

# Preface

Because of their photosynthesis, plants are the major primary producers in terrestrial ecosystems and a precious source of organic carbon for all their microbial symbionts. Biotrophic microbial symbionts derive nutrients from the tissues of the living host, and they often colonise the plant cells where they form intracellular structures that are the site of nutrient uptake and exchange, as well as of interorganismal signaling and communication. To colonise the plant tissues via balanced endosymbiosis, all biotrophic microbes, irrespective of their trophic strategy, need to overcome the plant defense responses through an exchange of molecular signals.

Plants are unique as they are able to associate with both prokaryotic and eukaryotic microbes and establish with them well-balanced symbiotic interactions that range from mutualism to antagonism. No other multicellular organisms give rise to this variety of symbiotic interactions. Plants must be able to discriminate between mutualistic micro-organisms that may exchange organic carbon for essential nutrients such as nitrogen and phosphorus, thus promoting plant growth, and antagonistic pathogens that are only detrimental and cause disease. As this volume is making clear, a fine tuning of the signals in plant symbioses is very complex and still only partially understood.

This volume provides overviews of the current knowledge on a variety of symbiotic systems. The first section is dedicated to signalling during the formation of mutualistic symbioses in legume plants. Legume plants have been pivotal to understand the genetic bases of symbioses and the comparison between nodule and arbuscular mycorrhizal (AM) symbioses has revealed a common symbiosis (SYM) signalling pathway leading to intracellular accommodation of fungal and nitrogen fixing bacterial endosymbionts. The recent discovery that AM fungi secrete symbiotic signals that resemble rhizobial lipochito-oligosaccharides (Maillet et al. 2011) brings the similarities between these two symbioses even further. Despite the importance of legumes as model systems to study mutualistic symbioses, there is a great diversity of plant-microbe interactions that involve nitrogen fixing bacteria others than rhizobia, and a variety of other mycorrhizal and endophytic fungi. Some of the chapters in this book provide current knowledge on these diverse

interactions, and witness the progress in the unravelling of genetic determinants in plant-microbe signalling, and the impressive amount of data emerged from the use of both genomic and post-genomic approaches. The last section of the book is focused on the interaction of plants with antagonistic biotrophs, ranging from filamentous fungi to oomycetes, and to nematodes.

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## Reference

Maillet et al. 2011. Fungal lipochitooligosaccharides symbiotic signals in arbuscular mycorrhiza. *Nature*, 469:58–63

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