

Ultrastructural Plasticity of Cyanobacteria

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Preface

The foundation of this monograph is laid by long-term research of the author together with her colleagues from the Professor Gusev school in microbial physiology at the Biology Faculty of M.V. Lomonosov Moscow State University. This monograph summarizes a considerable body of our pioneering investigations in the field of cell biology of microorganisms. The book deals primarily with cyanobacteria, a most ancient group of phototrophic microorganisms with unique physiology, versatile metabolism, and a vast interspecies morphological diversity. The high versatility of metabolism makes cyanobacteria, the primary producers in microbial communities, a key player determining the evolution pattern of biosphere. The monograph contains a detailed overview of the ultrastructure of the representatives of different subsections of the phylum Cyanobacteria under experimental and natural conditions causing dramatic changes of their mode of existence and behavior. The results of the analysis of ultrastructural changes in the cyanobacteria *Synechococcus* sp., *Anabaena variabilis*, *Chlorogloopsis fritschii* and *Nostoc* sp. comprise a large body of the material presented in this book. These species were deliberately chosen since they are, for a long time, a lovely object for scientists specializing in different fields of microbiology—physiology, biochemistry, genetics, cytologists, ecologists—and are thoroughly studied in many regards. The author truly hopes that the results of the ultrastructural research of their plasticity will give new exciting insights into these incredibly interesting microorganisms.

The work in the academic community of biological faculty of MSU and creative collaboration with other scientific institutes provided to the author as a specialist in the field of cytology a unique opportunity for investigation of numerous fundamentally different experimental systems revealing divers and often unanticipated adaptive capabilities. A detailed information is presented on various species of cyanobacteria (i) grown under optimum conditions, (ii) cultivated using different light regimens, (iii) undergoing enzyme-induced L-transformation, and (iv) existing in natural symbioses and model associations with plant partners. Diverse patterns of cyanobacterial ultrastructural reorganization are described. These patterns are interpreted as manifestations of phenotypic plasticity displayed

in response to environmental changes. The concept of bacterial ultrastructural plasticity as an indication of the operation of adaptation mechanisms functioning on the subcellular, cellular, and population level is discussed. This concept was developed by the author on the basis of her own extensive experimental data and present-day ideas concerning structural and functional adaptation mechanisms and their importance for prokaryotes. Since the experimental data and theoretical conclusions demonstrate that investigation of the ultrastructural plasticity is promising for the study of adaptive capabilities and intraspecific morphological variability in prokaryotes, this book may be of interest to the researcher specializing in various aspects of microbiology. The author believes that it would be useful for cell biologists, plant physiologists, symbiologists, and ecologists, as well as for undergraduate and graduate students of universities and colleges who focus on biology.

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