

Book Reviews

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BERINGIA REVISITED

Hoffecker, John F., and Scott A. Elias. 2007. **Human ecology of Beringia**. Columbia University Press, New York. xi + 290 p. \$45.00, ISBN: 978-0-231-13060-8 (alk. paper).

Key words: Bering Strait; Beringia; Beringian tradition; Younger Dryas; Last Glacial Maximum.

Beringia is a place of fascination for paleobotanists, paleontologists, glaciologists, and archaeologists. Beringia is a vast area, stretching from the Kolyma River in the Russian Far East to the Mackenzie River in Canada's Northwest Territories and including much of Alaska. While extensive Beringian land masses in Northeast Asia and North America (Alaska and Canada) still exist, the "bridge" once connecting the continents (the Bering Land Bridge) has lain beneath the waters of the Bering Strait for at least 12 900 years. During various times during the Pleistocene, Beringia was an unglaciated region of steppe vegetation, which connected the continents of Asia and North America and served as a corridor for people and animals traveling between the Old and the New World. Papers in scientific journals abound on the subject of Beringia, but entire books on the subject are rare. *Human ecology of Beringia* is thus a welcome volume because it brings current information on a host of paleoecology and anthropological topics together into one slim volume. Authors John Hoffecker, an anthropologist, and Scott Elias, a quaternary scientist, have succeeded in weaving together multi-disciplinary data to produce a concise and readable account of the environmental setting and peopling of the far northern reaches of the two continents.

Beringia is described by the authors as a "lost continent," which really existed and had enormous significance in human history. In the preface, the authors acknowledge a long list of collaborators and colleagues and dedicate the book to David M. Hopkins, whose decades of research on the topic earned him the reputation as the last giant of Beringia. Hopkins edited *The Bering land bridge* (Stanford University Press, Stanford, California) in 1967 and co-edited *Paleoecology of Beringia* in 1982 (Hopkins, D. M., J. V. Matthews, Jr., C. E. Schweger, and S. Young, editors. Academic Press, New York). In the 25 years that have elapsed since the latter publication, there has been a real explosion of research, notably sea-bed core drillings along with the discovery and documentation of several archaeological sites in Alaska that date between 10 000 and 14 000 years before present.

The book is presented in seven chapters, arranged both chronologically and geographically. Within the text of the first four chapters are sidebar boxes with concise information about various topics, such as marine isotope stages, tundra classification, the radiocarbon time scale, and ancient tool technology. The text in these boxes is interesting and relevant, but unfortunately not listed in a table of contents, so the reader has to hunt for them. The authors also include a variety of figures and tables, many of which have been borrowed from other sources. Again, they are not listed in the table of contents, which makes finding specific information somewhat difficult. However, the tables of Beringia sites are clearly presented, incorporating uncalibrated and calibrated radiocarbon dates on levels with cultural remains as well as those with organic

remains only, such as mammoth bone and hair. The book ends with a notes section, an extensive bibliography, and a detailed index.

Crucial to understanding the time frame for human settlement in both North and South America is the chronology of glacial advances and retreats and the related sea-level history. Hoffecker and Elias present up-to-date information on this chronology, based on Pleistocene marine isotope stages (MIS) reflecting past climate change in the form of variation of oxygen isotopes ^{16}O and ^{18}O in the fossil shells of marine organisms. They state that the Bering land bridge appears to have been absent during the MIS 3 interstadial, ca. 30 000 years ago. During the Last Glacial Maximum (LGM or MIS 2), however, sea level fell ca. 120 m below present day and the entire Bering-Chukchi Platform was exposed, creating a land bridge more than 1000 km wide. The LGM, with dates of 23 000–19 000 calibrated years before present, stands in contrast to the preceding interstadial because, they state, people probably did not occupy latitudes above 55° N at this time. "Identifying the variable(s) that apparently excluded settlement during the Last Glacial Maximum is a central issue in the human ecology of Beringia."

The authors deem the most critical environmental factor for precluding human settlement in the far north during the LGM to be the scarcity of trees and woody shrubs, and thus the lack of fuel source. One sidebar deals specifically with the problem of fuel in Beringia. Between 20 000 and 15 000 years ago, the landscape supported only a small number of poplars and shrub willows, but lots of bone and dung. Hoffecker and Elias argue that although bone may have been an adequate fuel source, it would have been difficult to ignite in the absence of wood timber. With archaeological survey and testing in Alaska continuing to extend the dates for the oldest sites back to the 14 000 year-old range, it is possible that future evidence will push the dates back even further into the range of the LGM. If these sites ever do materialize, there will be no more fuel, so to speak, to fire their argument. In light of ongoing experimental research on igniting bone without wood and the evidence for fires fueled by bone at the lowest level, ca. 14 000 calibrated years before present, at the Swan Point site in Alaska's interior by Barbara Crass and her colleagues, their argument appears weak.

Another book on the topic of Beringia which has recently been published is *Entering America: northeast Asia and Beringia before the last glacial maximum*, edited by David B. Madsen (2004. The University of Utah Press, Salt Lake City, Utah). Unlike Hoffecker and Elias, who discount migrations into Alaska before the LGM until there is more compelling evidence, many of the authors in Madsen's volume are inclined to favor a pre-LGM entry time. Such a possibility is not considered in the three models that Hoffecker and Elias present of New World Settlement, which include: the transatlantic ocean model, the Pacific coast migration model, and the interior route or ice-free corridor model. Although they prefer the coastal route model, they don't rule out the possibility of the other two. Even a short discussion of the pre-LGM model would have been a welcome addition to their volume, giving readers the full range of current thinking on the subject rather than leaving an important gap in their presentation.

Hoffecker and Elias do an admirable job of synthesizing a wide range of current data on the environment and human technology of Beringia for several thousand years at the end of the Pleistocene. The information on the settlement of Northern Asia is particularly enlightening and current, which is not surprisingly considering John Hoffecker's expertise on peoples of the northern latitudes on a global scale. They also include the most current information on New World sites, bringing the Sluiceway complex sites and Nogahabara I in Alaska, as well as the Little John site in the Yukon into the mix. By comparing their volume, published in 2007, to *The Paleoecology of Beringia*, published 25 years ago, one is struck by the enormous amount of research that has taken place in the intervening years. *Human ecology of Beringia* is a scientific account, but is

also very accessible for a wide variety of readers from college students to the professionals in the fields of quaternary science and anthropology. It is a worthy successor to the volumes of David Hopkins and his colleagues on the topic of Beringia.

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PHOSPHORUS, UNDER (ONE) COVER

Radcliffe, David E., and Miguel L. Cabrera, editors. 2007. **Modeling phosphorus in the environment**. CRC Press, Boca Raton, Florida. 432 p. \$139.95, ISBN: 978-0-8493-3777-2.

Key words: phosphorus; phosphorus index; phosphorus modeling; runoff; stream; watershed.

Modeling phosphorus in the environment, edited by David Radcliffe and Miguel Cabrera, provides the readership comprehensive, concise, and very valuable information and references on modeling phosphorus from the landscape to the stream channel and, in some cases, in the stream channel itself. The book describes a number of different modeling approaches, how these models are implemented, and ways to improve the current modeling methods. Phosphorus (sources, runoff, fate, and transport) has been the subject of much academic research and governmental attention over the years, related to the aesthetically displeasing and ecological consequences of stream enrichment and lake and reservoir eutrophication. This collection, under one cover, of the many methods and uses of phosphorus models, as well as their strengths and weaknesses, will provide a valuable resource for researchers, resource managers, policy makers, and others, as they work with phosphorus in the environment.

The book is broken out into four sections: (1) "Basic approaches"; (2) "Models"; (3) "Phosphorus indices, best management practices"; and (4) "Modeling in the future." Section 1 starts out with a chapter written by Andrew Sharpley, summarizing the different models that describe the movement of phosphorus from the landscape to surface waters. This is followed by discussions of modeling runoff and erosion by Mary Leigh Wolfe, basic approaches for modeling phosphorus in runoff by Miguel Cabrera, and phosphorus leaching by Nathan Nelson and John Parsons. The fifth chapter in the section is a very informative discussion by Brian Haggard and Andrew Sharpley about phosphorus transport and in-stream processes (abiotic and biotic) that influence the form of phosphorus and its fate and transport in the stream channel. The final chapter is another worthy discussion by Keith Beven and others about uncertainty estimation in phosphorus models and the value of data.

Section 2 contains a number of chapters written by model developers and users, describing widely used watershed and

water-quality models including the Soil and Water Assessment Tool (SWAT) by Indrajeet Chaubey and others, Hydrologic Simulation Program-Fortran (HSPF) by David Radcliffe and Zhulu Lin, Annualized Agricultural Nonpoint Source Pollution (AnnAGNPS) by Yongping Yuan and others, Areal Nonpoint Source Watershed Environmental Response Simulation (ANSWERS-2000) by Faycal Bouraoui and Theo Dillaha, Watershed Ecosystem Nutrient Dynamics-Phosphorus (WEND-P) by Robert Kort and others, and Generalized Watershed Loading Functions (GWLF) by Elliot Schneiderman. One modeling system omitted, perhaps because it was developed for a broader spatial scale than that covered by this book, is the SPATIally Referenced Regression On Watershed Attributes (SPARROW) model. SPARROW is a watershed modeling tool used for relating water-quality measurements made at a network of streamflow monitoring stations to attributes of the watersheds containing the stations. The SPARROW model predicts phosphorus and other constituent concentrations, flux, and yields in streams and has been used to examine important contaminant sources and watershed properties that control transport over large spatial scales.

Section 3 covers a discussion on phosphorus indices (PIs) and problems encountered in using PIs at the farm scale, incorporating best management practices in phosphorus models, and the collection of monitoring data to calibrate watershed-scale models. The PI is a ranking value of potential of phosphorus loss or vulnerability of phosphorus runoff at the field scale. The PI is used by states in developing guidelines for land application of phosphorus at the field scale and for developing management plans at the watershed scale. Jennifer Weld and Andrew Sharpley start this section by discussing the history of PI development, the index framework, examples of its use, and integration into nutrient management plans. Philip Hess and others provide a chapter on challenges to using and implementing PIs, followed by a chapter by Margaret Gitau and Tamie Veith on quantifying the effects of best management practices on phosphorus control. The final, and very welcome, chapter in this section is written by Daren Harmel and Brian Haggard describing methods of data collection in small watersheds to support phosphorus modeling. They discuss how to approach base-flow and storm-flow sampling using discrete and composite sample collection methods, followed by a short discussion on empirical methods for estimating nutrient loads and yield and uncertainty in the estimates.

Section 4 contains a one-chapter summary by David Radcliffe and Miguel Cabrera covering suggestions to improve modeling of phosphorus fate and transport. These suggestions include improved estimation of runoff occurrence and identifying source areas where runoff and phosphorus coincide. Furthermore, modeling of soil phosphorus pools need to be improved, as well as the leaching of phosphorus through the soils. More process-based modeling is needed to examine the effects of best management practices and in-stream processes of phosphorus transport. Calibration and uncertainty tools are increasingly needed for regulatory purposes. And, most important in my opinion, is the suggestion that monitoring data are critical for modeling phosphorus fate and transport and that there is a need for long-term water-quality database development especially associated with stations in the U.S. Geological Survey stream-flow monitoring network.

Water-quality data along with daily, monthly, and annual streamflow will allow estimations of nutrient loads and yields. These are the very data that the SPARROW model (mentioned above) is developed upon.

The value of this book is the vast amount of information provided over a wide range of topics related to modeling phosphorus in the environment, all under one cover. The editors have done a good job integrating all the topics and cross-referencing information among chapters. This book is a great source of information and should be in the library of every academic institution and the office of every student, researcher, resource manager, or governmental regulatory official who studies or works with phosphorus in the environment.

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ANT-PLANT INTERACTIONS IN A GEOGRAPHIC MOSAIC

Rico-Gray, Victor, and Paulo S. Oliveira. 2007. **The ecology and evolution of ant-plant interactions**. University of Chicago Press, Chicago, Illinois. xiii + 331 p. \$70.00 (cloth), ISBN: 978-0-226-71347-2 (alk. paper); \$28.00 (paper), ISBN: 978-0-226-71348-9 (alk. paper).

Key words: antagonistic interactions; ants; coevolution; geographic mosaic theory; mutualism.

Recorded observations of interactions between ants and plants extend back to ancient Greek and Roman writers who noted the seed-collecting habits of *Messor* ants in the Mediterranean. In the late 19th and early 20th centuries, naturalists compiled detailed observations of complex ant-plant relationships from the New and Old World tropics. Daniel Janzen's now-classic work in Mexico on the protective mutualism between *Acacia* and *Pseudomyrmex* ants, conducted in the 1960s, marked the start of the modern study of ant-plant interactions. The 40 years following Janzen's work have produced a large and rapidly growing body of work on the ecological relationships between ants and plants.

The ecology and evolution of ant-plant interactions meticulously summarizes and evaluates a large body of research on this topic—over 900 articles from the primary literature and nine books by the authors' count—covering seven major categories of association between ants and plants. The work also offers a clear conceptual framework for interpreting the coevolutionary dynamics of the diverse set of interspecific interactions between these two groups. Seven of the 10 main chapters are devoted to specific interaction categories. The remaining chapters are not tied to particular types of interactions; rather, they explore broader aspects of the topic. The text is supported by 66 high-quality figures and tables, most of which are modified from published sources. In addition, six detailed appendices, placed at the end of some chapters, catalog

key literature—or, in one case, specific plant traits—associated with a particular interaction type.

Victor Rico-Gray and Paulo Oliveira's book is explicitly grounded in John N. Thompson's two theoretical works on the coevolution of interactions. In *Interaction and coevolution* (1982, Wiley and Sons, New York), Thompson emphasized the link between antagonistic and mutualistic interactions and gave special consideration to the correlation between the complex social behaviors of animals and the frequency of mutualism. *The coevolutionary process* (1994, University of Chicago Press, Chicago, Illinois) introduced his geographic mosaic theory, which emphasized that particular species-species interactions may have very different outcomes depending on the community context in which they occur. Thus Thompson's ideas on coevolution provide the lens through which Rico-Gray and Oliveira view and interpret the varied array of relationships between these two taxa.

Interaction-specific chapters—Chapters 2 through 8—are ordered to emphasize the link between antagonistic and mutualistic interactions. The only two major categories of non-mutualistic association are presented together in single chapter titled “Antagonistic interactions: leaf-cutting and seed-harvesting ants.” Separate chapters on myrmecochory (ant dispersal of seeds) and pollination by ants share the heading “Mutualism from antagonism” to emphasize the likely origin of these interactions from their antagonistic precursors. A second chapter on seed dispersal, “Mutualism from opportunism: ants as secondary seed-dispersers,” explores a more recently recognized dispersal syndrome in which ants collect seeds from fallen fruits or from the feces of frugivorous vertebrates and return them to their nests. The fate of these seeds in many cases is to be discarded intact after the removal of attached fruit pulp or seed arils. Considering the abundance of ants and vertebrate-dispersed fruits in tropical forests, this interaction is likely to be common in the Old World as well, though nearly all examples cited are from the Americas.

About a quarter of the text is devoted to two chapters on protective mutualisms between ants and plants. “Antagonism and mutualism: direct interactions” evaluates the literature on

ant-plant mutualisms in which plants provide their associated ants with food rewards (e.g., extrafloral nectaries or food bodies), domatia, or both in exchange for defense from herbivores and competing vegetation. Direct mutualisms are more likely to result in clear benefits to both participants than are indirect ones. This second type of defensive association is evaluated in a companion chapter titled "Antagonism and mutualism: indirect interactions." Indirect mutualisms involve a third species that feeds on the plant—typically a honeydew-producing hemipteran or lepidopteran tended by the ant partner—and have a more conditional nature and less predictable, more variable outcome for the plant partner than do direct mutualisms. As the authors note, both classes of protective mutualism are driven by the actions of antagonistic species, mainly herbivorous insects and vertebrates, that provide the community context in which plant species can benefit from their ant associates. Research published since the release of Rico-Gray and Oliveira's book affirms the importance of community context in determining the outcome of ant-plant interactions.

The last interaction-specific chapter addresses associations involving ant-fed plants and ant-garden systems. The common thread in these interactions, which are limited to tropical forests, is that each is a kind of reversed trophic interaction favored by the nutrient-poor conditions in which the plant partners live. Unlike the other mutualisms, these have no clear association with antagonistic interactions. The final three chapters that precede the concluding chapter review the general nature of temporal and spatial variation in these associations, as well as their great importance to the structure and function of tropical rain forest canopies and tropical agroecosystems, respectively.

Three clear strengths emerge from a reading of *The ecology and evolution of ant-plant interactions*. First, it offers a detailed and insightful analysis, by interaction category, of published research. Second, it successfully applies existing general theory on coevolution to the interactions between ants and plants. In doing so, the book elucidates the close ties between these

mutualisms and antagonism and emphasizes their potential to show wide geographic variation in outcome. Third, having reviewed this literature and placed it in a broader, unified context, the authors use the final chapter, "Overview and perspectives" to give detailed suggestions for future research in twelve topic areas. These suggestions will be valuable in guiding future research in the field.

More recommendations for research are scattered throughout the book's other chapters, but many are not well developed and are offered unevenly, provided for some topics but not for others. In places, the book also misses opportunities to apply its main themes to specific interactions. For example, in the chapter on myrmecochory the authors review, as others have done, the potential benefits to plants of using ants to disperse their seeds. The advantage of avoiding seed predators, especially rodents, seems to be a clear example of where antagonistic interactions in the community could have provided a selective environment favoring the development of mutualism. More specific applications like this would have further strengthened their arguments about the origin and maintenance of interactions between ants and plants. Still, these are small faults in an otherwise excellent book that is sure to be highly influential in this area of ecological research.

The ecology and evolution of ant-plant interactions is an essential book for anyone who currently studies ant-plant interactions. It will also serve as required reading for graduate students who are beginning work on topics in this field. More generally, it should appeal to anyone with an interest in the ecology and evolution of mutualism.

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THE FUTURE DIRECTION FOR ENVIRONMENTAL LAW AND POLICY

Ruhl, J. B., Steven E. Kraft, and Christopher L. Lant. 2007. **The law and policy of ecosystem services**. Island Press, Washington, D.C. x + 345 p. \$70.00 (cloth), ISBN: 978-1-55963-094-8 (alk. paper); \$35.00 (paper) ISBN: 978-1-55963-095-5 (alk. paper).

Key words: ecosystem services; environmental law; environmental policy.

Most ecologists work largely in the realm of science. We clearly see how humanity is on an unsustainable trajectory from local to global in scale. We know a central part of the solution is to integrate ecosystem services into the way economic systems account, and government and other institutions decide and function. That lies in the realm of law and policy. This volume provides a significant and solid contribution to charting that territory. The "Literature cited" alone is a useful contribution.

In remarkably readable prose, the book is laid out in four main parts accessible to anyone from a scientific, legal, or policy

background. The first deals with ecosystem services from the point of view of ecology, geography, and economics. The authors are careful to point out the distinction between ecosystem function and ecosystem service, the latter being a quantifiable service to society. Both ecosystems and geography function in an integrating fashion and so are particularly suited to provide a base for humanity to chart a course toward sustainability. Yet ecosystem boundaries are hard to define and occur at many scales in time and space. Indeed, there are often conflicts and trade-offs even between ecosystem services such as freshwater flows important to Apalachicola Bay and its fisheries as opposed to upstream water impoundment for Lake Lanier. Economics has historically largely treated ecosystem services as free goods, and too often markets lead to exhaustion of resources. There is a clear need for advances in law and policy.

The authors then provide us with a solid background in environmental law and policy. This section is designed to help the reader understand the extent to which ecosystem services have standing in current property rights, regulation, and social norms. It would be useful as a primer for almost any environmentally concerned reader trying to understand the

seemingly arcane domain of law and policy. As someone who has spent decades at the interface with that world and continues to admire the outburst of environmental law and institutions of the 1970s and later, I found it wonderfully enlightening. The illumination of where the concept of “taking” applies and where it does not is very useful. One thing is quite clear by the end of the section: there is a long way to go before law and policy can suitably reflect environmental realities. Common property law as practiced for centuries is clearly tilted toward classic as opposed to sustainable development. State regulatory programs for wetlands, forests, and coastal resources are relatively weak. Social norms haven’t filled much of the gap.

The authors leaven what otherwise could be pretty dense reading in the first two sections by including possible real world examples. Ricketts’ work demonstrating pollination services from forests benefiting Costa Rican coffee production is frequently invoked in “for instance” examples. The book then blossoms in the third section with nine short chapters with real examples of ecosystem services in law and policy from wetland mitigation banking to a discussion of carbon trading systems to deal with greenhouse gases. The scientist reader will come away with a deep sense of the challenges faced in law and policy.

Among the lessons provided is how an ecosystem service of the hydrological cycle—such as the evapotranspiration of southeastern forests augmenting Midwest precipitation and agriculture—can lie completely outside of existing law. The Conservation Reserve Program represents a shift in favor of ecosystem services, but one wonders how good that now looks after the recent rush to corn for biofuels. The comparison of two environmental markets, that for sulfur in the Clean Air Act and the nutrient market for water quality, provides a useful analysis of one market that works and one that does not, with

useful implications for a global carbon market. A fascinating analysis of ecosystem services and land use in the Big Creek area of southern Illinois provides evidence that suitably designed policy and economic incentives will result in land use decisions close to a desired ideal.

The final section of the book outlines a possible set of institutions at different scales to integrate ecosystem services into regular decision making. At the finer scale it is based sensibly on watersheds, an ecosystem that most can innately grasp as relevant. At coarser scales it calls for new institutions that in turn would require considerable political will to establish. One can only hope that a sense of the underproduction of ecosystem services could drive that in the right direction.

The authors have concentrated on the United States with the only exception being the green policies of the Common Agricultural Policy of the European Union. It might have been useful to stray a bit farther to include Costa Rica’s Ecosystem Services Law. Be that as it may, the authors have given us a wonderful revelation of how ecosystem services currently interact with law and policy and where they could go. It reminds me of the successful interaction of science, law, and policy in the 1970s. We need that to happen again and this book provides the basis for it.

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DIVERSE PERSPECTIVES ON HOW TO UNITE QUANTITATIVE SCALING PATTERNS AND MECHANISMS FOR BIODIVERSITY

Storch, David, Pablo A. Marquet, and James H. Brown, editors. 2007. **Scaling biodiversity**. Ecological Reviews. Cambridge University Press, New York. xvii + 470 p. \$150.00 (cloth), ISBN: 978-0-521-87602-5; \$70.00 (paper), ISBN 978-0-521-69937-2.

Key words: biodiversity; fractals; latitudinal gradients; scaling; species turnover.

When I picked up this book, I was puzzled as to what a book about “scaling biodiversity” would cover. As a subject editor for a few ecology journals, I’ve regularly seen manuscripts that discuss spatial and temporal patterns of species diversity, often linked to patterns of environmental variation, allometry, demography, dispersal, species’ traits, history, and biogeography. In these, scaling encompassed tests of mechanisms like organismal movement and demography, correlation of biodiversity to a variety of extrinsic factors, and the description of statistical patterns using metrics ranging from the classical alpha, beta, and gamma diversity to relatively abstract contemporary metrics like fractals, power law (fat-tailed) relationships, and wavelets. Manuscript submissions also include many relationships that have large literatures attempting to explain them, such as species-area curves, dissimilarity vs. distance plots, and range-abundance plots. This edited volume

narrows down this list slightly by considering primarily *quantitative* relationships and is heavily biased towards spatial scaling relationships, but in general represents all of the above. Despite this, given the scattered literature that exists, the present volume serves a useful purpose in bringing together a broad range of approaches to patterns of biodiversity and what drives those patterns. Unlike some manuscripts I have edited (and rejected) for journals, the book, rather than using “spatial scaling” as a buzzword to try to connect loose descriptions of patterns, focuses on mechanisms, and more quantitative patterns.

This edited volume stems from a symposium that took place in Prague on 19–22 October 2004 and represents the talks presented at that meeting. The meeting was co-organized by leading researchers (the editors) in the Czech Republic, Chile, and U.S., giving a global spectrum of perspectives on topics that have gained increasing attention because of recent advances in remote sensing, biodiversity databases, and statistical methods. Some of the topics covered have progressed somewhat since the book was published, but the enormous breadth of coverage means that most of it is still highly relevant today. The book belongs to a new series, Ecological Reviews, co-developed by the British Ecological Society (BES) and Cambridge University Press to replace the BES Symposium Series. Like many in the earlier BES Symposium Series, the current volume is a collection of independent chapters without much attempt at synthesis. However for the present topic, this is

a fair reflection of the state of our understanding, and because of the diversity of relevant topics assembled it provides a useful overview of ways in which to think about the spatial scaling of biodiversity.

It is unclear who is the book's intended audience. Ten of the 21 chapters provide accessible reviews of scaling topics of an appropriate level for a broad graduate student audience in ecology. Eight chapters are novel research contributions aimed at an already-informed audience, and five chapters (an overlapping set) are hard work because they are highly technical—discussing topics such as multifractals, near-fractal hierarchies, Lévy flights (long-distance dispersal), and neutral dynamics.

I found enjoyment and motivation in some strong contributions. Jessica Green and Brendan Bohannon review the literature about whether microbes have global distributions, and point out that taxonomic resolution influences our perceptions of scaling. Also on the subject of phylogenies, Jérôme Chave and colleagues illustrate the differences between phylogenetic and conventional beta diversity measures. Kevin Gaston and colleagues provide an encyclopedic catalogue and analysis of different measures of beta diversity—I expect I will refer back to it when I next face the question of how to analyze species turnover data. David Currie provides a concise summary of the factors thought to control latitudinal diversity gradients, facilitating easy access to a sprawling and complex literature. David Storch and colleagues neatly elucidate the contrasting roles of area and energy in controlling species diversity. William Kunin provides a motivating summary of why the spatial scaling of extinction rates needs further study. Pablo Marquet and colleagues describe a compelling case for why ecologists need to think more about fat-tailed distributions when considering diversity and abundance (power law relationships such as Cauchy distributions). Of course, like any symposium volume some chapters (five in my estimation) were either poorly tied to the overall theme of the book, or were generally weak through having arguments that were poorly supported. Two chapters found that fractal patterns were not very useful for describing the datasets considered, leading me to question the utility of such approaches in general. To the editors' credit, the weaker chapters were much shorter than are typical chapters in this volume.

The book gains interest through its breadth of coverage and some clear reviews of complex topics. Unfortunately, the organization of the book is more confusing than clear. The first of four sections describes spatial scaling of species richness and distribution, using fractals, John Harte's hypothesis of equal allocation, and other analyses of probability of occurrence at different spatial scales. The second section, "Alterna-

tive measures of biodiversity: taxonomy, phylogeny, and turnover," discusses phylogenetic resolution and how they influence impressions of species turnover, and other measures of turnover (beta diversity). The third section, "Scaling of biological diversity with energy and the latitudinal biodiversity gradient," brings together historical effects on biodiversity in general, and climatic and energetic explanations of latitudinal diversity. The last section, "Processes, perspectives, and syntheses," is the most anomalous, and seems mostly to consist of analyses that did not neatly fit into the other sections; this section is not any more synthetic than other sections of the book. The four sections do not give a logical division of topics, instead they are arbitrary ways of dividing up ways of thinking about how biodiversity is scaled. Clearly, this results from basing a book around a symposium where it is not entirely clear how well different authors will fit into the overall theme. Some judicious editing and selecting authors after the symposium took place would perhaps have helped.

The book is well edited in the sense that it is generally error free with the exception of a few typographical errors, two of which are in the foreword by Sir Robert May. The foreword discusses scaling in physics and epidemiology, neither of which has much to do with the content of the book. The editors in Chapter 1 describe the structure of the book, and describe the ideal of physics-like scaling laws, and this is reflected in other chapters in which these individuals are involved, but other chapter authors are frequently more involved in describing the putative causes of scaling patterns. The book is however sold honestly, for example, in the preface James Brown and colleagues state, "Neither the symposium nor the book reaches definitive conclusions." The book would have been greatly improved by some truly synthetic chapters, such as the frequently used tactic of getting several authors to join together to coauthor synthetic concluding pieces.

Overall, I recommend the book because of its breadth of coverage of a complex and sprawling literature. The better pieces in the volume are also motivational and provide good fuel for research projects. The topics challenge us all to think about how to be more holistic in thinking about spatial (and temporal) patterns of biodiversity.

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