Plant-Pollinator Interactions: from Specialization to Generalization. Waser, Nickolas M. and Jeff Ollerton (eds). 2006. University of Chicago Press. $45.00 (USD) paperbound, ISBN 0-226-87400-1, xii + 445 pages.

Seldom does one wax poetic about an edited volume arising from a symposium at a large national meeting. This volume edited by Nick Waser and Jeff Ollerton is a glorious exception. They have compiled a rich set of papers, from diverse authors, all delivering a single unified message. What makes this even more amazing is that authors used different formats and even clearly showed disagreements with one another.

Yet, this volume is coherent and peppered with numerous references between the chapters. Read this book and soak in the wealth of details and perspectives.

All chapters were initially presented at the Ecological Society of America's 2002 annual meeting in a symposium titled "Specialization and Generalization in Pollination Systems", although curiously the editors failed to mention this. The volume is divided into three equal-length sections titled the ecology and evolution of specialization and generalization in pollination, community and biogeographic perspectives, and applications in agriculture and conservation. These are roughly on evolutionary, community, and human ecology. The editors contributed introductory remarks to each section, as well as a pair of bookends that serve as prologue and epilogue to the entire volume.

Despite the wide variety of backgrounds of the contributors, there was unanimity on two essential points. First, all contributors agreed that defining specialization of pollinator-plant interactions requires context, i.e. defining the spatial, temporal, and taxonomic scales over which a given researcher is working. As Paul Simon (1973) quipped about high-density urban life, "One man's ceiling is another man's floor." Second, all contributors agreed that a specialised pollinator can pollinate generalist plants, while specialists plants (i.e. those relying on only a few pollinators for seed set) can be pollinated by generalists pollinators. Reciprocal specialisation cannot and should not be considered the norm. It was a joy seeing these two points made from so many different perspectives.

Although papers in this volume were state-of-the-art, they lacked mathematical sophistication. This implies that the authors focussed on biology, in lieu of mathematics. There were some obvious foibles, such as one chapter that repeatedly referred to scalars as eigenvectors rather than eigenvalues. To be constructive and not overly picky, I want to focus on the quintessential notion of quantifying degree of specialization across an ensemble of interacting pollinators and plants.

Several authors discussed connectedness of plant-pollinator interactions, but only cobbled together suboptimal methods for quantifying connectedness. This is strange insofar as off-the-shelf mathematical tools exist, such as cut sets and mutual entropy. Jordano et al. came close to the graph theoretic notion of cut sets, but they redacted vertices rather than edges from the graph of interactions. Several authors mentioned niche breadth and overlap as a proxy for connectedness. Mutual entropy provides a robust measure of niche breadth and overlap (Colwell & Futuyma 1971 *Ecology*), as well as a robust measure of specialization or generalization of pollinator-plant interactions (Gorelick et al. 2004 *Am. Nat.*). Yet the contributors to this volume only mentioned marginal entropy, which is really only useful when dealing with a single entity. Shannon (1948 *Bell Sys. Tech. J.*) showed that mutual entropy is needed for quantifying interactions between multiple entities. In addition, other useful mathematical methods probably still need to be developed. For example, level of connectedness almost certainly depends upon whether one is a taxonomic lumper or splitter, although none of the contributors tried to gauge this sensitivity. Therefore, when quantifying pollinator-plant interactions, it would be useful to have phylogenetic comparative methods on bipartite graphs. My suspicion and hope is that the field of plant-pollinator interactions will advance in leaps and bounds once the methods discussed in this volume are coupled with improved mathematical methods.

My biggest problem with this volume is that the title was misleading and should have been "angiosperm-pollinator interactions". Gymnosperm pollination was never mentioned in this volume, even though most (all?) cycads and many gnetophytes are insect pollinated. Gymnosperm-pollinator interactions would have allowed for many independent tests of the hypotheses presented in this volume. I was especially surprised about this omission after noticing acknowledgement of Irene Terry, who has published seminal papers on weevil and thrip pollination of cycads. But, alas, this is a minor complaint and should not detract from the beauty and coherence of this volume.

This volume explicates many fascinating open research questions, a veritable windfall for nascent graduate students. Research on pollinator-plant interactions is important enough that Waser, Ollerton, and the other contributors should seriously contemplate reconvening in a few years to put together yet another, updated volume on this subject. If it is half as good as their current volume, every ecologist and pollination biologist should read it. Until then, we will all have to read the current marvellous volume.

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