

## The 100th Anniversary of the Birth of A.E. Kriss (1908–1984)

DOI: 10.1134/S0026261709030205



On September 14, 2008, we commemorated the 100th anniversary of the birth of Prof. A.E. Kriss, Doctor of Sciences (Biology), a Lenin Prize winner, and one of the founders of marine microbiology. The scientific activity of A.E. Kriss was for 50 years inseparably connected with the Institute of Microbiology, Academy of Sciences, where he headed the Department of Marine Microbiology from 1950 through 1980.

A.E. Kriss, a graduate from the State Institute of Medical Knowledge (now the Second St. Petersburg Medical Institute), a disciple of the outstanding microbiologist Academician Georgii Adamovich Nadson, started his scientific career at the Laboratory of Microbiology, USSR Academy of Sciences, which, after its transfer to Moscow in 1934, was transformed into the Institute of Microbiology, USSR Academy of Sciences. The materials of Kriss's candidate dissertation, devoted to the physicochemical characterization of the pigments of streptomycetes and nonmycelial actinobacteria, and published in 1937 in the book *Izmenchivost' aktinomitsetov* (Variability of Actinomycetes), retain their scientific value until now.

After that, the scientific interests of A.E. Kriss were focused on the ecology of microorganisms. In 1936–1938, he took part in expeditions exploring the soils of the Arctic tundra and the waters of the Russian northern seas. He was also engaged in studying the problems of anabiosis. The results of these works were published in the collections of works *Krainii Severo-Vostok Soyuz SSR* (USSR Extreme North East) (1952).

In this period, A.E. Kriss gave much attention to practical issues, such as investigation of the role of microorganisms in the corrosion of hydrotechnical constructions.

During the Great Patriotic War, A.E. Kriss participated in the development of bacteriophage preparations, which were successfully used in the treatment of gastrointestinal infections. These studies formed the basis of his doctoral dissertation "Bacteriophage as a Two-Component System," defended in 1947.

In 1946, A.E. Kriss was the first in the USSR to organize an electron microscopy laboratory (at the Division of Biological Sciences of the USSR Acad-

emy). He had been in charge of this laboratory for almost 20 years. In this laboratory, the first specialists in the field of studying the ultrastructure of microbial cells were brought up, and they provided for the high level of cytological studies in various scientific institutions of this country.

In 1948, A.E. Kriss became the head of the Department of Geography of Microorganisms, which was reorganized into the Department of Marine Microbiology in 1950.

The establishment of marine microbiology as an independent scientific discipline was determined by the works of Academician Boris Lavrent'evich Isachenko in the beginning of the 20th century and by the microbiological investigations summarized in the classical work *Marine Microbiology* by C. ZoBell in 1946. However, until the 1940s, the study area was limited to the waters of the sea shelf or the sea's surface layers, and the studies themselves were of episodic character.

Kriss's works gave rise to deep-sea microbiology. As early as the first postwar years, A.E. Kriss and his small research team (V.I. Biryuzova, M.I. Novozhilova, E.A. Rukina, and A.S. Tikhonenko) started systematic studies of the microflora of the deep regions of the Black Sea, having succeeded in obtaining permission to work on mine sweepers that disposed the sea of the lethal weapon. At the Black Sea, A.E. Kriss and his associates perfected the main methodical approaches to studying the microflora of the deep-sea layers of seas and oceans. A colossal material concerning the number, biomass, and multiplication rate of microorganisms at various sea depths was collected, and the seasonal and daily dynamics of these parameters was considered. This work confirmed the observations of B.L. Isachenko, which suggested that the depths of the Black Sea, a unique reservoir, are not a lifeless wasteland and that microbiological processes of the nitrogen and sulfur cycles actively proceed in the hydrogen sulfide zone.

Based on the detailed explorations of the water column and bottom sediments of the Black and Caspian Seas, the Sea of Okhotsk, and the Arctic Ocean, it was shown that microorganisms inhabit them at depths of hundreds and thousands of meters, even under packed ice in the region of the North Pole, where A.E. Kriss worked on drifting stations in 1953–1956. The data obtained using direct microscopic methods allowed quantitative assessment of the microbial production. An important conclusion was reached that microorganisms are not distributed in the water column uniformly but form microzones and layers, depending on the concentration of suspended organic matter.

A.E. Kriss summed up the main results of his studies in the monograph *Morskaya mikrobiologiya (glubokovodnaya)* (Marine Microbiology (Deep-Sea)) (1959), which was awarded in 1960 the Lenin Prize and translated into English, Japanese, and German. The priority of Soviet science in the field of marine microbiol-

ogy became generally acknowledged in those years. Here are some of the numerous responses to this book: "For over 20 years A. Kriss has been one of the most active researchers in the field of marine microbiology" (C. ZoBell), "Russian investigators must be recognized as the leaders in the field of marine microbiology" (J.M. Shewan and Z. Kabata), "The traditions of Russian soil and aquatic microbiology developed in the second half of the 19th century and generalized by S.N. Winogradsky and V.L. Omelyansky are carried on by A.E. Kriss" (H. Jannasch).

Developing the ecological and geographic trend in oceanic microbiology, A.E. Kriss and his associates took part in complex oceanic expeditions in the open-water areas of the Atlantic, Indian, and Pacific oceans and in the Antarctic seas. Vertical distribution of heterotrophic bacteria, as well as the total number and biomass of microorganisms, was studied at hundreds of stations. As a result of these investigations, the ecological and geographic regularities of distribution of the microbial population in the water column of open oceanic regions were revealed. The results of these investigations were summarized by A.E. Kriss in the monograph *Mikrobiologicheskaya okeanografiya* (Microbiological Oceanography) (1976).

A.E. Kriss considered easily assimilable organic matter to be one of the main factors influencing the distribution of bacteria, but he emphasized the necessity of studying such a specific for the water column factor as hydrostatic pressure, which increases with the ocean depth to hundreds and thousands of atmospheres. A unique installation was developed under his supervision, with the use of which it was possible to study under laboratory conditions the effect of several hundred atmospheres of pressure on the growth and activity of bacteria. The results of these studies of A.E. Kriss and his associates were set forth in the monograph *Zhiznennyye protsessy i gidrostaticheskoe davlenie* (Vital Processes and Hydrostatic Pressure) (1973).

In the 1970s, A.E. Kriss focused his scientific interests on the microbial population of Antarctica: he was engaged in studying the microflora of Lake Vanda and collected material in the waters washing Antarctica. He was the only microbiologist in the world who had been to the Earth's North and South Poles. A severe disease prevented him from completing his last book *Mikrobnoe naselenie Arktiki i Antarktiki* (Microbial Population of the Arctic and Antarctic Regions).

Anatolii Evseevich Kriss was very demanding to himself and his associates. The expeditions under his supervision were prepared very thoroughly. The procedures affording the sterility of sample treatment under marine conditions were rehearsed on shore. The findings were rechecked many times. The researchers were also tested for their capacity to work under oceanic conditions.

The tasks solved by A.E. Kriss were invariably connected with the problems of general biological signifi-

cance, such as anabiosis, the biological structure of the ocean, and productivity of the ocean. In the postwar years full of hardships, he foresaw the importance of marine microbiology in the future and, having revealed the qualities of a fighter, was able to convincingly prove to high-rank authorities the necessity for microbiologists to participate in complex oceanic expeditions on board research vessels, as well as the necessity to use merchant and navy ships for microbiological investigations.

A.E. Kriss considered the organization of systematic microbiological investigations of seawater areas both on ships and stationary bases to be a priority. On his initiative and with his immediate participation, the Laboratory of Microbiology was established at the Sevastopol Biological Station, reorganized then into the Institute of Southern Seas Biology (now the Institute of Sea Biology, National Academy of Sciences of the

Ukraine). M.N. Lebedeva, one of the first disciples of Kriss, headed microbiological studies at this laboratory for a long time. Kriss's disciples and associates worked in Murmansk, Alma-Ata, and the Far East in close contact with the Institute of Microbiology Department of Marine Microbiology.

At present, marine microbiology is developing in many countries; well-equipped, comfortable research vessels and stationary laboratories are at scientists' disposal. Investigations use new modern methods. The study results are published in dozens of scientific journals. But the importance of the contribution made to marine microbiology by the pioneers of research into the microbial population of the ocean, first of all by B.L. Isachenko and A.E. Kriss, should be remembered.

*Editorial Board of the Journal Mikrobiologiya*