speciation. The genetics of speciation is not covered in similar detail. However, this mainly reflects the fact that genetic research in birds has lagged behind that of other taxa, whereas birds have long been important research subjects in the fields of ecology and behavior.

The book should be an important reference guide to graduate students and researchers in evolutionary biology and ecology; and the educated nonspecialist should find much of interest in this well-written and thought-provoking book. In addition, several new ideas are presented in the book, and the author is not afraid of suggesting general conclusions to highly debated subjects based on the available data. Hence, although he may be challenged on some of his ideas and conclusions, or even proven wrong at certain points, I am confident that the book will spur further debate and inspire new research in the time to come. These are indeed exciting days in speciation research.

REFERENCES

Coyne, J. A., and H. A. Orr. 2004. Speciation. Sinauer Associates, Sunderland, Massachusetts.

Gavrilets, S. 2004. Fitness landscapes and the origin of species. Princeton University Press, Princeton, New Jersey.

Glenn-Peter Sætre, Centre for Ecological and Evolutionary Synthesis (CEES), Department of Biology, University of Oslo, P. O. Box 1066, Blindern, N-0316 Oslo, Norway; E-mail: g.p.satre@bio.uio.no

Syst. Biol. 57(3):516–517, 2008
Copyright © Society of Systematic Biologists
ISSN: 1063-5157 print / 1076-836X online
DOI: 10.1080/10635150802208798

Ecology and Evolution of Flowers.—Lawrence D. Harder and Spencer C.H. Barrett (editors). 2007. Oxford University Press, New York. 392 pp. ISBN: 978-0-19-857085-1 (hardback, 2006) $150 $75. ISBN: 978-0-19-857086-8 (paperback) $75 $39.95.

Flowers, for all their iconic status as symbols of romance and grief, are principally functional structures of plant reproduction. Freed from folklore, and studied in relation to their ecology and evolution, flowers are revealed as highly complex assemblages of organs that are subject to natural selection and ecological contingency, and to the interplay of those processes. This is aptly summarised in the opening sentence of this important book, where Lawrence Harder and Spencer Barrett state that reproductive structures and mating in the flowering plants "exhibit greater variety than those of any other organisms."

Understanding how and why this variety has arisen, and the implications for our appreciation of evolutionary processes and ecological functions (including the conservation of plants and their pollinators), is currently the focus of huge research effort. Over 1000 publications on plant reproduction appeared last year, and that number will surely continue to rise as more scientists realize what a fascinating and important topic this is. A true understanding of flowers requires us to span disciplines as diverse as community ecology, molecular phylogenetics, population genetics, and developmental biology. Edited volumes such as this one therefore serve as conceptual Geographical Positioning Systems, providing bearings and way markers across the topography of the subject. *Ecology and Evolution of Flowers* can be seen in part as an update of *Floral Biology: Studies on Floral Evolution in Animal-Pollinated Plants*, edited by the late David Lloyd and Spencer Barrett; and it does indeed do a wonderful job of showing where we have been and where we are heading to, albeit from the perspectives of a limited range of authors, as is always the case with such volumes.

Barrett and Harder's opening chapter is an appreciation of the life and research of David Lloyd, viewed in terms of his contributions to the strategic perspectives on flowering plant reproduction that emerged in the 1960s. That Lloyd was still publishing research over 30 years later, despite suffering from a sudden and highly debilitating condition in 1992, is remarkable. This chapter is a fitting testament to the life and work of a man who is viewed with high esteem and affection by colleagues across the world.

The 17 chapters that constitute the remainder of the book are divided into four thematic parts, each with a short introduction that sets out the scope of that section. Part 1 (Strategic Perspectives on Floral Biology) begins with a chapter by Martin Morgan that deals with phenotypic selection on flowering plant reproductive characters. His approach is from an evolutionary stable strategy (ESS) standpoint but he acknowledges the limitations that these models, with their assumptions of "a constant pollination environment," impose upon a spatiotemporally variable ecological context. The next chapter, by Da-Yong Zhang, also uses ESS models to understand investment in reproduction and allocation to sex function but with less appreciation of the variable ecological milieu in which plants exist. The final chapter in Part 1, by Lawrence Harder and Matthew Routley, provides a detailed account of the different fates that can occur for pollen and ovules and their implications for the evolution of mating systems.

Part 2 deals with the ecological context of floral function and evolution and begins with a chapter by James Cresswell on models of gene dispersal via pollinators. Cresswell succeeds in bringing together "three iconic

patterns" of pollen dispersal (in relation to distance, plant population size and individual plant success) to consider an overall model of gene dispersal, and discusses the current limitations of our knowledge. Monica Geber and David Moeller next consider floral evolution at a community scale (surely the appropriate scale for any but the most isolated plant populations) and highlight the importance of the community context in an overview of their current research on the genus *Clarkia*. Selection on floral traits by non-pollinating animals has emerged as a critical area for consideration in recent years, and it is the subject of the next chapter by Sharon Strauss and Justin Whittall. The overall conclusion of this chapter is that pollination biologists who ignore antagonistic interactions that can destroy floral function may be missing important selective processes acting on the evolution of those flowers. Chapter 8, by Gaku Kudo, looks at the importance of timing of flower production for individuals and populations and provides a rich review of the ways in which biotic and abiotic processes influence the flowering phenologies of plants. Finally, Marcelo Aizen and Diego Vazquez discuss how human alteration of habitats such as fragmentation, fire, and pollution can influence "flower performance" and thus the reproductive success of plant populations. This is the only chapter with an explicitly conservation perspective, though it is implicit in some of the others; and other recent books have given it greater emphasis.

Part 3 consists of four chapters on the subject of "Mating Strategies and Sexual Systems," beginning with an analysis by Chris Eckert, Karen Samis, and Sara Dart that goes beyond simplistic models of reproductive assurance to show just how complex self-fertilization is as a reproductive strategy. The following chapter considers another trend in flowering plant reproduction, as Tia-Lynn Ashman reviews the evidence for and against different explanations of how separate sexes can evolve from the ancestral hermaphroditic condition and (like Strauss and Whittall in chapter 7) highlights the importance of antagonistic interactions. John Pannell, in chapter 12, continues this theme with a review of the evolutionary implications of long-distance dispersal, for example, to oceanic islands, on plant sexuality. Finally in this section, Spencer Barrett and Kathryn Hodgins review their work on sexual polymorphisms in *Narcissus*, which has emerged as a model genus in this respect.

"Floral Diversification" is the topic of the final section and, given the huge diversity of the angiosperms, it is fitting that the range of subjects covered is equally wide. Jeff Conner begins with a review of flower evolution from an ecological genetics point of view, with an emphasis on his work on the family Brassicaceae. In their review of the geographical context of floral evolution, Carlos Herrera, Maria Castellanos, and Mónica Medrano highlight a comparatively neglected area of research that is likely to be more prominent in the future. Steve Johnson revisits some of these ideas in a chapter that takes an explicitly Darwinian point of view to discuss how pollinators can be responsible for driving speciation in flowering plants. Chapter 17, by Kathleen Kay and colleagues, poses questions about the role of floral characters such as nectar spurs in promoting diversification, whilst the final chapter by Diane Campbell and George Aldridge highlights the importance of hybridization in generating floral novelty and how pollinators respond behaviorally to such hybrids. A useful glossary rounds off the text.

Not all of the chapters in this broadly focused book will appeal to all readers, but all researchers in the field of flower biology will find something to interest them in these thought-provoking reviews and syntheses. My personal preferences are for those chapters that consider the importance of ecological setting and geographical variation on floral evolution and function. These are (in my view) areas which will emerge as especially important in the coming years: it is only by understanding the spatio-temporal context of plant-pollinator interactions that we can appreciate how flowers have evolved and how they operate in relation to their ecological, functional, and phenotypic specialization or generalisation. This in turn is the starting point for understanding how changes in pollinator abundance (including extinction and alien introduction) and shifts in flowering time can contribute to plant population extinction.

As previously mentioned, this conservation perspective is lacking in this book, which is notable in a field in which concerns about the ecological impact of pollinator declines and species introductions is fuelling much of the research. Perhaps this is not surprising: during a recent conversation with a colleague (actually one of the chapter authors in this book) we agreed that the field of pollination biology is so wide that it is possible to study some aspects (for example, evolution of self incompatibility or the ecology of gene flow) and yet be largely unaware of other fields, such as pollinator behavior or scent chemistry. Perhaps pessimistically, we concluded that it may never be possible to synthesize and integrate such a broad subject, and in fact thinking of it as a single field may be inaccurate. To paraphrase Chris Eckert and colleagues in chapter 10, the study of the ecology and evolution of flowers has an intuitive simplicity that belies a considerable underlying complexity. This volume surely takes our understanding of that complexity forward and is highly recommended as an account of the state of a fast evolving arena of research.

Jeff Ollerton, Landscape and Biodiversity Research Group, School of Applied Sciences, University of Northampton, Park Campus, Northampton, NN2 7AL, U.K.; E-mail: Jeff.Ollerton@northampton.ac.uk