In 1897 Roscoe Pound and Frederic Clements invented the quadrat for sampling plants, and this simple invention fundamentally changed field biology because it brought quantification to the study of plant communities. Limnologists began to develop methods to quantitatively sample plankton and other aquatic organisms by the early 1900s. Ecologists quickly adapted other measuring devices from the laboratory and began the march to quantitative methods of field work. But natural history surveys were still the dominant form of field studies, and these were looked down on by laboratory biologists.

The key difference was that laboratory scientists could do experiments and field biologists could not. Frederic Clements, Henry Cowles, and Victor Shelford, among others, recognized that we could use nature's experiments to make progress in understanding ecology and evolution in the field. The development of experimental gardens to study ecotypes, begun by Harvey Hall and Frederic Clements, came to fruition with the Carnegie Institution of Washington supporting the classic experiments of Jens Clausen, David Keck, and William Hiesey. This was not, however, a simple transition. Kohler details how many of the first generation of American ecologists gave up trying to do field experiments and retired to the lab, the classroom, or another career. Others like Forrest Shreve had their studies cut short when administrators decided that field biology was not science and changed funding priorities to laboratory work.

By the 1930s ecologists and evolutionists had developed a population orientation that moved beyond the laboratory biologist concerned only with individuals and pieces of individuals. The addition of ecosystem ecology by Raymond Lindeman in the early 1940s was the second major development that moved ecology out of its perceived subordination to laboratory science and into an area of enquiry that was its alone. Robert Whittaker's classic work in the Great Smoky Mountains in the late 1940s began the revolution in ecology away from the simple ideas of plant community dynamics that originated with Frederic Clements 40 years earlier. By 1950, ecology had come of age, and the border war between the lab and the field was settled at least intellectually if not always personally. And here Kohler stops his narrative.

This is a good book for a fireside read for those interested in the history of ecology in the first part of the 20th century. Since scientists in general take no interest in history beyond the last 12 months, the book's appeal will be limited. This is unfortunate, since ecologists should know more about their history lest they endlessly repeat the same mistakes. But there is always too much to read and history is low on the list.

The overview in Kohler's book suffers from a focus on events in the United States to the near exclusion of developments in Europe, Asia, and Australia. Eugenius Warming and Charles Elton get a brief mention, but in general one gains the impression that the U.S. was the focus of most of the lab-field border wars. To be fair, Kohler notes that he is restricting his scope of discussion to avoid writing a much more complex book, but it would be interesting and important to know if the trends he describes in the U.S. were mirror images of similar trends in Britain and Scandinavia.

My only other complaint is that there is in this book little insight into the role of hypotheses in ecological studies. Was this because ecologists have been concerned with testing hypotheses only since the 1940s, or were the early studies that so frustrated Shelford, Clements, and Gleason hypothesis-free science?

The book contains 48 black-and-white photos of some of the many characters that put ecology on the map. If this book makes you contemplate the historical perspective and ask *what will we ecologists look like in 100 years?* it is well worth reading. And we field ecologists hope we will not be judged like Charles Bessey's conclusion in a 1903 letter:

"Of course. . . there is such a thing as good solid work in Ecology, but there is mighty little of it being done."

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DOES BIODIVERSITY REALLY MATTER?

Loreau, Michel, Shahid Naeem, and Pablo Inchausti, editors. 2002. **Biodiversity and ecosystem functioning: synthesis and perspectives.** Oxford University Press, New York. xii + 294 p. $110.00 (cloth), ISBN 0-19-851570-7 (acid-free paper); $55.00 (paper), ISBN 0-19-851571-5 (acid-free paper).

The elucidation of linkages between biological diversity and ecosystem processes has been a major focus of ecological research since Hal Mooney and Detlef Schulze organized the first meeting on this topic in 1991. Michel Loreau, Shahid Naeem, and Pablo Inchausti convened a second conference on this topic in 2000 in Paris to: take stock of progress in the intervening decade; synthesize existing data; address major controversies that had developed regarding design and analysis of experiments aimed at determining whether biological diversity positively influences ecosystem functioning; and point the way ahead for future studies. A brief summary of the major findings of this "Synthesis Conference" was published shortly after the meeting (M. Loreau et al. 2001. Biodiversity and ecosystem functioning: current knowledge and future challenges. Science 294:804–808). The conference and the "Science" paper received wide coverage, both be-

cause of recent high-profile disagreements in the literature regarding the validity of prior studies and because of the important policy implications of the research. The consensus documents of workshops at the conference as well as original research papers presented there are published in the volume under review.

Overall, the editors and organizers of the Synthesis Conference have achieved the four goals outlined above. This volume is a very readable, well-integrated set of papers that clearly summarize what is and is not known about linkages between biological diversity and ecosystem functioning. The conference brought together the major protagonists in the debate regarding appropriate design and analysis of experimental tests of these linkages, and their consensus chapter (Chapter 6, by Bernhard Schmid et al.) provides a clear blueprint for the next generation of experiments in this field. The breadth of the volume, from grasslands through soil ecosystems to marine benthic communities, is welcome, and there are dozens if not hundreds of ideas for undergraduate research projects, master's theses, and doctoral dissertations embedded within its 20 chapters. The book is nicely produced but unevenly edited (for example, "data" is used both as a singular and a plural noun; there are repeated instances of "different. . . to" instead of "different. . . from"; species binomials are either italicized or not; and there are more than a few typographical errors). Nonetheless, this volume will stand as a benchmark for the field and should be on every ecologist's bookshelf.

The book is divided into six sections. In the two introductory chapters (Section I), the editors (Chapter 1) and Hal Mooney (Chapter 2) provide some historical background for the field. These two chapters are the least satisfying in the book. Naeem et al.'s introductory review is too cursory and does not articulate well the definitions and concepts used throughout the successive chapters. Mooney's history of the "debate" is heavy on acronyms and focuses on the international context in which assessments of biodiversity and ecosystem functioning will be placed, rather than on the debate itself. Surprisingly, neither chapter addresses the fundamental political *raison d'être* of the field: if we could only discover a use (i.e., a utilitarian benefit for humans) of all the biological diversity on the planet then we could provide policy-makers (and perhaps the general public) with a strong argument for stemming the current tidal wave of extinctions. In fact, only John Vandermeer and his colleagues discuss this hidden "subtext" (in the penultimate chapter). Yet, this subtext dominates discussion of the topic outside the ivory tower.

The second section includes four chapters that focus on the "core areas of debate"—the relationship between biodiversity and ecosystem processes in grassland ecosystems. These four chapters provide a summary of the Cedar Creek (Minnesota) experiments (David Tilman et al.), the larger-scale, comparative BIODEPTH experiments in Europe (Andy Hector et al.), the fundamental critique of the analysis and interpretation of these experiments (Michael Huston and Allen McBride), and a consensus document on how to move forward with these experiments (Bernhard Schmid et al.). The papers in this section are well written and coherent, and illustrate clearly why there has been so much disagreement (poorly defined and inconsistently used measures of diversity, restrictive definitions of ecosystem functioning, a single type of ecosystem, studies using only a single trophic level, confusion between independent and dependent variables, and failure to entertain alternatives to individuals' pet hypotheses). The consensus chapter is a model for how science progresses, and these four chapters together would make an excellent foundation for a graduate seminar on scientific methods.

The third, fourth, and fifth sections are the most enticing for students looking for future projects. The thirteen chapters in these three sections extend the discussion to metrics of ecosystem functioning beyond aboveground biomass (e.g., stability, fluxes of nutrients and energy through trophic webs) and to a variety of other ecosystems (soils, aquatic and marine systems, and managed agro-ecosystems). For those determined to find a positive relationship between biological diversity and ecosystem functioning, the chapters on multitrophic systems may be discouraging, but illustrate clearly that complete ecosystems are complex, that effects often will be subtle and difficult to measure, and that "causes" and "effects" are not easily distinguished. There are also significant challenges to designing experiments that will unambiguously test multiple hypotheses regarding biological diversity and ecosystem functioning across multiple trophic levels. John Vandermeer et al.'s chapter on managed ecosystems is particularly welcome, as >90% of the terrestrial surface (and a good portion of lakes, streams, rivers, and oceans as well) are managed for food, fiber, timber, or water production. As most biodiversity loss is occurring in managed systems, they suggest that studies of the role of biological diversity in managed ecosystems should receive the lion's share of attention of those concerned with the impacts of loss of biological diversity. This is a tough sell for ecologists used to studying obscure organisms in pristine sites, but a trip through the northeast (Boston-to-Washington) corridor of the United States should convince even the most hardened skeptic.

The final section consists of a single synthesis chapter by the editors. It presents little new information but concisely summarizes the key achievements of the last decade and the challenges ahead. The debate over design, analysis, and interpretation of results of biological diversity-ecosystem functioning experiments in grasslands appears to be resolved, and next-generation experiments in this arena appear promising. Extending these studies to other ecosystems, across multiple trophic levels, and to broader temporal and spatial scales present fundamental challenges in design and analysis, and also will require deeper collaborations with, and training of, taxonomists and systematists working on understudied groups (especially invertebrates, bacteria, and fungi). Through the Synthesis Conference and this book, the organizers and editors have done a wonderful job at defining these challenges and engendering collaborations by bringing together new researchers and silverbacks, protagonists and antagonists, all of whom care deeply about the roles that biological diversity plays in a variety of ecosystems. Full speed ahead!

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