to classical methods, the theory of anisotropic control and filtering for linear discrete-time stochastic systems is used to suppress the effect of exogenous disturbances on control systems. The method of spatial and angular relative positioning was proposed for the information support of aircraft control systems. It involves the parameters of the magnetic induction gradient as measuring information. This method is currently being developed further.

The thematic issue contains several papers presenting recent results in the theoretical branches mentioned above.

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