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## All-Russia Conference on Prospects for the Development of Soil Biology Devoted to the 100th Anniversary of the Birth of Academician E.N. Mishustin

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The conference was held on February 22, 2001, at the Faculty of Soil Science of the Moscow State University for the 100th anniversary of the birth of Evgenii Nikolaevich Mishustin, a distinguished Russian microbiologist and soil scientist, the founder of Russian soil microbiology.

The conference was held at the Faculty of Soil Science because its Department of Soil Biology, the only Russian university department with such a name, is now the center of soil biology in Russia.

The one-century period of soil biology has seen many advances, the most important of them being the evaluation of the role of biota in soil formation and soil productivity, the investigation of the major processes of the organic matter cycle brought about by soil microorganisms and their role in the formation of humus and soil structure, the establishment of the functioning mechanisms of soil microbial complexes, and so on. There comes a time to sum up the results of one hundred years of research in soil biology and draw up general guidelines for its further development.

The conference was organized by the Faculty of Soil Science of the Moscow State University in cooperation with the Microbiology Council of the Russian Academy of Sciences, the Institute of Microbiology of the Russian Academy of Sciences, the Coordination Council for Life Sciences of the Moscow State University, Dokuchaev's Society of Soil Scientists, and the Scientific Training Biotechnological Center at the Moscow State University. Financial support was provided by the Russian Foundation for Basic Research.

More than 100 soil scientists from Russia and the former Soviet republics attended the conference.

Two lectures directly concerned the life and research activity of Mishustin, others were related to some aspects of his work and the influence of his ideas and concepts on the development of soil biology.

In his opening speech, academician G.V. Dobrovolskii appreciated Mishustin's research activity and emphasized the role of Mishustin's pioneering works on the geographic distribution of soil microorganisms in the development of genetic soil science and geographic soil microbiology. Another one of great

Mishustin's achievements is his investigation of the biofixation of atmospheric nitrogen. Dobrovolskii noted that the work of soil scientists in collaboration with microbiologists, so much encouraged by Mishustin, now continues at the Department of Soil Science under the guidance of D.G. Zvyagintsev.

Of great interest was the memorial lecture of Mishustin's daughter, I.E. Mishustina, which, because of her illness, was read by Mishustin's grandson P.I. Ivanov, also a graduate from the Department of Soil Biology. This lecture, called *My Father's Life in Science*, showed how Mishustin's scientific career developed and how the knowledge acquired by the scientist was shared with his students. The results of Mishustin's immense investigations in soil biology were summarized in his 16 monographs. His textbook *Microbiology* was issued four times.

Of great interest was also the report of Professor S.V. Zonn, a soil scientist who worked with Mishustin.

D.G. Zvyagintsev spoke about the achievements made by soil biologists during the one-century period and about the future prospects of this science. In his opinion, efforts should be concentrated on the investigation of soil as a habitat of many microorganisms and on the processes occurring in soil under natural conditions. Other problems to be solved are the description of new bacterial species and the study of interorganismic interactions as they occur in soil: between microorganisms and plants, microorganisms and soil invertebrates, fungi and bacteria, protozoa and microbes, and algae and microbes. It is also necessary to intensify the investigation of the role of microorganisms in the formation and degradation of humus, soil aggregates, and soil minerals; the role of physiologically active substances in the functioning of soil biota; the formation of enzymatic complexes in soil; and the genetics of soil microbial communities. One of the challenging problems of soil biology is the application of genetically engineered microorganisms in agriculture.

I.Yu. Chernov from the Institute of Soil Science of the Moscow State University and Russian Academy of Sciences briefly reviewed the advances made in the geography of soil organisms, a science Mishustin

helped found. The speaker noted that the development of this science is possible only on the basis of the synthesis of historical biogeography, modern synecological approaches to the study of microbial communities, and molecular biological methods.

The report presented by M.M. Umarov from Moscow State University dealt with the microbial fixation of nitrogen in soil. Umarov noted that Mishustin was the author of one of the first monographs devoted to the problems of nitrogen fixation. Until his death, Mishustin headed the research project *Interbioazot-2000*, in which about 100 research institutions were involved. The investigations of nitrogen fixation carried out at the Department of Soil Biology and at other institutions demonstrated the urgency of searching for alternative ways of providing nonleguminous plants with available nitrogen, such as those utilizing the potential of soil nitrogen-fixing bacteria.

The problem of populational oscillations in soil microbial communities was discussed by Mishustin's pupil A.M. Semenov from Moscow State University. The investigation of oscillations in the microbial population of soil with the use of a linear harmonic approach allowed researchers to propose and substantiate the hypothesis of a wave-like development of soil microbial communities. The speaker suggested the use of the concept of the wave-like development of microbial communities to test soil stability, since the amplitude and period of the wave-like response of microbial communities may reflect tendencies in their state and in the history of particular niches and ecosystems.

The present-day concepts of bacterial oligotrophy were comprehensively considered in the lecture read by D.I. Nikitin from the Institute of Microbiology of the Russian Academy of Sciences. His own investigations and the detailed analysis of data available in the literature on oligotrophy led Nikitin to the formulation of *the concept of actual oligotrophy*. Some unique features of oligotrophs allow their detection in particular bacterial taxa. Nikitin emphasized the necessity and feasibility of studying oligotrophs, which are ubiquitous in soils and perform important functions.

V.T. Emtsev from the Timiryazev Agricultural Academy, who long worked with Mishustin and was the coauthor of their excellent textbook on microbiology, presented the report *Soil Microbes and the Degradation of Xenobiotics*. In Emtsev's opinion, the microbial consortia that include autochthonous soil microorganisms are the most efficient and promising degraders of xenobiotics in polluted soils.

O.E. Marfenina from the Moscow State University concentrated on anthropogenic impacts on soil microscopic fungi. One of these is the loss of fungal diversity resulting in the transformation of zonal complexes of microscopic fungi and the formation of specific soil mycobiota with modified properties.

N.D. Anan'eva (Institute of Physical Chemistry and Institute for Biological Instrumentation of the Russian

Academy of Sciences, Pushchino) spoke on the problems of soil remediation from pesticides and the kinetics of the decomposition of xenobiotics in soil. The speaker proposed some microbiological methods for the evaluation of the purification capacity of soil, which can be used for the biomonitoring of soil contamination with pesticides and other xenobiotics.

B.A. Byzov from the Moscow State University concentrated on the dynamics of trophic interactions between soil microorganisms and animals. The principles of such interactions formulated by the speaker must stimulate investigations aimed at estimating the contribution of particular interorganismic interactions to the functioning of soil biota. Such knowledge will allow new effective biological measures for pest control to be developed.

The lecture presented by A.V. Kurakov from the Moscow State University was devoted to the role of microscopic fungi in the transformation of nitrogen in soils. The speaker presented substantial experimental evidence illustrating the involvement of both fungi and bacteria in the nitrogen cycle and emphasized that the roles of these two types of microorganisms at different stages of the cycle may vary depending on the anthropogenic load on the soil and its natural evolution.

All the reports were listened to with great interest by the participants, most of which were students and post-graduates of the Faculties of Soil Science and Biology of the Moscow State University and the Timiryazev Agricultural Academy.

The Conference Proceedings were published as a separate book (D.G. Zvyagintsev, Ed., Moscow: MAK, 2001) and are available on the Internet (<http://www.soil.msu.ru/bio>). The book includes not only lectures but also eleven original papers on various problems of soil microbiology.

The resolution accepted at the Conference described the major advances of soil biology over the one-century period and emphasized the great contribution made by Mishustin to this science.

Soil biology, as one of the ecological disciplines, will be of particular significance in the new century. Advances in this science ensure further progress in the preservation of the biosphere and prevention of ecological disasters. The most important lines of research in the field of soil biology are (1) the study of the biospheric functions of soil biota; (2) soil biology and environmental protection; (3) evaluation of the role of soil biota in the productivity of ecosystems; (4) soil biota and the stability of ecosystems; (5) interorganismic interactions in soil biota; and (6) biological methods for monitoring soil pollution and for soil remediation.

The conference formulated the idea that investigations in the field of soil biology should be coordinated.