

but also ways to ensure continued success through the protection of their habitat.

Nature's ghosts is more than just a chronicle of people, places, and events. It is a conceptual history of extinction from its inception just over 200 years ago to the present—when modern conservation biologists wrestle with how to preserve what may soon be the largest loss of biodiversity in the earth's history. With more than 80 pages of endnotes and an extensive bibliography, Mark Barrow has written a scholarly work that contains important lessons not only for those currently involved in protecting species, but for all ecologists. What should be the role of scientific societies like the ESA in influencing public opinion and policy? How can ecologists become involved in the policy-making process while maintaining their scientific objectivity? As a young ecologist during the 1970's, I saw the ESA primarily function as an organization interested in the *science* of ecology. That began to change significantly in the 1980's with the establishment of the Public Affairs Office. A point that Barrow makes again and again is that while science can provide

the necessary foundation for establishing environmental programs and policies, it, in itself, is not enough. Many of the individuals chronicled in this book are ecologists and naturalists who through years of dedicated research worked to document the reality of extinction. But in the end it is not just enough to know that it is occurring. One must be able to put that knowledge to use, and that requires a broader perspective and a willingness to work with others to achieve those ends. That is the real lesson that *Nature's ghosts* teaches.

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A first date without getting to first base

Butlin, Roger, Jon Bridle, and Dolph Schluter, editors. 2009. **Speciation and patterns of diversity**. Cambridge University Press, New York. x + 333 p. \$140.00 (cloth), ISBN: 978-0-521-88318-4; \$65.00 (paper), ISBN: 978-0-521-70963-7.

Key words: adaptive radiation; biodiversity; biological diversity; evolutionary diversification; natural selection; patterns of diversity; speciation; species diversity gradients.

The central objective of this book is to foster dialogue and integration between research on mechanisms of speciation and research on patterns of biodiversity. This dialogue is long overdue given that all speciation is obviously a prime driver of biodiversity. The request to review the book came with the teaser: "I hope this book is close enough to your interests that you will want to read it. You should know that my best reviewers are always people who need to read THAT book." Although I couldn't attest to the quality of my review, I did know that I had to read THAT book—and that I had already purchased it. Now I had a great excuse to start reading, and I decided to use the book as the basis of my lab group meetings for the early fall of 2009. We started out primed by high expectations.

The book succeeds admirably on several levels. First, nearly all of the individual chapters are outstanding, sometimes passionate and personal, reviews of the research programs of their authors. Many of the chapters are, quite simply, the best and most authoritative reviews available. Second, the chapter topics are quite diverse, as I will outline below, which forced us to read about subjects that we otherwise wouldn't—but should. For these reasons, the book provides an excellent framework for academic discussion groups.

Unfortunately, the book largely fails in its goal of dialogue and integration: it is a mosaic of different ideas and topics, rather than a melting pot that would give us something wholly new and integrated. Indeed, it sometimes feels as though the authors met at the symposium on which the book was based,

presented their research, and then went home and wrote up their chapters without thinking much about what the other participants had to say. And yet, the book might ultimately succeed in fostering future dialog despite—or perhaps because of—this deficiency: if a book proposing integration so obviously fails to achieve it, the gap between the two fields becomes more striking and (hopefully) motivational.

The book begins with an introductory chapter in which the editors describe how speciation mechanisms might influence patterns of diversity. These points of possible integration are generally not taken up in the chapters that follow. For instance, the editors make an important point about how ecological versus non-ecological mechanisms of speciation should have very different consequences for patterns of diversity, and yet the following chapters provide no tests of this prediction.

Every book on speciation has an obligatory chapter on the "species problem," and Hey is here charged with saying something new on the topic. He does so by first highlighting the problem of relying on statistical significance in the designation of distinct species, and he then defines two alternative criteria: a particular length of time since the populations split and a particular level of gene flow between them. Our group didn't fully agree with these criteria, but then disagreement is symptomatic of all (fun) discussions of the species problem. It would also have been nice to see the other systems discussed in the book evaluated under these criteria.

The next three chapters discuss diversification in asexuals. Here is where another limitation of the book first becomes apparent: a scarcity of cross-referencing among chapters. My lab group had a particular favorite example. In one chapter, Bell opined that "The two complementary concepts that follow naturally from the sexual life cycle are species and gender: mating takes place between individuals of like species and unlike gender Consequently, 'species' and by extension 'speciation' refer exclusively to sexual eukaryotes, and using the same labels for asexual organisms such as bacteria leads only to confusion." The other two chapters on asexuals (one by Barraclough, Fontaneto, and Herniou and one by Curtis, Wallbridge, and Sloan) then discussed speciation without

addressing Bell's comment. This omission does not negate the concepts discussed in those chapters, but it does make readers wonder whether, or how closely, the different authors considered each other's points. Further illustrating the point, the chapters on asexual and sexual organisms had only a single, passing, cross-reference to each other.

Next up is a chapter by Bridle, Polechová, and Vines that reviews how organisms might or might not adapt to environmental variation in space and time. This chapter provides initial integration of these two dimensionalities, one that should be read by ecologists interested in the potential for evolutionary rescue in disturbed populations. The chapter does not, however, integrate this variation within species with evolutionary diversification. Then comes one of the few chapters that really does integrate mechanisms of speciation with patterns of diversity: a simulation model of adaptive radiation by Gavrilets and Vose. I wish that authors of the other chapters had specifically commented on whether the patterns discovered by Gavrilets and Vose were also seen in their systems.

Next follow excellent reviews of ecological speciation (when divergent selection drives reproductive isolation) in *Timema* walking sticks (Nosil and Harmon), *Pundamilia* cichlids (Seehausen), *Heliconius* butterflies (Mallet), and *Neochlamisus* leaf beetles (Funk). Each of these systems is becoming a classic example of ecological speciation, and so it's great to read updated reviews that also explore new and general ideas. In the same order as above, these chapters focus on the importance of niche dimensionality, environmental gradients, hybridization, and integrated analysis methods. Sadly, however, none of these chapters spends much time connecting these ideas to patterns of biodiversity.

The book then transitions from speciation mechanisms to patterns of diversity. The transition is abrupt, apart from a chapter where Schemske revisits the classic problem of latitudinal species diversity gradients and asks how they might be influenced by different speciation mechanisms. This chapter comes reasonably close to the book's objective of a true dialogue, and although it isn't a formal analysis, the author suggests quantitative tests that could be performed. I found myself pining for more chapters on spatial patterns of diversity.

Instead, the book closes with four chapters on whether speciation rates vary through time, with authors including Phillimore and Price; Ricklefs; Purvis, Orme, Toomey, and Pearson; and Alroy. Some of these chapters are individually excellent, although they do not explicitly incorporate speciation mechanisms. Rather, speciation is a rate parameter that is tested for variation through time, with most authors concentrating on biases that can arise in doing so. The resulting temporal patterns can certainly hint at mechanisms, such as shifting geographic distributions, ecological opportunity, species interactions, or environmental triggers, but many alternative explanations remain possible. Although these final chapters all address a similar topic, they sometimes contradict each other without interpretation, and each ignored potential biases that the others emphasized as being important. Moreover, the last five (pattern) chapters had only a single, again passing, reference to any earlier (mechanism) chapter.

Evaluation is contingent on expectation. If this is low, it is easily surpassed, engendering a favorable view. If high, it is rarely exceeded, engendering disappointment. For this book, I had high expectations for dialogue and integration that weren't met. But I was probably too naive given that few research programs have progressed far in this direction. And, of course, a lack of integration across chapters afflicts most edited volumes—as opposed to monographs. Perhaps the editors should be commended for presenting this mosaic honestly rather than forcing a premature melting pot—thereby highlighting that very real deficiency that afflicts these research areas. In the end, you should read this book not to find out what has been done (although read it for that too), but instead to realize what should be done next.

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