Preface

The reproductive organs and mating biology of angiosperms exhibit greater variety than those of any other group of organisms. Flowers and inflorescences are also the most diverse structures produced by angiosperms. Why should organs that serve but one main purpose, reproduction, evolve such matchless variety? The answer seems to lie in the interactions of plants with their pollen vectors, which are necessary to overcome the fundamental mating problem confronted by plants, namely their immobility. The significance of these interactions is apparent in the observation that most of the reproductive diversity of flowering plants involves features that function during pollination and mating. Thus, the search for explanations of this diversity should logically focus on mating as a process and an outcome, its ecological and genetic context, its consequences for variation in maternal and paternal success within and between populations, and its evolution within species and lineages.

Analysis of the function and evolution of flowers has changed considerably during recent decades. The traditional descriptive, natural-history approach, which focused almost exclusively on flowers themselves, is increasingly accompanied by conceptually motivated experiments in both the laboratory and field, formal mathematical theory, genetic analysis, and studies of pollinator behaviour. In addition, the scope of topics considered has broadened significantly as the long-standing, artificial division between ecological studies of pollination and genetic studies of mating has eroded, so that the reproductive biology of plants is fully integrated into evolutionary ecology. This expansion of approaches and perspectives continues to expose new questions and stimulate reanalysis of enduring questions. For example, during the decade since the publication of the previous general research volume on floral biology[1], topics that have attracted increased interest include: pollen limitation of seed production; the nature and strength of selection on floral traits; inflorescence function; the relative incidence and consequences of specialization and generalization in plant-pollinator interactions; the occurrence, causes and implications of hybridization; the community context of plant reproduction, including the effects of herbivory on floral evolution; and the phylogenetics and comparative biology of floral adaptation. Moreover, the scale at which some of these topics are now being investigated has expanded beyond the local population to encompass a broader geographical context, including metapopulations and regional assemblages. Given the dynamic nature of this discipline, a review of recent developments seemed timely, which prompted us to organize this volume.

Ecology and Evolution of Flowers includes 18 chapters written by internationally recognized authorities, which both review recent advances in floral biology and present new results. The chapters are organized into an introductory chapter and four major sections that consider different aspects of floral ecology and evolution. The first chapter reviews the seminal contributions of David G. Lloyd to the strategic analysis of plant reproduction. We have chosen to highlight Lloyd's contributions, because his penetrating functional analysis, until illness ended his research career in 1993, identified the current research agenda for major areas in plant evolutionary biology. The remaining chapters build on Lloyd's legacy and illustrate the ecological function of flowers, the

[1] Lloyd DG, and Barrett SCH (1996). *Floral biology: studies on floral evolution in animal-pollinated plants*. Chapman and Hall, New York.

alternate evolutionary solutions that enable plants to reproduce successfully in varied environments, and the resulting process of adaptive diversification. In all cases, we encouraged authors both to provide a synopsis of current knowledge of their chosen topic, and to use their own empirical or theoretical studies to illustrate current issues and prospects for future analysis in more detail.

The major sections of ***Ecology and Evolution of Flowers*** in turn examine functional aspects of floral traits, the ecological influences on reproductive adaptation, the evolutionary ecology of mating and sexual systems, and the role of floral biology in angiosperm diversification. The first section, "Strategic perspectives on floral biology", presents current theoretical perspectives on the relations of fitness to reproductive allocation and floral traits and their implications for floral adaptation and mating-system evolution. The second section, "Ecological context of floral function and its evolution", illustrates that the evolution of reproductive strategies does not occur in isolation, but instead depends on population characteristics and the influences of other species in the community that act as mutualists, competitors or predators. This section also considers the consequences of anthropogenic disturbance for floral function. The third section, "Mating strategies and sexual systems" considers the functional consequences of the diverse deployment of female and male organs within flowers and within and among plants. This variety in organ deployment contributes to the diverse patterns of mating within plant populations and characterizes the remarkable variety of sexual systems in angiosperms. The final section, "Floral diversification", examines the genetic opportunities and constraints associated with floral adaptation and considers the role of this floral evolution in speciation, species integrity and lineage diversification. All sections of the volume are supported by a glossary to assist readers in understanding relevant terminology and concepts of plant reproduction, ecology and evolution. Overall, this integrated treatment illustrates current understanding of the role of floral function and evolution in the generation of angiosperm biodiversity and offers many suggestions for the next phase of research on this intriguing subject.

Compilation of such a volume requires the involvement and cooperation of many participants. We are grateful to numerous individuals who contributed to the content and production of this book. First and foremost, we acknowledge the essential contributions of the authors, who provided the necessary content, worked to enhance synergy among chapters, and tolerated the idiosyncrasies of the editors. Second, we greatly appreciate the continued enthusiasm for this project of Ian Sherman (Commissioning Editor, Biology, Oxford University Press) and his decisiveness in moving the volume along. We also thank the many individuals who reviewed individual chapters, thereby enhancing the volume as a whole, including: Lynn Adler, Paul Aigner, Scott Armbruster, Camille Barr, Christine Caruso, Andrea Case, Pierre-Olivier Cheptou, Mitch Cruzan, Marcel Dorken, Tim Holtsford, Linley Jesson, Pedro Jordano, Peter Klinkhamer, Josh Kohn, Claire Kremen, Elizabeth Lacey, David McCauley, David Moeller, Bill Morris, Sally Otto, Emmanuelle Porcher, Shane Richards, Loren Rieseberg, Ophélie Ronce, Satoki Sakai, Doug Schemske, Dan Schoen, Stacey Smith, John Stinchcombe, James Thomson, Jana Vamosi, Diego Vázquez, Arthur Weis, Colin Webb, Steven Weller, and Paul Wilson. The assistance of Bill Cole, Chris Eckert, and Matt Routley was invaluable in facilitating reviews and interaction among authors. In addition, Stefanie Gehrig (Assistant Commissioning Editor, Biology, Oxford University Press) aided considerably during the final production of this book. Finally, we thank Dale Hensley and Suzanne Barrett for tolerating our compulsive fascination with flowers and for their forbearance while we were immersed in the writing and editing of this volume.

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