

Book Reviews

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PLANT MULTI-TASKING

Agrawal, Anurag A., Sadik Tuzun, and Elizabeth Bent, editors. 1999. **Induced plant defenses against pathogens and herbivores: biochemistry, ecology, and agriculture.** The American Phytopathological Society Press, St. Paul, Minnesota. ix + 390 p. \$55.00, ISBN: 0-89054-242-2.

Ecologists studying plant–herbivore interactions have lagged behind plant pathologists in understanding how plants respond to enemies. This is partly because the induced plant defenses against grazers are a relatively recent discovery, partly because plant pathologists have more readily embraced molecular tools, and partly because ecologists haven't paid attention to plant pathology. *Induced plant defenses against pathogens and herbivores* attempts to remedy this last situation by juxtaposing chapters regarding plant responses to pathogens with those concerned with induced responses to grazers, an approach that is partly—but not wholly—successful.

Agrawal, Tuzun, and Bent have assembled 18 chapters by 41 well-recognized experts on various aspects of plant responses to pathogens and grazers. The volume begins with an introduction to induced resistance by Rick Karban and Joseph Kuć. The book is divided into three major sections. The first section (“Biochemistry and mechanisms”) is perhaps most useful to the integrative reader, since excellent reviews of the current state of understanding are provided. Felton and Eichenseer's chapter on how insect saliva might manipulate plant responses is especially noteworthy for presenting novel ideas and unpublished observations, a rarity in such volumes. It is clear that molecular biology has not penetrated studies of plant–herbivore interactions to the extent it has in plant–microbe interactions, to the former's detriment. This is changing, but some of the latest molecular results are not discussed in this volume.

The second section (“Ecology and evolution”) includes a heterogeneous mix of topics, including more mechanism (Stout and Bostock, Zangerl), modeling (Underwood), and ecological/evolutionary musings (Agrawal, Sabelis et al.). This section reveals the history of these subjects: it is heavily dominated by herbivory studies.

The third section (“Agricultural applications”) develops applications of induced plant resistance for agriculture. Here the history of the subject is again revealed as the emphasis swings to pathogens. Several authors describe the economic and other constraints on developing useful pest control from basic science, which should be an eye-opener for some ecologists.

The contributions to this volume are uneven in terms of their clarity, purpose, and success in integrating what we know about plant responses to pest and pathogens. Some authors present research results, others review their own results published elsewhere, and others mainly muse. Only six

of the 18 chapters discuss responses to both pathogens and grazers, highlighting their similarities and differences and exposing interesting parallels and directions for future research. The remaining chapters cover one or the other type of response, sometimes presenting up-to-date information but not integrating the two bodies of knowledge. Redundancies among chapters could have been weeded more vigorously. The book generally suffers from the absence of a capstone discussion that would tie these disparate approaches and complex, diverse findings together.

Nevertheless, the chapters contain all the information needed for willing readers to do some integration of their own. For example, the authors make several intriguing observations concerning the striking similarities between pathways associated with plant responses. Hammerschmidt and Smith-Becker point to the activity of salicylic acid in plant and animal tissues and speculate that these SA-dependent pathways are a vestige of a common pathway that evolved before the divergence of the two kingdoms. Other contributors highlight the ubiquitous nature of jasmonic acid signaling in plants, the parallels between plant hypersensitive responses and apoptosis, and the similarity between plant resistance genes and the mammalian interleukin-1 receptor. What fun it is to ponder the evolutionary implications of these similarities!

Publishing volumes aimed at discussing the inducible responses of plants and animals seems to be a growth industry: ignoring pathology books, this is the latest of four texts to cover this and related topics since 1991. There is much overlap among these books and with numerous recent review articles in terms of content and authorship. While new and significant results are published weekly in this area, it may be time to allow these to accumulate before more summaries appear.

This would be a useful volume for researchers and grad students who want to be brought up to date (2000) on mechanisms of induced defenses in plants, especially in finding responses to pathogens and herbivores in the same volume. But that situation will change again in another few years, so the shelf-life of books like this is unpredictable. It may be most interesting to look back on this volume 5 or 10 years from now to see whether plant–herbivore science really learned from plant pathology and whether we developed a real integrated understanding of plant responses to diverse stimuli.

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CARNIVORES IN ECOSYSTEMS

Clark, Tim W., A. Peyton Curlee, Steven C. Minta, and Peter M. Kareiva, editors. 1999. **Carnivores in ecosystems: the Yellowstone experience**. Yale University Press, New Haven, Connecticut. xii + 429 p. \$37.50. ISBN: 0-300-07816-1 (alk. paper).

This book, written by 25 university and agency researchers, describes the science and conservation of carnivores in the Greater Yellowstone Ecosystem (GYE). The emphasis, however, is on a few large charismatic carnivores in Yellowstone National Park (YNP) which lies at the center of the ecosystem. The editors' purpose is "to begin integration and synthesis of the remarkable scientific legacy that exists for the GYE's carnivores and to evaluate how we can best position ourselves to meet the growing conservation challenge in this and other ecosystems around the world."

Within YNP there is complete protection of carnivores, but that has not always been the case. As described in this book, changes in the park administration's attitude toward and treatment of its wildlife has changed dramatically across the years, reflecting changes in society's attitudes and values. Readers of this book should keep in mind that much of the GYE (nearly 8 million hectares) is comprised of USDA Forest Service lands and private lands where the non-endangered carnivores are subject to harvest and where livestock on private and federal lands tempt the fate of bears and wolves.

Since gray wolves were restored by reintroduction in 1995 and 1996, the area has supported the complete suite of carnivores present before Euro-American exploration. Those species include: grizzly bear, black bear, coyote, red fox, cougar, lynx, bobcat, marten, mink, short-tailed and long-tailed weasels, raccoon, badger, river otter, and striped skunk. Most are difficult and expensive to study. Whereas the largest are fairly well researched, knowledge of the fisher, wolverine, river otter, mink, lynx, bobcat, and raccoon is almost entirely from anecdote. Thus, the book's discussions of those species draw heavily on information obtained in other areas.

The book consists of 12 chapters. Bears, wolves, cougars, and coyotes are the primary subject of "case history" chapters. The mesocarnivore community (11 species) is described in a single chapter, reflecting the dearth of information mentioned above. Other chapters deal with issues such as the evolution of human attitudes about carnivores and Yellowstone Park and with contentious conservation and management issues there. Examples include the management of black bears and grizzly bears relative to park garbage dumps, alleged damage to vegetation by overpopulated ungulates, results of the 1988 fires, and the "natural regulation" ungulate management policy of the Park Service. We read that YNP is important for carnivore research because the carnivore guild can be studied in a nearly unexploited situation for comparison with other areas. For example, coyotes can be studied in the absence of exploitation by humans which occurs almost everywhere else. Authors of different chapters disagree about whether large carnivores generally can serve

as "umbrella" species for all carnivores. Buskirk in Chapter 7 insists they cannot because of the importance of habitat structure to smaller carnivores (e.g., martens).

If I had to select any one chapter for managers and decision-makers to read, it probably would be Chapter 11. That chapter addresses the relation between genetics, population size, dispersal pattern, and extinction probability of GYE carnivores, and it makes a strong impression. The alarming rate at which private land is being developed around the periphery of the GYE is increasingly isolating it from wilderness areas to the north and west. For most carnivores, little if any, gene flow is occurring between this and any other population. While that may not be a problem for some carnivores, it may not bode well for species such the grizzly bear which has an effective population size of only 13–65.

Appropriately, the book includes coverage of the prey available to carnivores, from elk and bison to small mammals. Excellent long term data on ungulates and range condition are available. A chapter on "Coyotes and canid coexistence in Yellowstone" contains the best discussion of coyote social organization I have seen. Also, it addresses competition and coexistence of wolves, coyotes, and red foxes in YNP. Much will be learned about that subject in the next few years. Already, wolves have taken a heavy toll on coyotes.

The addition of wolves to the carnivore guild has instilled excitement and a new sense of urgency in researchers. The topic of wolf restoration shows up in nearly every chapter; significant impacts to ecosystem structure and function are expected. Indeed, the pre-existence of information on other carnivores, the prey species, the vegetation, and the climate, creates a rare opportunity to learn if and how a major predator will create ripple effects through the system. However, too much space is devoted to predicting (by modeling and otherwise) the impacts wolves may have. Wolves have been in the system for over five years and the time has come to discontinue the reporting of predictions that served to help justify their reintroduction and begin the reporting of new findings. Hopefully the addition of wolves will lead to better understanding of the natural dynamics of the system, including the "top down" versus "bottom up" regulation debate and the matter of compensatory mortality of elk about which so much has been written. Several years of data will be needed.

The most arduous reading in the book is the final chapter which offers an overview of the state of carnivore science. The limited contribution of carnivore science to ecological theory and synthesis is discussed in light of inherent difficulties and expense of studying carnivores and the limited opportunities for experimentation and hypothesis testing. Researchers are mildly chastised for not taking advantage of alternative approaches to research. There is an insightful discussion of the utility of the concepts of keystone and umbrella species. Considerable space is devoted to advocating use of behavioral phenotypes for building more realistic landscape models. The attempt to cover too much ground, in combi-

nation with a writing style that is less than user-friendly, will result in few readers making it through this chapter.

The appearance of this book will not enhance your coffee table or desk top. Figures are in black and white, and it is unfortunate that several of the book's lower profile subjects did not even warrant a photograph. The strength is in the text and the impressive quantity of information that has been brought together in one volume. Except as noted above, the writing is clear. The most valuable use of the book will be as a reference text. Extensive lists of references after each chapter will be valuable to many readers. (The last chapter lists 727!) There is some redundancy between chapters, and a few errors are noticeable.

Anyone with more than a casual interest in carnivores and/or the GYE will find this book worth reading. I believe readers will come away with a fuller understanding of carnivores in the region, and how they relate to one another, their prey, the landscape, and to humans. Whether this book will be read by decision makers who are in the best position to make a difference for this ecosystem, I cannot predict.

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TROPICAL FOREST ECOLOGY

Leigh, Egbert Giles, Jr. 1999. **Tropical forest ecology: a view from Barro Colorado Island**. Oxford University Press, New York. xvi + 245 p. \$85.00 (cloth), ISBN: 0-19-509602-9 (acid-free paper); \$35.00 (paper), ISBN: 0-19-509603-7 (acid-free paper).

In July of 1984 I arrived on Barro Colorado Island (BCI) to begin my career as a tropical biologist. An important part of my early education was evening visits to the BCI office of Egbert Giles Leigh, Jr. to discuss tropical biology over a glass of whiskey (usually of brands I could not afford as a graduate student, therefore also part of the education). In Leigh, I found a man with very diverse interests ranging from sex allocation theory and group selection to plant architecture, mutualism, and the origin and maintenance of species diversity. In this delightfully well-written book, Leigh addresses the diverse ecological issues he has studied during his 30+ years as a biologist for the Smithsonian Tropical Research Institute. Using research conducted at BCI as a departure point, he marshals information from throughout the tropics to show what is interesting about tropical forests, what these forests have in common, and how we can use our knowledge of adaptation and natural selection to understand the interrelationships of plants and animals in tropical forests.

In the Introduction, Leigh establishes his adaptationist viewpoint and recognizes that not all ecologists agree on the relative role of competition and interdependence in the structuring of ecosystems. He states that his book seeks to answer three questions: (1) Do plants and their seasonal rhythms of fruit and leaf production limit populations of vertebrate herbivores? (2) Why are there so many kinds of tropical trees? and (3) What is the role of mutualism in the ecological organization of tropical forests?

In Chapter 1, Leigh introduces Barro Colorado Island, beginning with a brief discussion of the study area itself before departing on a fascinating description of the history of the biota with respect to the formation of the Isthmus of Panama, the climatic changes that occurred through the Pleistocene,

and finally, the impacts of human populations on the forests of the region. Only relatively recently have ecologists begun to understand that we have only a snapshot view of systems that have been changing dramatically over time. Leigh embraces this viewpoint, providing us with the most appropriate introduction to the site.

In Chapter 2, entitled "Dramatis personae," Leigh sets out to summarize the natural history of a number of plants and animals that occur on BCI. I thoroughly enjoyed this section. It is full of witty observations, such as the fact that howler monkeys are supported by less energy than that of a 25-watt light bulb (sloths ranking just above that of a nightlight). For me, reading this section was very much like becoming reacquainted with old friends; however, I am not sure how this chapter would be read by someone unfamiliar with the site without some knowledge of how each of the players fits into the larger picture. Also, this approach easily brings the criticism that detailed information on some important taxa has been left out (e.g., euglossine bees). Finally, as I continued to read the book, I found myself wondering if an equivalent description of the important study areas and long-term experiments on BCI (Lutz Watershed, the Forest Dynamics Plot, the Irrigation Experiment) would not also have been useful (perhaps as part of the previous chapter).

Leigh addresses the climate of tropical forests in Chapter 3. His main focus is on rainfall and evapotranspiration and the remarkable conclusion that sites which vary four-fold in rainfall (1510–5795 mm/yr) only vary 1.4-fold in evapotranspiration (1173–1675 mm/yr). Leigh suggests that the nearly constant rate of evapotranspiration in tropical forests is caused by a similar climate that provides for a similar vegetation structure which, in turn, provides a similar rate at which rainfall is recycled as water vapor. Following a short chapter on erosion and soil formation (Chapter 4), and a wonderfully illustrated discussion of tree architecture (Chapter 5), Leigh shows us the extreme similarity of vegetation structure among tropical forests in Chapter 6. The "constants of tropical forest," as he describes them (in forests with 1700 mm per year rainfall and \leq four months dry season), are sim-

ilarities in leaf fall (6–8 tons/ha/yr), leaf area index (6–8 ha/ha), tree mortality (1–2% per year), basal area (30 m²/yr), and biomass (300 tons dry weight/ha). Using a simple model of photosynthesis, he also shows that production is probably very similar among all tropical forests. Leigh's basic argument is clear: where rainfall (total or seasonality) and soils do not limit production, forest structure is driven by aspects of climate (temperature, humidity, and wind) that are very similar throughout the tropics.

In Chapters 7–9, Leigh returns to the questions raised in the Introduction. Taking advantage of various studies of the animals on BCI and their consumption of leaves and fruits, Leigh provides an analysis of the effect of the seasonality of leaf and fruit production on vertebrate and invertebrate herbivores. He explains that fruit consumption on the island is favored over folivory because mature leaves of tropical trees are so heavily defended. Along the way, Leigh uses this fact (and two other very pertinent ones) to lay to rest Terborgh's assertion that the lack of large predators on BCI results in an unusually high abundance of herbivorous mammals that negatively affect the vegetation.

In Chapter 7 I became fully aware that Leigh makes no use of graphs to present data in his book. All data are presented in tables, some of them quite large. I found myself staring at Table 7.1 for some minutes to convince myself that there was indeed a seasonal pattern in leaf flushing. This could have been determined at a glance from a line graph.

With regard to forest tree diversity (Chapter 8), Leigh again uses published data to give us a full picture of the patterns of diversity among tropical forests. He reviews the hypotheses that explain why tropical forests are so much more diverse than their temperate counterparts, rejecting the notion that chance plays a strong role in maintaining community diver-

sity. The chapter on mutualism (Chapter 9) is a fascinating exposition on the paradox of competition and interdependence in tropical forests, applying the concepts of adaptation, group selection, and the evolution of mutualism to arrive at a resolution of the paradox. Addressing the harmonious nature of ecosystems, he brings up the "constants of the rainforest" again, suggesting these similarities tell us something important about the "commonwealth" of ecosystems.

In three moving pages, Leigh ends the book by decrying the spiritual crisis, caused by economic determinism, that has led to the destruction of so much of the world's tropical forests. Clearly, humans do not share the commonwealth of the rainforest, but pillage its resources. No tropical biologist would disagree with Leigh's sentiments, although I doubt many approach the issue from Leigh's religious stance, which he so richly explains.

Leigh has produced a wonderful synthesis of our understanding of tropical forests, one that should attract a wide audience. With a few exceptions noted above, the information is straightforwardly presented and clearly organized. As one who has a bad habit of "humming the math," I greatly appreciated that much of the mathematical details were left for appendices after each chapter. I look forward to further editions of this book as our knowledge of the tropical forests of the world continues to grow—at least as long as there are any tropical forests left to study.

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COMMUNITY ECOLOGY: AN EXPERIMENTALIST'S (MODERN) DESCRIPTION

Morin, Peter J. 1999. **Community ecology**. Blackwell Science, Malden, Massachusetts. viii + 424 p. \$45.95, ISBN: 0-86542-350-4.

This textbook was developed from the course that Morin has taught for 15 years to graduate students at Rutgers University. The preface states that it should be useful to upper-level undergraduates and graduate students. It will be useful to professionals too; it is a solid text with up-to-date treatment. It covers no new ground, but draws much material together in one volume in such a way that any interested person can save a lot of time in finding both useful references and at least one synthesis of many important ideas. I will draw on the text in this way repeatedly in the several ecology courses that I teach.

The book's purpose is to serve as a text for a course in community ecology, and it will serve admirably. Any serious

student attempting to wend his way through the complexities of this rather difficult subject will find excellent assistance. Any professor teaching a community ecology course will find that the text provides much organizational help and direction.

The content is much the same as has been included in similarly titled tomes for the past two decades and that I remember studying under that rubric as an undergraduate in the 1960s (but much updated, of course). However, probably because Morin has written the book out of experience and as a text, he has provided a heavy dose of population ecology not usually considered to be a part of community ecology in several key places, to make sure that all the intended student audience is ready to explore the community ecology topics. Professors commonly employ this quite useful device. Having this material in one volume will facilitate that practice for professor and student alike.

The main text is in three parts: (I) "Communities: basic patterns and elementary processes"; (II) "Factors influencing

interactions among species"; and (III) "Large-scale, integrative community phenomena." Slightly more than 60% of the text is in Part I, which introduces communities, treats the interactions among populations that Morin considers central to any legitimate concept of community (competition, predation, food webs, mutualism, and indirect effects), and describes the function and contribution of observations, models, and experiments (laboratory and field) to current understandings of communities. Part II (just under 20% of the text) examines temporal patterns in assemblages (but not succession), habitat selection, and spatial dynamics (including recruitment and island biogeography). Part III (slightly less than 20%) analyses species diversity, succession, and applications of community ecology to resource management. Morin's treatment and inclusion of material are appropriate and consistent with current understandings of the field.

I found the organization laid out in the table of contents (summarized above) and the organization within parts and chapters to be excellent. Subjects are treated in an appropriate order, and are properly integrated with each other so as to allow the naïve or the sophisticated reader to readily relate material from one section with material from another. The 15-page index is very complete, with entries that fit both student's and practitioner's expectations. I asked several students to find information on topics they chose, and all found the material they wanted. Morin's writing is clear, concise, and to the point, yet includes sufficient elaboration to be convincing. The placement of the material on stability analysis in an appendix as one example of a useful method in community ecology is appropriate, but I would have liked to have seen additional methods covered similarly. This is not a major weakness of the book as a text, since many methods manuals in ecology are available, and since graduate students are usually expected to develop methods or to adapt them from original sources for any laboratory work carried out as part of a course.

The book is typical of most recent texts for advanced courses, with adequate illustrations (most drawn from published sources, a few original to illustrate concepts or points) emphasizing science rather than being included as pedagogical devices. The illustrations effectively communicate by complementing the text.

The treatment of community ecology will not surprise many, and the opening statement ("Ecology is the science of communities," quoted from Victor Shelford) reflects Morin's lifelong work and passion in this area, probably without bias against other subdisciplines in ecology. He is simply emphasizing that ecology involves interactions, and that no natural unit without interactions is complete. He recognizes that others include ecosystem function as a part of community ecol-

ogy, but excludes it himself from this treatment. I concur, considering that the interactions among populations that are treated here as being a part of community ecology are explored with very different methods from the chemical approaches of the ecosystem ecologist. However, I would also disagree with the opening statement. Shelford's well deserved recognition as a founding parent of modern ecology notwithstanding. The topics explored in this book are part of a continuum of environmental interaction ranging from how the individual copes with physical features on a physiological scale, to complex chemical and physical processes on a global scale. This is a quibble rather than a significant criticism.

There are 28 pages of references, about 20 per page. Reference dates range from the 1830s through 1998, with 40 from 1996–1998. These recent references are well integrated into the text. The coverage is generally even across taxa; the large number of plant, insect, and other invertebrate papers probably reflects the literature. However, the slightly greater number of amphibian papers (22 readily recognized) versus fish (19 readily recognized) is almost certainly partly the result of Morin's selection of reports; the fish literature on the community level is exceedingly rich and fishes have made important contributions to community ecology in the past two decades. Morin's purpose was not to review community ecology as illustrated by any particular taxa, but to elucidate principles by drawing on examples and developing generalizations. This he did well. So again, this is a quibble, not a major criticism, and may reflect my own interest in fishes. Certainly, most of the most important contributions that led to general principles being developed are included, regardless of taxa investigated or the date when the contribution was made.

I cannot offer any complaints about the analysis or conclusions included in the text. It is an excellent synthesis of modern community ecology. Students looking for a "soft" introduction will be disappointed, since full mathematical rigor is included. Morin's explanation of the models he chooses to use should be suitable for anyone with a background in calculus and algebra. Practitioners will benefit most from the excellent literature list and the compilation of this content in a single well-integrated book. The sewn paper binding seems sturdy enough, but libraries will likely want to rebind the book for their collections.

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EXPLORING THE ESSENTIALS OF ECOLOGY

Townsend, Colin R., John L. Harper, and Michael Begon. 2000. **Essentials of ecology**. Blackwell Science, Malden, Massachusetts. xvii + 552 p. \$65.95, ISBN: 0-632-04348-2.

I bet you first looked at the author list on this text and thought the order was backwards. Then you looked at the number of pages and thought "Ah ha! Only 552 pages. This must be a watered-down version of 'the big book.'" *Essentials of ecology*, however, is a new, refreshing, and portable contribution to the slew of introductory ecology textbooks. I have not adopted the encyclopedic Begon et al.'s *Ecology* (Begon, Michael, John L. Harper, and Colin R. Townsend. 1996. Blackwell Science, Malden, Massachusetts), hereafter referred to as the Big Book, for a variety of reasons, including my aversion to books deemed daunting to most students. The stated audience for *Essentials* is students enrolled in a semester-long, introductory course in ecology. The book is of medium length, is easy to read, and is quite manageable for a single-semester course. Overall, I like the book very much and it currently resides at the top of my list of books for adoption.

The first objective of the book, stated in the first paragraph of the preface, is to help citizens become ecologically literate. This, I believe, is an important goal and happens to be one of my own course's learning objectives. Due to the fact that citizens who study introductory ecology are only a small sector of society, the book will have difficulty achieving this very broad goal. Those who read the book, however, will undoubtedly become more ecologically literate.

This is a valuable book for three reasons: content, approach, and layout. First, the content is strong. Ecological concepts are clearly presented while examples are diverse and important. There is a mix of classic and contemporary research, weighted toward the former. Second, the book approaches ecology as a science and introduces two important aspects of ecology (statistics and evolution) that are rarely so explicitly handled in ecology texts. The first chapter ("Ecology and how to do it") introduces the reader to such topics as classic long-term experiments and the quantitative assessment of data, including discussion of data sampling, accuracy and precision, null hypotheses, modeling techniques, and how to interpret probabilities, particularly the *P*-value. Interpreting *P*-values is vitally important to understanding ecology but I question what students will gain from this text. The authors state that a *P*-value of 0.04 is "powerful enough that the conclusion [of an effect or relationship] can be considered safe." On the next page, however, the authors warn that "very little difference in the data is required to move a *P*-value from 0.04 to 0.06." Clearly, the interpretation of *P*-values in terms of safety is problematic but good discussion material for students. Unfortunately, students will rarely find *P*-values used to support results presented in the text. Despite this problem, the attempt to introduce statistical inference in the introductory chapter should be applauded.

The second chapter discusses evolution and the primary

mechanism natural selection. Additional information would have been appreciated, although lengthening the book (for instance, in my lecturing, I discuss the Hardy-Weinberg Law as a powerful null hypothesis for evolution). The chapter is quite adequate for most introductory courses. The text I am currently using and will be dropping has neither explicit discussions of how to do the science of ecology or even the mention of evolution in the index.

Third, the layout and imagery are clear and appealing. Graphics are of high quality and include an abundance of four-tone photographs, although occasionally they provide little information (e.g., an unnumbered photographic figure of annual plants blooming in a desert suffers considerably from enlargement). Graphs are abundant and display data points for regressed relationships and error bars for categorical data. However, they lack statistical values (e.g., *t*- and *r*² values) and *P*-values. Disease dynamics and predator-prey oscillations are important choices for an introductory text but the reader can assess the authors' conclusions only by qualitatively inspecting the graphs. These oversights are inconsistent with the introductory chapter that defines quantitative assessments of data as being essential to understanding ecology as a science.

Side-bar boxes are presented to discuss concepts in more depth. Also, boxed "Topical ECOncerns" discuss important and current processes and problems. These are often related in a personal, testimonial type of discussion with interviews. The use of boxes is extensive in certain sections and may lead some readers to find that these disrupt the flow of the text and encapsulate material that would better be included within the main body of the text, such as the very nice description of the Lotka-Volterra model of competition. Conceptual graphs are displayed using appealing colors, symbols and, at times, goofy cartoons. (For example, a cartoon on predator-prey oscillations displays predators crying over dead offspring with a burgeoning, smiling rodent population looking on. I actually am not sure why the offspring have died when the prey population is abundant, but that will be for the students to consider.) These cartoons should work well for students.

The text is divided into four sections, beginning with the previously discussed "Introduction" with two chapters on quantitative and evolutionary aspects of ecology. Additional sections include "Conditions and resources" (two chapters) covering basics in physiological ecology in both terrestrial and aquatic systems, "Individuals, populations, communities, and ecosystems" (seven chapters), and concluding with "Applied issues in ecology" (three chapters), covering sustainability in agricultural systems, pollution, and conservation biology.

One criticism of the Big Book is its relatively narrow emphasis on population and community ecology. *Essentials* lives up to this criticism as well, with 48% of its bulk dedicated to the third section. The emphasis is really on populations, with only a brief mention of some community-level topics such as community development, or succession, with the no-

ticeable omission of references to Clements, Gleason, or Eglar. If you are looking for a book discussing behavior within a synthetic treatment of ecology you will not find it here. Topics such as foraging theory and reproduction are scattered while discussions of the evolution of cooperative behavior, kin selection, communication, mating systems, and social structure are absent. The above topics receive either their own chapters or detailed discussions in other currently available books. Many of the concepts of population and community ecology, however, are pulled together nicely in Chapter 9, "Population processes—the big picture."

Noticeable errors are rare in this first edition but a few bumbles can be found (e.g., an instance of repeated sentences). I did not, however, see content-based or other important errors. The book briefly discusses some modern techniques of modeling but is thin on explicit discussions of data analysis and assessment of results. This is not unexpected in an introductory text but is problematic in a text that strives to be relatively quantitative. Spatially explicit cellular automata models are discussed along with pseudo-spatial (metapopulation biology) approaches that reveal important population dynamics not possible through traditional, non-spatial modeling approaches. Currently unanswered questions are presented in the margins for student inquiry.

There are approximately 400 references cited. Inspecting the first page of the reference list as a proxy for a random sample, I found only one reference each from 1995, 1996, and 1997, and none of the 33 cited works were later than 1997 (median citation date is 1988). This may represent evidence of a "boiling down" of the Big Book. Other evidence exists, such as a citation to "Begon et al., 1995a," with the

"a" being unnecessary since this is the author's only paper in the reference list. In addition, the data chosen by the authors for graphical presentation come from a relatively mature literature. The citations for data presented in Chapter 5 ("Birth, death, and movement") are typical: a median publication date is 1975 for 18 references (skewed toward earlier dates). In defense, some of the research represents classic citations but other examples could be pulled from more recent studies. Readers of this review will have to decide on the importance of this for their students (do students care less about work published before their birth?).

Essentials likely will not compete with the Big Book. Users of the larger text who are pleased will not change because of the *Essentials'* introductory target audience. This book is superior to the other introductory texts that I have evaluated. Its breadth of topics and readability is notable. Students will enjoy and read the chapter on "Organisms as habitats" for its use of humans in a discussion of parasites and pathogens, exposing them to an important perspective in ecology.

Overall, I recommend *Essentials* for use in introductory courses. The book makes a better attempt than most texts to present ecology as a quantitative science and brings both classic and contemporary issues in ecology together in a well presented and readable synthesis. Depending on the reader, the book's shortcomings may be relatively inconsequential and can be easily addressed in the classroom.

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BOOKS AND MONOGRAPHS RECEIVED THROUGH MARCH 2000

- Allen, John L., editor. 2000. **Annual editions: environment 2000/2001**. Nineteenth Edition. Dushkin/McGraw-Hill, Guilford, Connecticut. x + 229 p. \$16.56, ISBN: 0-07-236549-8.
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- Barrow, Mark V., Jr. 2000. **A passion for birds: American ornithology after Audubon**. Princeton University Press, Princeton, New Jersey. x + 326 p. \$69.50, £44.00 (cloth), ISBN: 0-691-04402-3 (alk. paper); \$19.95, £12.50 (paper), ISBN: 0-691-04954-8 (alk. paper).
- Bennett, Nigel C., and Chris G. Faulkes. 2000. **African mole-rats: ecology and eusociality**. Cambridge University Press, New York. xiv + 273 p. \$59.95, ISBN: 0-521-77199-4.
- Bowman, D. M. J. S. 2000. **Australian rainforests: islands of green in a land of fire**. Cambridge University Press, New York. xi + 345 p. \$85.00, ISBN: 0-521-46568-0.
- Crisler, Lois. 1999 (originally published 1956). **Arctic wild: the remarkable true story of one couple's adventure living among wolves**. The Lyons Press, New York. xvii + 301 p. \$16.95, ISBN: 1-55821-688-X.
- Dodson, Stanley L., Timothy F. H. Allen, Stephen R. Carpenter, Kandis Elliot, Anthony R. Ives, Robert L. Jeanne, James F. Kitchell, Nancy E. Langston, and Monica G. Turner, editors. 1999. **Readings in ecology**. Oxford University Press, New York. ix + 461 p. \$35.00, ISBN: 0-19-513309-9.

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- Dugatkin, Lee. 2000. **Cheating monkeys and citizen bees: the nature of cooperation in animals and humans.** Harvard University Press, Cambridge, Massachusetts. xi + 208 p. \$14.95, ISBN: 0-674-00167-2.
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- Flora of North America Editorial Committee, editors. 2000. **Flora of North America: north of Mexico.** Volume 22. Magnoliophyta: Alismatidae, Arecidae, Commelinidae (in part), and Zingiberidae. Oxford University Press, New York. xxiii + 352 p. \$95.00, ISBN: 0-19-513729-9 (acid-free paper).
- Goodall, Jane. 2000 (originally published 1990). **Through a window: my thirty years with the chimpanzees of Gombe.** Houghton Mifflin, New York. 268 p. \$14.00, ISBN: 0-618-05677-7.
- Gosling, L. Morris, and William J. Sutherland, editors. 2000. **Behaviour and conservation.** Conservation Biology Series 2. Cambridge University Press, New York. xi + 438 p. \$90.00 (cloth), ISBN: 0-521-66230-3; \$39.95 (paper), ISBN: 0-521-66539-6.
- Harrod, Howard L. 2000. **The animals came dancing: Native American sacred ecology and animal kinship.** The University of Arizona Press, Tucson, Arizona. xxv + 170 p. \$35.00 (cloth), ISBN: 0-8165-2026-7 (alk. paper); \$17.95 (paper), ISBN: 0-8165-2027-5 (alk. paper).
- Hartman, John R., Thomas P. Pirone, and Mary Ann Sall. 2000. **Pirone's tree maintenance.** Seventh Edition. Oxford University Press, New York. ix + 545 p. \$49.95, ISBN: 0-19-511991-6 (acid-free paper).
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- Kavoori, Purnendu S. 1999. **Pastoralism in expansion: the transhumming herders of western Rajasthan.** Oxford University Press, New York. xvi + 209 p. \$28.95, ISBN: 0-19-564543-X.
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- Robinson, John G., and Elizabeth L. Bennett, editors. 2000. **Hunting for sustainability in tropical forests.** Biology and Resource Management Series. Columbia University Press, New York. xxi + 582 p. \$80.00, £51.00 (cloth), ISBN: 0-231-10976-8 (alk. paper); \$29.50, £19.00 (paper), ISBN: 0-231-10977-6 (alk. paper).
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- Van Dover, Cindy Lee. 2000. **The ecology of deep-sea hydrothermal vents.** Princeton University Press, Princeton, New Jersey. xx + 424 p. \$85.00, £53.50 (cloth), ISBN: 0-691-05780-X (alk. paper); \$39.50, £24.95 (paper), ISBN: 0-691-04929-7 (alk. paper).
- Vogt, Kristiina A., Bruce C. Larson, John C. Gordon, Daniel J. Vogt, and Anna Fanzeres. 2000. **Forest certification: roots, issues, challenges, and benefits.** CRC Press, Boca Raton, Florida. 374 p. \$89.95, ISBN: 0-8493-1585-9 (alk. paper).

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