
CHRONICLE

Academician Georgii Zavarzin Turns 70



An outstanding Russian microbiologist, Academician Georgii Aleksandrovich Zavarzin, turns 70 on January 28, 2003.

Georgii Zavarzin was born and brought up in a family with a rich cultural and scientific background. His father, Aleksandr Alekseevich Zavarzin, was a well-known architect; his uncle, Aleksei Alekseevich, was a biologist and the founder of the Leningrad cytological school; and his mother, Nina Borisovna, was a microbiologist noted for the characterization of phages of unicellular algae. However, the most important influence on the making of the future scientist was that of his grandfather, Academician Boris Lavrent'evich Issatchenko. Many of his ideas and those of his great senior contemporary Academician Winogradsky were further developed in subsequent studies by Zavarzin.

Zavarzin formed as a microbiologist in the 1950s–1960s, when the physiological and biochemical approach in microbiology was prevalent, and the microbial cell per se was the primary object of investigation. His early works, however, already contained essential elements of a concept that two decades later he came to call “extensive microbiology.” The cornerstones of this approach, focused on understanding the functional diversity in the microbial world, were set down in a series of pioneering works by Zavarzin and coworkers describing new and difficult-to-study physi-

ological groups of microorganisms. These were various groups of lithotrophic microorganisms, organisms producing or utilizing gases, obligate anaerobes, and various groups of extremophiles (thermo-, halo-, and alkaliphiles and, most recently, psychrophiles). The priority of Zavarzin's laboratory in this field rests not only on description of a large number of new taxa, but also on studies of new microbial processes, including aerobic oxidation of CO, lithotrophic reduction of elemental sulfur and iron, anaerobic oxidation of CO with hydrogen production from water, halophilic production of methane from C₁- compounds, halo- and alkaliphilic acetogenesis, etc. At the time, Zavarzin headed the Department of Lithotrophic Microorganisms of the Institute of Microbiology and published two monographs: *Litotrofnye mikroorganizmy* (Lithotrophic Microorganisms) (Moscow, Nauka, 1972) and *Vodorodnye i karboksidobakterii* (Hydrogen and Carboxydobacteria) (Moscow, Nauka, 1978). For the first book, Zavarzin was awarded the Winogradsky Prize, which is highly symbolic if one recalls for how long the name of the great discoverer of chemosynthesis had been hushed up.

It was also at that time that Zavarzin's remarkable book *Fenotipicheskaya sistematika bakterii—prostranstvo logicheskikh vozmozhnostei* (Phenotypic Systematics of Bacteria: The Space of Logical Possibili-

ties) (Moscow, Nauka, 1974) came out. The significance of this book has been overshadowed in recent decades by the vigorous development of the phylogenetic approach, involving the comparison of conservative sites of prokaryotic genomes. This fact, however, fails to undermine either the meticulous logic of the book's author or the novelty and originality of the ideas presented. The turn of this book may still come with the next twist in the development of the taxonomy of microorganisms.

An outstanding microbiologist in a classical mold, Zavarzin has at the same time all the traits of a genuine Russian naturalist, eager to comprehend and capture in logic the connections and relations of different complexity existing in nature. At the end of the 1970s and during the 1980s, his research interests moved beyond the limits of pure laboratory cultures of microorganisms. Rather than studying the microbial cell or the pure culture as its macro analogue, Zavarzin and his collaborators started to explore microbial communities and multiple links existing between their components. Based on the properties of constituent organisms, the microbial community in these works is characterized as an integral unit whose stability is maintained by trophic, cooperative, competitive, and syntrophic relations between various physiological groups. Accordingly, the department headed by Zavarzin was renamed the Department of Microbial Communities. His collaborators investigated microbial communities of waste treatment plants and extreme environments, such as hydrotherms, hypersaline lagoons, soda lakes, and tundra bogs.

Zavarzin's interest in microbial communities once again stretched beyond their limits to problems of biosphere evolution and to the role of microbial communities in the formation of the modern biosphere. Relict communities of extreme environments were studied as analogues of prime Precambrian ecosystems. Accordingly, a Laboratory of Relict Microbial Communities was organized within the Department of Microbial Communities and was headed by Zavarzin himself. His ideas concerning evolution and the biosphere were outlined in several monographs and collections of papers such as *Rol' mikroorganizmov v krugovorote gazov v prirode* (The Role of Microorganisms in the Turnover of Gases in Nature) (Moscow, Nauka, 1979), *Bakterii i sostav atmosfery* (Bacteria and the Composition of the Atmosphere) (Moscow, Nauka, 1984), and *Kal'dernye mikroorganizmy* (Caldera Microorganisms) (Moscow, Nauka, 1988). Zavarzin's long-standing interest in organisms utilizing and producing gases led him to investigations of the global contribution of microorganisms to the formation of the atmosphere, both ancient and modern, and to studies of the role of microorganisms in the production of greenhouse gases and, correspondingly, in global climatic changes.

Zavarzin's interdisciplinary research interests are also well illustrated by the scope of his organizing activities in science, transcending by far the bounds of

microbiology. He was the vice president of Scientific Committee on Problems of the Environment (SCOPE), the head of the biosphere division of the Federal Research and Development Program "Global Changes in the Environment and Climate," and a member of the boards of the International Geological and Biosphere Program and the International Institute of System Analysis.

His high creativity was the key factor in his creation of a strong research school. Six doctors of science and many candidates, his former students, continue to work on problems he was the first to set up and investigate. A two-term lecture course that he gave at the Biological Faculty of Moscow State University was published in 2002 as a textbook entitled *Prirodovedcheskaya mikrobiologiya* (Naturalistic Microbiology). In addition to his sitting on the editorial boards of many leading scientific journals, including *Mikrobiologiya* (Microbiology), Zavarzin is also a member of the editorial board of *Priroda* (Nature, a Russian-language popular scientific journal) and its frequent author. He has also written and published several popular scientific books.

It would be impossible not to say a few words about Tat'yana Nikolaevna Zhilina, the wife and the closest collaborator of Georgii Aleksandrovich, his faithful friend and companion, a kind and exceptionally gifted person. Herself a microbiologist of the highest grade and a doctor of science, Tat'yana Nikolaevna was able to realize, by elaborate and painstaking work, a large number of scientific ideas put forward by her husband.

The larger part of Zavarzin's scientific activity was during the Soviet period. While having all the qualities of a prominent leader, Georgii Zavarzin has always valued his personal freedom and independence over potential advances in the managerial hierarchy, sacrificing formal recognitions of his scientific leadership. This only makes more evident his current informal leadership and the influence he has on the development of microbiology both in Russia and elsewhere. At the same time, Zavarzin has always been a genuine citizen ready to serve his country, conscientiously carrying out the duties of an elected deputy of the Cheremushki district council in Moscow and those of a vice-chairman of the State Committee on Natural Resources of the USSR. Having an excellent knowledge of Russian history, loving the Russian natural environment, and deeply concerned with the present and future of our country, Zavarzin is a genuine Russian patriot in the original meaning of the word.

The wide scope of his mind, his ability to always uncover something new, his total rejection of conventional thinking, and, last but not least, his inexhaustible passion for research have always had enormous influence on those working by his side, on Russian microbiology at large, and on related branches of science. We wish Georgii Aleksandrovich Zavarzin many happy years of work in science and the joy of numerous new discoveries.

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