Preface

This *Microbiology Monographs* volume provides a comprehensive and detailed source of information on endosymbioses between prokaryotes (eubacteria and cyanobacteria) and plants. Our first task is to thank all authors of the chapters in this volume. We greatly appreciate the investment in time and effort they have made to produce the comprehensive coverage of their topics.

The book comprises 12 chapters, authored by well-known scientists in the field. The first three chapters deal with nitrogen-fixing symbioses between rhizobia and legumes, which are the best-known nitrogen-fixing symbioses due to their agricultural importance. The area of genomics has led to great progress in the analysis of these symbioses in recent years. The discovery of beta-rhizobia has shed light on the extent of lateral transfer of symbiosis genes. Plant genetic studies have led to the elucidation of the perception of rhizobial signal factors by legumes, and the signal transduction steps that lead to nodule induction which involve functions recruited from plant symbioses with soil fungi.

The next three chapters concern nitrogen-fixing symbioses between actinomycetous soil bacteria of the genus *Frankia*, and mostly woody plants from eight different families, collectively called actinorhizal plants. These symbioses are important in agroforestry and soil reclamation. Being less accessible to molecular analysis than legume-rhizobia symbioses due to the woody nature of the host plants, and the fact that the microsymbionts are, so far, non-transformable, they have not been examined as closely as legume symbioses. However, transfer of knowledge obtained in legume research to actinorhizal research has recently shown that in both symbioses, the same signal transduction pathway is used in response to microsymbiont signal factors. The fact that *Frankia* strains cannot be transformed is in agreement with the lack, or rarity of, lateral transfer of symbiosis genes in this phylogenetic group, constituting a strong contrast with the situation in rhizobia.

The next five chapters deal with symbioses between cyanobacteria and mosses, ferns, gymnosperms and one angiosperm genus, *Gunnera*. As precursors of chloroplasts, filamentous heterocystous cyanobacteria are arguably the most successful endosymbionts in evolution (apart from the precursors of mitochondria), so it is not surprising that many symbioses exist between cyanobacteria and lower plants as well as gymnosperms. It is striking that only one cyanobacterial angiosperm symbiosis has evolved. The symbiosis between cyanobacteria and the water fern *Azolla* is of special importance, not only because of the role of *Azolla* as green manure in rice culture, but also because here, the cyanobacterium is an obligate symbiont, unable to survive outside the plant. A cameo chapter on tripartite lichens – symbioses between cyanobacteria, algae, and fungi – has been added.

The last chapter summarizes the current knowledge on endophytic diazotrophs. Endophytic bacteria, which do not cause any harm to the plant, but actually may support plant growth, are found in most plant species, but it has to be closely analyzed how this growth promotion is achieved, and whether under certain circumstances a usually advantageous endophyte may turn into a parasite.

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