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PERSONALIA

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In memory of Fazoil Inoyatovich Ataullakhanov

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On March 24, 2026, at the age of 79, Fazoil Inoyatovich Ataullakhanov passed away. He was an outstanding scientist, who shaped several fields of modern biophysics, a full member of the Russian Academy of Sciences (RAS), and a member of the Editorial Board of the journal *Uspekhi Fizicheskikh Nauk* (*UFN*). To everyone — from students to academicians — he was simply Fazly: a vibrant, exceptional, and open person, who combined firmness and high standards with a warm, humane attitude toward those around him.

Fazly was born on April 23, 1946 in Samarkand into a family of physicians. His talent as an artist and his love of making things with his own hands were already evident in childhood: he would paint, build model aircrafts, and devise and improve mechanisms. These skills stayed with him throughout his life and shaped both his scientific style and his path as an artist.

At the age of sixteen, he came to Moscow and entered the Physics Faculty of M.V. Lomonosov Moscow State University (MSU). His scientific approach took shape at the Biophysics Department and later in the laboratory of Simon El'evich Shnoll in Pushchino. Under the supervision of Anatoly Markovich Zhabotinsky he studied the peroxidase-oxidase system, combining mathematical simulation with experiments on instruments that he had built himself.

A characteristic feature of his work was already evident at that time: thinking as a physicist, he was convinced that even complex biological systems can be reduced to a small number of controlling variables that reveal their internal logic. Mathematical models helped him in this, and he considered a clear understanding of the physiological function of the system under study to be exceptionally important for constructing them. The models served to identify key types of behavior rather than to provide an exhaustive description; they also made it possible to guide experiments, for which Fazly often built unique setups.

After completing his postgraduate studies, Fazly worked for about ten years at the Research Institute for Biological Testing of Chemical Compounds under the supervision of Lev Aramovich Piruzyan, studying the mechanisms that regulate intracellular metabolic processes. The work was carried out mainly on human erythrocytes at the Institute of Blood Transfusion. Fazly and his team succeeded in reducing the biochemical complexity of the metabolic system of the erythrocyte to a small number of governing relations and clarified the role of various metabolic pathways, the modes of their regulation, and their coordination in erythrocyte metabolism.

With the filtration device invented by Fazly, macroscopic measurements could be used to determine the functional properties of an erythrocyte population, including its capacity for adenosine triphosphate (ATP) production and volume regulation, as well as the lifespan of the cells. On the basis of this work, Fazly defended his doctoral thesis in 1984.



Fazoil Inoyatovich Ataullakhanov
(23.04.1946 – 24.03.2026)

In 1989, at the invitation of the director of the National Research Center for Hematology, academician Andrei Ivanovich Vorobiev, Fazly took charge of a laboratory at that institute. He considered blood coagulation to be primarily a physical problem of the spatial propagation of activation. Grume formation begins as a front moving at a constant velocity, but in the organism this propagation stops, forming a localized thrombus. Fazly proposed a new type of active medium, in which the primary wave of activation generates a faster secondary wave that catches up the primary wave to suppress it. This intrinsic mechanism of propagation arrest without external boundaries formed the basis of a new class of blood coagulation models, ranging from reaction — diffusion models to detailed molecular ones. Experimental studies by his group confirmed the predicted spatial patterns and the role of individual protein factors.

Analyzing the limitations of standard clinical tests, which do not allow for the spatial nature of clot formation, Fazly developed the thrombodynamics method. In this method,

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Fazly at the HemaCore Labs symposium (2016).



Fazly at work in the laboratory (2012).

coagulation is initiated locally and is assessed as the propagation of an autowave of thrombin activity. Together with his students, he founded the company Hemacore and took part in using the method into practice. Today, the test is applied in research laboratories worldwide and in more than 200 hospitals in Russia. During the COVID-19 pandemic it became one of the key methods for assessing the state of the blood coagulation system in a large multicenter study that made it possible to identify risk factors and to propose therapeutic approaches.

From about the 2000s onward, Fazly collaborated with the laboratory of Professor R Macintosh at the University of Colorado and later with the laboratory of Professor E.L. Grishchuk at the University of Pennsylvania (USA), studying the cell division mechanisms. In this field, as in all others, the breadth of his interests and his rare combination of talents as an experimentalist, engineer, and theorist were fully evident. He designed and built specialized laser-microscopy setups, including those of 'optical tweezers' type, which made it possible to measure the forces generated by molecular machines with high accuracy.

With the setup that Fazly built in Boulder (USA), the force generated by microtubules — protein polymers that drive chromosome movement during cell division — was measured for the first time. This work, published in the journal *Nature* in 2005, provided a new view of the mechanics of mitosis and made it possible to assess the contribution of microtubules as active force generators in the living cell.

In the following years, Fazly tirelessly improved the instruments he had created and built new unique setups for high-sensitivity studies of the molecular machines and protein interactions underlying cell division. As always, the experimental work was accompanied by the development of theoretical models, which helped to identify the key principles governing the systems under study and suggested ideas for new, previously nonobvious experiments.

The molecular-mechanical models of microtubules and kinetochore proteins, and then the model of the mitotic cell as a whole that he developed, required a new mathematical framework and supercomputer calculations. These models made it possible to establish the principles of force generation by microtubules, to understand the architecture of the molecular mechanisms that use this force to move chromosomes, and also to shed light on the processes of chromosome search, capture, and error correction. Violation of these processes can lead to chromosomal instability and malignant transformation of cells.

In 2006 Fazly became head of the Center for Theoretical Problems of Physicochemical Pharmacology, RAS. From 2011, he headed the Department of Biophysics and Systems Biology at the Dmitry Rogachev National Medical Research Center of Pediatric Hematology, Oncology and Immunology (NMRC PHOI).

In 2019, F I Ataullakhanov was elected a corresponding member and in 2022, a full member of the RAS in the Section of Physiology.

Fazly had been a contributor to *UFN* since 2002, and in May 2015, at the invitation of the Editor-in-Chief of *UFN*, academician Leonid Veniaminovich Keldysh, he joined the Editorial Board of *UFN*, carrying out very important and much-needed work in evaluating papers on biophysical topics. His sixth (and, sadly, last) review article in *UFN*, "Microtubules as the simplest biomechanical motor for chromosome segregation during cell division," written jointly with his colleagues, is scheduled for publication in the August issue of the journal *Usp. Fiz. Nauk* **196** (8) 829–841 (2026).

Throughout his life, Fazly was distinguished by remarkable scientific intuition, an immense capacity for work, devotion to science, and the ability to be a charismatic informal leader in any setting and situation. He founded a major scientific school and supervised more than seventy graduate students; many of his disciples work in leading Russian and foreign laboratories or head their own research teams all over the world. For many years, Fazly taught at the Biophysics Department of the Physics Faculty at Lomonosov MSU, and later at the Moscow Institute of Physics and Technology (MIPT). His lectures on cell biophysics, known for exceptional depth, breadth, and clarity of thought, played an important role in the scientific development of several generations of researchers.

The memory of Fazly — a scientist, a mentor, an artist, and a man of rare inner strength — will remain forever in the hearts of his family, friends, colleagues, and students.

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