

Georgii Nikolaevich Rykovanov (on his 70th birthday)

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February 9, 2024 was the 70th birthday of Georgii Nikolaevich Rykovanov — an outstanding scientist and organizer of fundamental and applied research, research supervisor of the Russian Federal Nuclear Center – E I Zababakhin All-Russia Scientific Research Institute of Technical Physics (RFNC – VNIITF, Snezhinsk, Chelyabinsk region), academician of the Russian Academy of Sciences (RAS), doctor of physical and mathematical sciences. G N Rykovanov’s main work concerns ensuring the combat preparedness of the Russian Armed Forces, which is associated with the development and modification of special products that have unique characteristics in efficiency, reliability, and operational safety. His contribution to the development of many areas of science and technology in the nuclear industry is equally important.

Under the leadership of G N Rykovanov and with his direct participation, a number of priority fundamental and applied scientific results have been obtained in the field of research of hydrodynamic processes, the theory of turbulence, the physics of thermonuclear fusion, extreme states of matter, the detonation theory, laser physics and technology, and nuclear medicine.

Georgii Nikolaevich Rykovanov was born on February 9, 1954 in Vologda into a family of teachers. In 1969, he entered a physics and mathematics school at Leningrad University; in 1971, he entered Moscow Engineering Physics Institute (MEPhI).

In 1977, after graduating from MEPhI in the specialty Theoretical Nuclear Physics, G N Rykovanov was hired by the theoretical department of RFNC–VNIITF, where he immediately got actively involved in creating new samples of special military equipment and mastered in practice all the stages of their creation: from the physical idea and computational simulation to scientific support of experimental tests. As a research supervisor, G N Rykovanov repeatedly took part in preparing and testing new designs at external testing sites.

In the initial period of his work at RFNC–VNIITF, he personally carried out theoretical calculations for the design of special products, which were then transferred to arms. In 1985, he received for this work the first state prize—the Order of the “Badge of Honor”.

Successfully combining practical work on creating pieces of military equipment with theoretical investigations of the physics of thermonuclear reactions, G N Rykovanov proposed a unique method for the experimental study of thermonuclear combustion. The obtained results are now being used in the development of virtual testing technology based on the application of supercomputer simulation. G N Rykovanov is one of the main authors of the new fireproof explosive composition (FPC), the use of which allows the operational



Georgii Nikolaevich Rykovanov

safety of products to be radically improved. In the period of 1989–1998, fundamental investigations of relations between molecular structure of explosive materials and their sensitivity and power-intensity were carried out on his initiative and under his guidance. He is the author of the empirical model of FPC detonation kinetics.

In 1995, G N Rykovanov was appointed head of the theoretical department, in 1998, director of RFNC–VNIITF, in 2007, director–scientific supervisor at RFNC–VNIITF; since 2012, he has been a scientific supervisor at RFNC–VNIITF. In this period, a number of products for equipping various types of armed forces were developed under his guidance and with his direct participation and were transferred to arms. For one of the above-mentioned products, G N Rykovanov personally proposed an original physical scheme which had no counterparts. This provided a new perspective for designing new creations with unique tactical-technical characteristics. At the present time, items for new weapon systems and complexes are being developed under G N Rykovanov’s guidance.

After a comprehensive nuclear test ban treaty (CTBT) was signed, the issue of creating technology for maintaining and confirming the reliability of ammunition became acute. With the active participation of G N Rykovanov in 2000–2010,

such technology was theoretically and experimentally substantiated, and it is currently being used.

Under the guidance of G N Rykovanov and with his personal participation, traditional and new areas of scientific research and experimental design work for defense and civil purposes are being developed. The work is as follows:

- computer simulation and creation of supercomputers. At the present time, RFNC – VNIITF is the leading organization in Russia in the total power of computing resources. The institute's specialists created specialized supercomputers for other organizations of the State Atomic Energy Corporation Rosatom and the Ministry of Defense;

- experimental facilities and diagnostic complexes. Complexes for laser interferometric measurements for field tests have been created; at the terminal stage is the creation of a unique radiographic complex of small-aspect pulsed tomography for studying gas-dynamic processes in explosive experiments, which is unparalleled in the world;

- diode-pumped fiber lasers. A scientific team was formed and technological, production, and testing complexes were created, which made it possible to reach the world level within 10 years. Currently, the institute has developed and began mass production of fiber lasers for materials processing and 3D printers;

- transporting and packaging kits (TUKs) for transportation of spent nuclear fuel (SNF). TUK-80 was developed and certified for spent fuel from the AMB reactor for the Beloyarsk NPP and TUK-143 for transporting dismantled cores of boat reactors;

- nuclear and hydrogen energetics. Unique complexes have been created for experimental studies of hydrogen safety in nuclear energy and the development of new hydrogen energy technologies;

- nuclear medicine. A complex of neutron therapy of oncological diseases was created and experimental production of radioactive pharmaceuticals for proton emission tomography and gamma diagnostics was implemented.

G N Rykovanov is the head of the priority scientific and technological branch Technologies of Fissile and Special Materials. With his direct participation, important results have been obtained in the examination of the properties of fissile and special materials, namely:

- a program of experimental studies of the properties of the main fissile materials (FM) of various brands and manufacturing technologies under static and dynamic impact typical of exploitation conditions has been developed and is being implemented. New data have been obtained on changes in the FM properties during long-term storage. The results of these studies are used to justify the reliability of special products.

- a modern materials science center equipped with unique research facilities and installations has been founded, at which experimental work is carried out to study the properties of fissile and construction materials and the influence of product storage and exploitation conditions, and technologies of protective coating are tried out;

- computational technical work on computer simulation of the properties of fissile materials are being performed with the participation of RAS institutes using methods of quantum mechanics and molecular dynamics.

G N Rykovanov is attentive and interested in training young people and improving the scientific qualifications of employees. He takes part in organizing the work of special departments at the Scientific Research Nuclear University

(SRNU) MEPhI (Moscow), at Ural Federal University (Ekaterinburg), at South Ural State University (Chelyabinsk), and at the Snezhinsk Institute of Physics and Technology (SIPT) SRNU MEPhI (Snezhinsk) concerning training young specialists for RFNC – VNIITF. He is chair of the dissertation council of RFNC – VNIITF for the defense of candidate and doctoral theses and a member of the special Expert Council of the Higher Attestation Commission.

G N Rykovanov pays great attention to improving the quality of life and solving social issues of the employees of the Nuclear Center and residents of Snezhinsk, and to the development of science in the Chelyabinsk region. This was the basis for conferring him the rank of “Honorary Citizen of the City of Snezhinsk” and “Honorary Citizen of Chelyabinsk Region”.

G N Rykovanov is the author and co-author of more than 400 scientific works and is an authoritative scientist. In 2003, he was elected a corresponding member and in 2011 a full member of RAS. He is a chairman of the Scientific Technical Council (STC) of the State Atomic Energy Corporation Rosatom, a member of the Bureau of the Division of Energetics, Mechanical Engineering, Mechanics, and Control Processes of RAS, a member of the Ural Branch of RAS, and a member of the Scientific Publishing Council of RAS.

In 2019, by a resolution of the Presidium of the Ural Branch of RAS, for a series of studies, he was awarded the S V Vonsovskii Gold Medal for an outstanding contribution to the development of scientific research and cooperation of RFNC – VNIITF with academic institutes.

G N Rykovanov is a Hero of Labor of the Russian Federation (RF), laureate of the RF State Prize in science and technology, and laureate of RF Government Prize in science and technology. He was awarded Orders of the “Badge of Honor,” “For Merits benefitting the Fatherland” IV degree, Aleksandr Nevsky, many medals, and the Certificate of Honor of the President of the Russian Federation.

G N Rykovanov enjoys well-deserved authority both among scientists and specialists of RFNC – VNIITF and among the leaders of our country, of the nuclear industry, and the region.

We sincerely wish you, dear Georgii Nikolaevich, good health, new creative success, and accomplishment of your most daring undertakings for the benefit of our Fatherland! Happiness and prosperity to you and your family!

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