

Inside the Tangled Bank

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Source: BioScience, 52(12) : 1141-1143

Published By: American Institute of Biological Sciences

URL: [https://doi.org/10.1641/0006-3568\(2002\)052\[1141:ITTB\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2002)052[1141:ITTB]2.0.CO;2)

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Inside the Tangled Bank

Parasitism: The Diversity and Ecology of Animal Parasites. Albert O. Bush, Jacqueline C. Fernández, Gerald W. Esch, and J. Richard Seed. Cambridge University Press, Cambridge, UK, 2002. 566 pp., illus. \$130.00 (ISBN 0521662788 cloth).

evolution have appeared in the past decade, and they continue to appear (Brooks and McLennan 1993, Poulin 1998, Combes 2001, Moore 2002). This attests to the growth of interest in parasitism, but none of those books is appropriate as an introductory text. The trend adds to the disjunction between

the teaching of parasitism at the undergraduate and the graduate levels. It is the reason so many nonparasitologists, sitting on search committees and making decisions about funding for basic research, view parasitology as primarily a clinical or pharmaceutical activity, and parasites as bizarre evolutionary products having

Many parasitologists who teach in undergraduate institutions lead a double life. In our classrooms we dutifully extol the virtues of the biomedical approach to parasitism, pandering to the premed students who provide the enrollment necessary to ensure that our administrators permit us to teach parasitology. And yet, when we teach graduate students and when we interact with our colleagues at meetings, we all acknowledge that the glue that holds the discipline of parasitology together is the ecological–evolutionary nature of host–parasite associations. This is true for medical, veterinary, and wildlife disease parasitologists, just as it is for the systematists, ecologists, population biologists, developmental biologists, physiologists, and cell and molecular biologists.

I have often heard parasitologists muse about teaching a different kind of undergraduate course, one that would emphasize the basic diversity of parasites and then explain their associations from the ground up. Such a course would place the species of biomedical/veterinary/wildlife disease importance in their proper evolutionary and ecological context. Previous textbooks that attempted this task are long out of print, and the past decade has seen such an explosion of interest in the evolutionary biology and ecology of parasites that most of those texts are outdated in any event. Most of us are barely able to keep up with advances in our own areas of specialization and find the task of distilling the information in those specialized texts into undergraduate teaching material daunting.

A fair number of highly technical and scholarly texts on parasite ecology and

little to offer general biology on their own. Further, those nonparasitologists who become fascinated with parasites and their possible influences on the evolution of their hosts often have only a rudimentary appreciation for the diversity and complexity of parasites and their associations.

The authors of this text have changed all that. They represent a “dream team” of superstars, with superb credentials both in undergraduate teaching and in graduate training and research. Three have had the dubious honor of chairing an academic department at some point in their careers, after which writing a general textbook with only four authors must have seemed quite peaceful. Two are among the authors of one of the few parasitology articles that has become a *Citation Index* classic publication, a seminal position paper setting out standard terminology for important aspects of parasite ecology (Margolis et al. 1982).

What these authors clearly comprehend is that one cannot understand par-

asites without adopting a fundamentally macroevolutionary viewpoint—understanding both their evolutionary legacies (which explains, for example, why all species of *Schistosoma* have similar life cycles and morphologies), as well as their ecological interactions with their environments, most of which are other living organisms.

Accordingly, the text of this book comprises two parts: In the first part, the authors emphasize the diversity of the various major, and minor, parasite groups; in the second part, they begin from first principles and basic population biology. They proceed to describe the structure of parasite diversity hierarchically from infracommunities to component communities to compound communities. As they do so, they weave in larger spatial and temporal scales.

At the end of the book, the astute student has glimpsed the enormous panorama of parasitism on a global scale. Parasites are everywhere, inhabiting everything. They are deeply embedded

throughout all ecosystems, to such an extent that simply knowing the parasites and their life cycles is sufficient to know much of the trophic structure of communities of free-living species. Parasites influence, and are influenced by, the population biology and community ecology of their hosts. They have long evolutionary histories of associations with ancient and modern host groups, often revealing aspects of the distant past, including episodes of global climate change and the drifting of continents. They are the very essence of Darwin’s tangled bank. Parasites thus are intrinsically interesting to study not simply because they are complex and beautiful but also because they are such wonderful examples of many general evolutionary and ecological principles. One could use this text to teach a general introductory evolution or ecology course as well as a parasitology course.

Finally, the student who uses this text as part of an educational voyage of discovery learns to think about parasitic disease in a new way. Evolutionary theory teaches us that all evolutionary changes are the summation of both costs and benefits, and many parasitic diseases in humans are part of the cost of civilization. Those species represent a relatively small percentage of all parasites, and they exhibit very interesting yet in many ways atypical biology. We humans have created many of the conditions in which parasitism becomes parasitic disease; paradoxically, we have produced an arms race between parasites and our technology that parallels the evolutionary arms race between many parasites and their hosts. In this parasitology text, the student comes to understand that the connection between parasitism and parasitic disease is ecological and highly contextual. In my mind, this object lesson in humility is something that can benefit every student, but especially those intending a career in human or veterinary medicine.

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seldom recognized adequately for their efforts. If a field does not develop rapidly, does not become trendy, no one pays much attention to the efforts. If a field does become trendy, few remember or acknowledge, in the flush of excitement and the competition for professional fitness in a hot area, the pioneers who made it all happen in the first place.

Fortunately for the progress of science, people like Moore are not deterred by these unpleasant realities. In this book, Moore has managed to capture the spirit

of why she does what she does, the magic of discovery in a virtually unknown world. She conveys to the novice (that is, anyone not fortunate enough to have spent much time looking at parasites) the wonder of the tangled bank of host–parasite interactions that may have behavioral consequences. She does so through a sequence of examples illustrating each conceptual point. All of this is done in a comfortable, conversational writing style and with a perfect mix of illustrations that does not in any way de-

SURVEYING THE REALM

Parasites and the Behaviour of Animals. Janice Moore. Oxford University Press, Oxford, UK. 2002. 315 pp., illus. \$45.00 (ISBN 0195084411 paper).

More than any other living biologist, and likely more than any biologist in history, Janice Moore has devoted her professional life to discovering, documenting, and explaining the behavioral consequences of host–parasite interactions. As in numerous other areas in evolutionary biology and ecology, theories and models about such effects have developed far more rapidly than the empirical database. As a parasitologist, Moore understands why this is so and, characteristically, says so.

Parasites have extremely complex lives, and they can be found in a wide variety of taxa, each of which is characterized by a unique and complex evolutionary legacy. In addition, the great majority of the research funds spent on parasites throughout the world is focused on a tiny percentage of parasitic species. What Moore does not say is that the intersection of these two realities, one biological and one socioeconomic, means that only a few intrepid souls with an iron will and almost obsessive desire to peer into the unknown will be able to manage the long march of discovery. People like Moore are

tract from the scholarly nature of the text. Moore is not only very good at what she does, she is also very good at explaining it. The only boring thing about this book is its title, and I imagine that was not her first choice. That notwithstanding, this book is going to inspire students to take up the challenge in the next generation. And, as Moore points out, this kind of study is a challenge, demanding that a researcher be part field biologist/naturalist, part laboratory experimentalist, and part modeler.

Researchers like Moore are professionally fearless, or they would not be pioneers. In this book, Moore puts all the evidence on the table, not just that which fits a particular viewpoint. There is a 60-page annotated appendix of published studies documenting intriguing associations between parasites and host behaviors, and a 69-page bibliography attesting to the depth of her scholarship and love of discovery. She puts forward her views, discusses alternatives, and, when warranted, freely admits that we do not yet know enough to make a strong decision.

In the final chapter, she does not claim to have found any first principles, or even that such exist. In fact, she acknowledges that what little we know may have built-in biases, which casts doubt on the notion that we will discover statistically significant generalizations about the ways in which parasites influence host behaviors. She does claim, however, to have shown that the relatively few studies of behavior in the context of host-parasite relationships have provided extraordinary glimpses of a virtually untapped goldmine for evolutionary biologists, ethologists, and ecologists. And she is absolutely right. After all, when we get past the theories, past the models, past the meta-analyses, past the biases in funding of such research, we will always be left with those orange-colored cystacanths, those pulsating sporocysts, and those insane ants.

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WHAT WE MEAN BY "RESTORATION"

Restoring Nature: Perspectives from the Social Sciences and Humanities. Paul H. Gobster and R. Bruce Hull. Island Press, Washington, DC, 2000. 321 pp. \$25.00 (ISBN 1559637684 paper).

Restoring Nature focuses on "the intersection of the humanities, the social sciences, and the biological and physical sciences" (p. 305). More specifically, it questions what we mean when we talk about restoration. It reminds us that "the selection of which nature to restore should depend as much on which nature is socially acceptable, socially valued, and socially sustainable as it should depend on which nature is ecologically plausible" (p. 302). *Restoring Nature* directs our attention to the importance of understanding the objectives of restoration and to admitting that terms like "nature," "pristine," and "predisturbance" have no clear meaning. While we restorationists sometimes feel and act as if we are on a virtuous mission to correct past wrongs to the land, this collection of essays reminds us that there is nothing pure or self-evidently right about what we seek to accomplish. It helps us see beyond the minutiae of hydroperiods, weed control, and soil amendments to look at the bigger questions: Exactly what are we trying to do, and why?

In *Restoring Nature*, we hear from environmental psychologists, landscape architects, community planners, sociologists, and others. Noticeably absent are the voices of biological and physical scientists; in this volume there are no botanists worried about plant community dynamics, no entomologists worried about pollinators, and no hydrologists worried about groundwater flow. But this is not to say that biological and physical scientists should not read this book. They should, in part because it offers a break from *P* values and complex graphics, but, more important, because it opens the

door to another way of thinking about restoration. It reminds us, if we need reminding, that the biological and physical sciences do not hold all the answers. It tells us that, although "science is commonly thought of by the public and portrayed by practitioners as an objective, cold, nonpartisan, value-neutral enterprise" (p. 133), at least some scientists "have been as partisan as can be" (p. 133). And it urges professional restorationists with significant technical training to appreciate the boundaries of that training and the need for open discussion with stakeholders.

The so-called "Chicago controversy"—a controversy that grew from arguments about the objectives of prairie restoration in the rural and suburban lands surrounding Chicago—serves as a unifying theme throughout the book. On the one hand, there were those well-meaning people who believed that restoring the area's natural ecosystems meant a return to the treeless prairies of precolonial days. On the other hand, there were those well-meaning people who did not want to cut down widely spaced trees that had stood for longer than a human life span and that created the ambiance of an English park. As we read in the book's first line, the Chicago controversy is something that Bill Jordan, one of the leaders of the restoration field, has called "a loss of innocence" (p. 1). And while the controversy may have been especially vehement in Chicago, similar controversies rear up on many restoration projects, from the two-acre mitigation project by the highway near your house to the Florida Everglades with its hordes of lawyers to coastal Louisiana's monolithic water diversion structures, whose operation has been stifled by the objections of oyster farmers.

The authors, mostly academics, explore the controversy from many directions and with many intellectual agendas. There is the problem of economics: "\$11.6 million dollars is a lot to spend for what nature does for free" (p. 146, quoting a *Daily Herald* newspaper article). There is the concept of hyperreality in restoration, "presenting as natural that which would no longer be natural in origin" (p. 76). There are excerpts from in-

interviews illustrating the human frustration that so often comes with restoration: "I got angry and I stood up and when I was finally called on I said, 'What's so special about prairies?'" (p. 125). *Restoring Nature*, then, shows how social and philosophical scholarship can contribute to improving restoration programs.

A review of *Restoring Nature* cannot do it justice. This book is so rich with ideas that each essay warrants a review of its own. But together these essays send a coherent message. For those of us whose lives revolve around the restoration of something that some people on some days might construe as nature, and for those of us whose lives are only intermittently distracted by restoration issues, the importance of the message cannot be overstated. It is a message about restoration success and the kind of communication needed to understand what stakeholders hope to gain from restoration. Near the end of the book, contributing authors Paul Gobster and Susan Burro sum up this message and capture the essence of *Restoring Nature*: "The ultimate success of the Montrose Point Restoration Project and other restoration and management programs in urban and wildland areas," they write, "will rely on how diverse values of humans and nature are integrated with one another" (p. 204).

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