



---

Adaptive Herbivore Ecology: From Resources to Populations in Variable Environments.  
*Cambridge Studies in Ecology. By R Norman Owen-Smith*

Adaptive Herbivore Ecology: From Resources to Populations in Variable Environments by  
R Norman Owen-Smith

Review by: Reviewed by Ken N Paige

*The Quarterly Review of Biology*, Vol. 78, No. 1 (March 2003), pp. 121-122

Published by: [The University of Chicago Press](#)

Stable URL: <http://www.jstor.org/stable/10.1086/377903>

Accessed: 03/08/2015 14:52

---

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at  
<http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



The University of Chicago Press is collaborating with JSTOR to digitize, preserve and extend access to *The Quarterly Review of Biology*.

<http://www.jstor.org>



## REVIEWS AND BRIEF NOTICES

History, Philosophy & Ethics .....	74	Plant Sciences .....	96
General Biology .....	82	Animal Sciences .....	101
For Tyros & Laics .....	86	Aquatic Sciences .....	106
Paleontology .....	88	Environmental Sciences .....	111
Molecular Biology .....	89	Neural Sciences .....	123
Cellular Biology .....	91	Behavior .....	126
Genetics & Evolution .....	92	Human Biology & Health .....	127
Reproduction & Development .....	94	Biomedical Sciences .....	130
Microbiology .....	95		

## HISTORY, PHILOSOPHY &amp; ETHICS

## THE PROBLEM OF THE SOUL: TWO VISIONS OF MIND AND HOW TO RECONCILE THEM.

By Owen Flanagan. *New York: Basic Books*. \$27.50. xvii + 364 p; ill.; index. ISBN: 0-465-02460-2. 2002.

The author is a well-known philosopher of mind. A year or two back he was asked to join a small group in India that explained to the Dalai Lama some of the Western views on mind, body, free will, and the like, including his own. Flanagan has now written up his explanations for the rest of us. I strongly urge readers who want to find out how one of the best of today's philosophers is tackling the mind-body problem to read this book.

Flanagan takes us through the usual list of topics—mind and body, free will and determinism, our sense of self, the matter of ethics and moral conduct—briskly and openly, adding all along the way his own comments and much about himself. There is a very moving mini-autobiography, as he tries to illustrate what it is about a person that endures through time. As you might imagine, with a name like Owen Flanagan, he is an Irish American Catholic, or at least he was. Now Flanagan is a nonbeliever and subscribes to a naturalistic vision of humankind—I suppose easiest would be to say that he takes the kind of stance favored by David Hume and his successors. For example, he does not believe in free will in some transcendental kind, a sort of ethereal force that enables us humans to step outside the chain of causation and to make decisions one way or the other, no matter what came before. Rather, he thinks we are part of the causal nexus, but that this does not deny that

we are independent beings with the power to choose.

The one criticism that I have is that Flanagan needlessly puts his own position against that of the religious. Perhaps he was overinfluenced by his Catholic upbringing, but my sense is that many Christians would accept all that he says, and then put down to mystery the issues that Flanagan rejects and thinks the rest of us should too. But this is another good reason for reading *The Problem of the Soul*—to argue as well as to learn.

MICHAEL RUSE, *Philosophy, Florida State University, Tallahassee, Florida*

## DARWIN'S CATHEDRAL: EVOLUTION, RELIGION, AND THE NATURE OF SOCIETY.

By David Sloan Wilson. *Chicago (Illinois): University of Chicago Press*. \$25.00. vii + 268 p; index. ISBN: 0-226-90134-3. 2002.

The author's thesis is that "religions have functioned as mighty engines of collective action for the production of benefits that all people want" (p 187), and so natural selection explains their prevalence. Religious groups are adaptive units; they are like organisms, although less completely integrated than organisms. The codes and culture of religions are adapted for advantage in between-group competition and for suppressing the dissipative effects of within-group competition. "Religion is selflessness with strings attached" (p 176), the strings being for the control of free riders in the group.

Wilson regards religion as a phenomenon to test his multilevel selection theory. But the book's polemics are directed as much against the rational choice theory of religion, associated with Rodney

Stark and other sociologists, as it is against the unilevel selection theory. According to Stark, rational choice theory offers a paradigm for explaining the behavior and attitudes of members of religions, better than functionalism, which includes natural selection theories. Wilson tries to show that a multilevel natural selection theory is superior in explanatory power in some areas, and is at least complementary to rational choice theory in others. This requires that religion be explained by its secular utility, which is all that evolutionary selection can work on, rather than the payoffs of salvation, which believers and rational choice theorists work with. Wilson forgets his own apologetical motives (to be noted later) when he caricatures rational choice theory as crediting the illusion (p 83) of getting what one cannot have, spinning one's wheels (p 80) to get what one cannot have, presumably salvation and eternal bliss.

Selection at the level of the group is aided by the fact that the evolution of religion is much more cultural than genetic. What nature "sees" is phenotypic variation; what heritable entity underlies the variant she selects is irrelevant, whether it is DNA or attitudes and practices passed on by cultural modes of transmission. Wilson is not a proponent of memic selection, which he regards as a nonfunctionalist competitor of his own theory. For him, culture and religion are functional for the average human being in the groups that have them. They have their secular utility, whereas meme theory makes the memes mere parasites. Nor is he a proponent of evolutionary psychology, which he thinks forecloses the possibility of cultural evolution being an open-ended process analogous to the open-endedness of the evolution that occurs in our immune systems.

What is religion? Since many traits of human beings contribute to their success in intergroup competition (e.g., militarism, literacy), what is unique about the religious trait? Relying on Durkheim and Terrence Deacon, Wilson suggests religion offers a symbol system organized around a central symbol of the sacred, which commands respect and dictates behavior (p 227). The system is not intended to capture factual reality; that is the scientific symbol system's job.

Wilson has many irons in the fire, as you see. His last chapter thrusts another in, namely apologetics. If religion is an important (essential?—he never says so explicitly) component in our society's adaptation, we should welcome its being a religious society. There is no reason to think the religion's creed is factually true and, consequently, one might try to be a free rider in it. But a less risky alternative, given religion's adaptive intolerance of free riders, is the one Wilson recommends: "Like the Nuer

tribesman and Balinese farmer, let us know exactly what our unifying systems are for, and then pay them homage with overflowing belief" (p 233). Wilson says he hopes his book contributes to John Templeton's vision of a supportive relationship between religion and science (p 260), and he acknowledges a grant from Templeton's foundation.

ARTHUR E FALK, *Philosophy, Western Michigan University, Kalamazoo, Michigan*

SCIENCE, MONEY, AND POLITICS: POLITICAL TRIUMPH AND ETHICAL EROSION.

By Daniel S Greenberg. Chicago (Illinois): University of Chicago Press. \$35.00. x + 530 p; index. ISBN: 0-226-30634-8. 2001.

This book could be titled *Scientists Descend on Washington: A Journalist's Scrapbook*. It is a very impressive volume, filled with facts, numbers, acronyms, and insights concerning decades of science-budget struggles in Washington. It offers a good political history of many of today's important programs, as well as failed ventures. It deserves to be on the shelf of every science watcher.

Greenberg argues that physicists, biomedical researchers, and other scientists have beaten sorry paths to Washington, where they grovel for funds and chant myths about their poverty, their nobility, and their unbounded potentials to help humanity. They exaggerate the stupidity of nonscientists. Clearly, scientists do produce many magnificent discoveries and inventions, but they also have come to believe the myths themselves; they are blind to the distortions in their social and self-images, and they have abrogated their historical obligation to offer objective perspectives on important social issues.

I suspect that average readers will focus on the first and last chapters, which offer overviews of the ways in which the lure of big money has compromised too much of science, but will thumb through the fact-packed middle part of the book, which is like a delicious party mix. Pretzel lovers will sort through the peanuts to pick out the pretzels, while peanut lovers will be brushing the pretzels aside. But readers who nibble everything will get a good feeling for the complex dealings of Washington science politics.

Greenberg is very good at detailing the wrinkling patterns on the Washingtonian financial feet of the behemoth of American science. But this long book seems to be so meticulously documented that readers could easily assume that it reveals the whole elephant. An enormous amount of detail is reported in a way that might leave casual readers with the misleading impression that individual scientists and science agencies have simply

become corrupt, and for no good reason but greed, hubris, and unaccountability.

The book mentions, but could better develop, the fact that jobs in science have become highly managed, especially since World War II and the Reagan Revolution. The leadership trends and management practices at universities have quite deliberately made scientists increasingly *dependent* on federal grants for their financial security and self-esteem. Local politicians, businesses, and boards of regents have quite consciously hired administrators to *pressure* scientists to forage for dollars inside the beltway, to bring money and expertise into their states, and when necessary to justify their programs with simplistic rhetoric.

There is a managed system, and it would be misleading to imagine that it is weak, and that individual university scientists, professional associations, or even individual government bureaucracies are simply independent actors fighting for a place at the public trough. Much more could be said about the difficulties that scientists would have in bucking the system.

Students see this and must decide if they have the stomach for it. So aside from the matter of talent, there has been a selection among prospective young scientists in favor of those who can put up with this, or who may even relish the hustle, and a selection against those who cannot. Science has been undergoing a shift in its sociology as well as in its management. In this light, Greenberg's lashing of scientists will not be enough to help them to understand that history expects them to be the children of Galileo and Newton and of the great minds who were the hope of the Enlightenment, or to figure out what to do about it.

The job situation on campuses outside of the beltway is not independent of matters inside the beltway, but Greenberg does not develop the subordination of universities and science to the national political economy as well as one might. For example, he only discusses early in the first chapter the Bayh-Dole Act of 1980, which has dangled hopes for riches from inventions in order to stimulate an entrepreneurial mindset in science. This was part of a completely conscious major political effort to bring American scientific brainpower into more direct service of the broad interests of the business community. The effort was aimed to make science *less* autonomous and *more* *accountable*, specifically to economic interests. This is not the sort of accountability that Greenberg would like. The significance of manipulation of the job market from the top of the power structure seems to fade from the perspectives in later chapters.

The National Academy of Sciences (NAS) has

played a nontrivial role in building and maintaining a complex system of funding, prestige, political influence, and policies that individual scientists and even seemingly powerful program directors must navigate in order to survive and function. It has become increasingly dominated by ties to industry and the military, and has even increasingly drawn its members *directly from* industry. So, in this sense, it is by no means autonomous. It plays a key role in shaping the directions in which science and technology develop, and consequently even the directions in which national and global society develops. The NAS exercises power by virtue of its political connections, its prestige as a body, and the potential of its studies to influence programs and budgets, but also through the ability of its powerful members to influence individual career advancements within the scientific community, and to influence university politics.

Greenberg well understands that the NAS is powerful in Washington science politics. But a full understanding of national science politics would dig more deeply into the mechanisms and magnitude of the influence of this body with the scientific community outside the beltway, and with the federal agencies. It would reveal how the NAS sets agendas, and how political dealings that are typically opaque relate in turn to the groveling for funds, the mythmaking, and the bloating of budgets that Greenberg deplors.

No single book can cover in the documentary detail at which Greenberg excels, all aspects of concern about the condition of science today. Keeping this in mind, it is easy to praise Greenberg's impressively researched book as a landmark contribution to the study of science funding politics today.

PHILIP J REGAL, *Ecology, Evolution & Behavior*,  
University of Minnesota, St. Paul, Minnesota

#### OUR POSTHUMAN FUTURE: CONSEQUENCES OF THE BIOTECHNOLOGY REVOLUTION.

By Francis Fukuyama. New York: Farrar, Straus and Giroux. \$25.00. xiii + 256 p; ill.; no index. ISBN: 0-374-23643-7. 2002.

In order to evaluate this volume, one needs to ask: What perspective supports the basis of my assessment? My perspective is as an instructor, someone who teaches philosophy classes that deal with humanistic dimensions of science and technology to undergraduates, many of whom are science majors and have never thought about the social implications of scientific research and technological development. I thoroughly enjoyed reading Fukuyama, and plan on assigning his book in a subsequent semester. He is a clear writer and his ability to organize big issues surrounding the impending

Brave New World in concise terms allows the ever-changing world of biotechnology, and the philosophical resources needed to make sense of it, to accessibly shine through. From my perspective as a researcher, as someone who typically reads books on science and technology in order to learn something new, I was disappointed. Although Fukuyama does a fine job of reminding us what the well-known, potential social problems are that may arise from developments in biotechnology—such as the emergence of designer babies, psychotropic drugs leading to a radical transformation in the subject's affective demeanor, increased life spans that lack a quality of life, and economic-class conflict rooted in inequitable access to biotechnology resources—his solution for dealing with them, which amounts to an appeal to natural law theory, is neither innovative nor particularly well developed. Worse yet, it may even be naïve.

Fukuyama's primary thesis is that it is only by appealing to "human nature" that we can make the appropriate social and political choices regarding advances in biotechnology (e.g., the next wave of neuropharmacology, human cloning, and genetic engineering): "The aim of this book is to argue that [Aldous] Huxley was right, that the most significant threat posed by contemporary biotechnology is the possibility that it will alter human nature and thereby move us into a 'posthuman' stage of history. This is important, I will argue, because human nature exists, is a meaningful concept, and has provided a stable continuity to our experience as a species. It is, conjointly with religion, what defines our most basic values. Human nature shapes and constrains the possible kinds of political regimes, so a technology powerful enough to reshape what we are will have possibly malign consequences for liberal democracy and the nature of politics itself" (p 7). For Fukuyama, the appeal to human nature is crucial because although political regulations are important, particularly at the international level, when unaided by philosophical support, they will collide with, and have a difficult time overcoming, the Libertarian ethos of personal freedom and the positivist conviction that scientific and technological progress is essential for moving history in a progressive direction. Likewise, although Fukuyama does not display the disdain toward organized religion exhibited by many intellectuals, he suggests that an appeal to religious doctrine cannot provide the needed solution, since it will not be convincing to secular segments of the population, and because religious institutions tend to take extreme stands, such as when the Church's view on abortion leads it to abandon nuanced reflection and outright reject particular biotechnology developments.

So what is wrong with appealing to human

nature? Fukuyama finds this move necessary because he sees our intellectual climate as too mired in constructivism, which is to say, as being more comfortable with the notion of cultural contingency and diversity than universal givens and universal rights. In short, Fukuyama worries that the "so-called" post-Kantian deontological theories of right are worthless here because they are "not dependent on any substantive assertions about human nature or human ends" (p 119). Utilitarianism cannot be appealed to because "[u]tilitarians seldom take into account more subtle benefits and harms that cannot be easily measured, or which accrue to the soul rather than to the body" (p 100). He also concedes, however, that appealing to human nature is difficult because an interminable debate exists over the relative impact of natural and social forces determining who we are. It is ultimately by turning to genetic studies that purport to delimit our distinguishing characteristics qua humans that Fukuyama declares: "The definition of the term *human nature* I will use here is the following: human nature is the sum of the behavior and characteristics that are typical of the human species, arising from genetic rather than environmental factors" (p 130). But what does this vague definition tell us? It suggests that there are human responses that through evolution have become innate and guide the formation of moral ideas in a somewhat uniform sense. It also allows Fukuyama to appeal to the concept of "human dignity . . . the idea that there is something unique about the human race that entitles every member of the species to a higher moral status than the rest of the natural world" (p 160). But what the author never satisfactorily answers is why we should accept the appeal to human nature as the legitimate bedrock of moral, social, and political freedom when, as Fukuyama well knows, the very definition he currently presents of human nature may very well become outdated. By presenting a reactionary discourse grounded in the appeal to a vague and idealized sense of current human nature that is juxtaposed with caricatures of rival positions, Fukuyama almost ensures that we will be unprepared for the putative posthuman era ahead.

EVAN SELINGER, *Philosophy*, State University of New York, Stony Brook, New York

SCIENCE, TRUTH, AND DEMOCRACY. *Oxford Studies in Philosophy of Science*.

By Philip Kitcher. Oxford and New York: Oxford University Press. \$27.50. xiii + 219 p; ill.; index. ISBN: 0-19-514583-6. 2001.

Employing the overly used rhetorical gambit of positioning one's views in the middle of extremely myopic positions, the Scylla of true believers and

the Charybdis of skeptics, Philip Kitcher begins *Science, Truth, and Democracy* by informing readers that he wants to avoid two “unacceptable images.” On the one hand, Kitcher is not a member of the “scientific faithful” whose core view is epitomized by the belief that: “The sciences represent the apogee of human achievement” (p 3). Although not so naïve as to believe that scientific research is completely free of moral constraints, this group nevertheless maintains that “moral, political, and religious judgments” should not influence “the formulation of projects for scientific inquiry and the appraisal of evidence for conclusions” (p 3). On the other hand, Kitcher by no means identifies with the demythologizers of science: the “[w]ould-be debunkers [who] believe that it is very much in the interests of those who are currently in power in affluent societies to cultivate the idea of a pure science that stands free of moral, political, and religious values, and that the myth serves as a tactic for excluding viewpoints that the powerful would like to marginalize” (p 4). Although both of these groups are idealizations of utopian and dystopian views, ample evidence abounds in the literature that suggests Kitcher is not inventing straw men.

The author posits an analogy between scientific practice and map making in order to advance the claim that just as there is no universal and ideal atlas that reveals all the spatial relations on our planet, there is not complete science, but rather, only specific scientific enterprises that have been engaged in response to human curiosity and practical needs exist: “Like maps, scientific theories and hypotheses must be true or accurate . . . to be good. . . . Beyond the necessary condition is a requirement of significance that cannot be understood in terms of some projected ideal—completed science, a Theory of Everything, or an ideal atlas” (p 61). On the basis of this model, Kitcher’s guiding question is normative: What kinds of science should we pursue? His answer is essentially that the sciences that ought to be fostered are those that promote the collective good. This response is, of course, vague, and Kitcher thus sets himself the task of answering the correlative question: What is the collective good that science should be trying to promote?

The answer to this question brings us to what is perhaps the most important chapter of the book, Well-Ordered Science. Kitcher begins this chapter by claiming that “vulgar democracy” in which every citizen has the ability to vote and express a preference on the direction that scientific research should take is not an acceptable course of action because laics cannot be trusted to express preferences that are truly in their best interests. Rather, their preferences are “often based on impulse or

ignorance and thus diverge from favoring what would actually be good for them” (p 117). Kitcher goes so far as to characterize “vulgar democracy” as prompting “tyranny of the ignorant”: “Only a moment’s reflection is needed to see that the most likely consequence of holding inquiry to the standard of vulgar democracy would be a tyranny of the ignorant, a state in which projects with epistemic significance would often be dismissed, perceptions of short-term benefits would dominate, and resources would be likely to be channeled toward a few ‘hot topics’” (p 117).

In ruling out “vulgar democracy” as a viable option, Kitcher turns to a *regulative ideal* of well-ordered science, a model that can be strived for, but perhaps may never be reached. Here Kitcher takes a Rawlsian turn and invites us to imagine an ideal group of deliberators who come to have “tutored preferences.” Making an analogy with a family who wishes to spend a free evening together engaged in some form of entertainment, Kitcher invites us to imagine the ideal deliberators who will decide the direction of science as sharing a collective concern for the common good, despite obvious and distinctive self-interests. Like members of the “original position” of Rawls, they begin their deliberations in partial ignorance of the needs, desires, and values of the other participants and of critical facts of nature. Through deliberation they not only gain knowledge of the material world, but also become acquainted with what the others prefer. As a result, the preferences become negotiated until a consensus is reached. Kitcher defines this model in terms of three core elements that revolve around the transition from personal preference to tutored preference in which the best way to allocate resources, the appropriate moral constraints to heed, and the best way to apply the fruits of investigation are decided: “At the first phase, decisions are made to commit resources, such as investigators and equipment, in particular amounts to particular projects. The second phase pursues those projects in the most efficient way, subject to moral constraints that rule out certain physically possible options. At the third phase, the results of the various investigations are translated into practical consequences” (p 118).

Kitcher is to be commended for tackling a difficult topic and for having the courage to remain philosophical, which is to say, avoiding the sociological impulse and presenting an idealized model that empirical procedures may never be able to capture. But Kitcher’s offhand dismissal of “vulgar democracy” is troubling because it appears to be condescending. Admittedly, there are many gaps between expert and general knowledge, some are technical, some are linguistic, and some are rooted in the social and political arena. To this end,

Kitcher's appeal to tutored preference seems reasonable, since it is a theoretical attempt to reckon with these disparities. Nevertheless, Kitcher never presents a compelling case that as matters currently stand, our ability to muddle through needs to be refined. And unless this is proven, the case against "vulgar democracy" appears to be grounded in an unjustified sense of paternalism.

EVAN SELINGER, *Philosophy, State University of New York, Stony Brook, New York*

**DRAWING THE LINE: SCIENCE AND THE CASE FOR ANIMAL RIGHTS.**

By Steven M Wise. *A Merloyd Lawrence Book. Cambridge (Massachusetts): Perseus Books. \$26.00. xiii + 322 p; ill.; index. ISBN: 0-7382-0340-8. 2002.*

Wise is an animal rights lawyer and author of *Rattling the Cage: Toward Legal Rights for Animals* (2000. Cambridge (MA): Perseus Books), which argued for legal rights for chimpanzees and bonobos. This new volume explores the more general question of which animal species possess the mental traits that would qualify them for basic liberty rights under the common law (p 241). Wise begins by describing the mental development of a human child to create a vocabulary for discussing mental complexity and attributes, and then devotes a chapter to each of seven other species: gorilla, orangutan, African elephant, domestic dog, African Grey parrot, bottle-nosed dolphin, and domestic honey bees.

The descriptions of the species—most based on one or two well-studied individual animals—are a valuable account, mainly in nontechnical language, of recent research on animal cognition, awareness, and communication. Wise describes the cognitive abilities of African Grey parrots, navigation and communication by honey bees, responsiveness of dogs to subtle cues from humans, use of tools and language by Great Apes, and the remarkable responses of elephants to the remains of dead conspecifics. In this respect, the book is a welcome advance over much of the earlier animal rights writing that tended to blur a vast taxonomic landscape into the single moral category of "animals." Wise thoughtfully sifts the available evidence from a wide range of leading scientists, even traveling to laboratories and African field sites to see the different species personally. The cooperation of most of the scientists—and the understandable hostility of one who saw an animal rights lawyer as a threat to his laboratory—provide an interesting subplot to the book.

Wise presents his scheme for deciding whether a given species qualifies for basic liberty rights. Here the lawyer/author and biologist readers may

part company. To biological readers, Wise will come across as unsophisticated in quantifying complex biological traits. Obviously, there are many traits that need to be considered: sentience, self-awareness, capacity to suffer, possession of a sense of self, and awareness of other minds, among others. Wise proceeds (somehow) to combine these into a single scale of "autonomy values" running from one (where these faculties are certainly present) to zero (where they are certainly absent), with animals who possess sufficient autonomy for basic liberty rights (p 241) placed above 0.5. But without clear scoring criteria, Wise's numbers seem little more than arbitrary. He assigns the dog a value of 0.68, between honey bees (0.59) and African Grey parrots (0.78), citing a variety of reasons, but with no clear rationale for assigning numerical scores for specific mental attributes. To make the scale more complex, the numbers are intended to reflect the degree of certainty provided by current evidence, with the midpoint on the scale reserved for species whose mental abilities are simply unknown. Thus, the parrot receives a higher score than the dog partly because its cognitive abilities have been studied more rigorously.

In applying the scale to the issue of rights, Wise seems to add another layer of arbitrariness. Although claiming that all species with autonomy values greater than 0.5 should receive basic liberty rights, he decided that a reasonable application of the "precautionary principle" would put 0.70 as a cutoff value. Hence, bees and dogs (at 0.59 and 0.68) do not qualify, whereas elephants and parrots do.

In the past, many animal rights advocates have been unclear about what they mean, in practical terms, by rights for animals. Wise tries to be more analytical, but readers will still be confused as to the practical implications of his arguments. He begins well (Chapter 2) by setting out four kinds of legal rights: liberties, claims, powers, and immunities. Later he refers to dignity rights (p 231), basic equality rights (p 232), bodily integrity rights (p 238), and bodily liberty (p 238), but with only the most minimal explanation of how these different kinds of rights would affect our treatment of other species. In each chapter he devotes only a few sentences to the practical implications of his analysis. His one clear conclusion is that we should no longer capture, hunt, imprison, or cull Great Apes, African elephants, African Grey parrots, and bottle-nosed dolphins (p 239). But where else does his system take us? Direct human actions—such as culling, capturing, and imprisoning—represent only a fraction of the harms we cause to other species. Vastly more important are the impacts we exert indirectly through logging, cropping, fishing,

transportation, and most other human economic activities. How would these human activities be affected by Wise's analysis, especially if increased knowledge of animal cognition moved many other species into the range where basic rights apply?

In summary, readers will have very different responses to this book. Those who are not specialists in animal cognition are likely to find the empirical information interesting and accessible. For biologists, Wise's attempt at numerical scoring of the mental abilities of animals, and his use of these scores to ascribe rights to animals, will seem unsophisticated. And for those focused on improving the lives of animals, the practical implications of Wise's arguments are likely to seem unclear and unsatisfying.

DAVID FRASER, *Animal Welfare Program, University of British Columbia, Vancouver, Canada*

#### THE RISE OF EXPERIMENTAL BIOLOGY: AN ILLUSTRATED HISTORY.

By Peter L. Lutz; Foreword by Bob Boutilier. Totowa (New Jersey): Humana Press. \$59.50. xiii + 200 p + 8 pl; ill.; index. ISBN: 0-89603-835-1. 2002.

This book does provide illustrations, including the most familiar repertoire of drawings, paintings, and photographs from the history of medicine and biology. Although the illustrations are not well integrated with the text, they can stand on their own. My major criticism is with the text. Content, style, and conclusions all have serious problems, which is unfortunate since an expansive illustrated history of biology could be valuable for course use. One clue to the content problems is the mismatch between the title, which stresses "experimental" and "biology," and the fact that we only get to Darwin on page 163 out of 182 text pages. The book mostly details early history, including much of what would normally be called medicine rather than biology.

With no clear organizational theme, except the declared intent to provide a brief introduction to the history of biology and to show the many different things we have learned, the book does not even try to develop any story line. The style is encyclopedic, briefly describing one thing after another. Readers will not gain insight into the selection criteria used, nor into what holds the individual parts together. Encyclopedias can be useful. Yet the results will be disconcerting to readers with any historical sense. The author reveals his lack of historical training with revelations such as that libraries burned in Alexandria and "by great luck, vital classical texts were translated into Arabic and Hebrew" (p 39), or that the fifth century was followed by the "Dark Ages" and that "for the next

1000 years, no important new discoveries were made" (p 49). Perhaps the author is hampered by his reliance on the 11th edition of the *Encyclopedia Britannica* as his source in various cases. Yet surely he could have discovered that Leeuwenhoek was not, in fact, secretive about his "new technology," but actually journeyed to London to share his microscopes and microscopic samples and observations. Occasional misspellings of names or mistaken details further suggest that the author is new to this material. History is not just a list of tidbits, so the lack of an organizational framework or theme is a serious problem.

Lutz's conclusions are also odd. Considering that we learn virtually nothing about the 20th century, which is according to most historians of biology a very important time for experimental work, it is surprising to read that "[a]nother lesson in the history of science however, is that the increasing power to do good carries with it the threat of even greater harm" (p 182). We would certainly not have learned that from this book. Nor would we have learned much to solve the problem with which Lutz concludes the book: "Like never before, it is imperative that citizens and politicians become better educated in the methods and goals of science—past and present. Scientists themselves should not hesitate to contribute to this general education" (p 182). A noble sentiment, certainly, but it is extremely important that those scientists eager to do so should understand the subject matter that they attempt to teach.

JANE MAIENSCHIN, *Philosophy, Arizona State University, Tempe, Arizona*

#### SCIENCE AND LITERATURE: BRIDGING THE TWO CULTURES.

By David L. Wilson and Zack Bowen. Gainesville (Florida): University Press of Florida. \$55.00. xv + 252 p; index. ISBN: 0-8130-2283-5. 2001.

This book explores the interface between the sciences and the humanities in a quite novel manner. Growing out of the course, Science and Literature, taught jointly at the University of Miami by a scientist (David L. Wilson) and a literary scholar (Zack Bowen), the book is written in the form of a dialogue between the two individuals. The volume begins with the introduction and explication of the fundamental tenets of science and how these can be applied to a range of issues; this is followed by a discussion or demonstration of how a literary scholar thinks about the same issues. The dialogues are organized into chapters based on these issues. Additional chapters include longer analytical essays exploring how science and literature interact in novels such as John Fowles's *The French*

*Lieutenant's Woman*. Little will surprise readers who are accustomed to listening to exchanges between the celebrated "two cultures." The scientist writes in short, declarative sentences with conviction, earnestness, and certainty; he may not make grand claims to truth, but he has "the method" that best approximates it. He believes that both areas will be bridged in the kind of argument offered by E O Wilson in his volume, *Consilience: The Unity of Knowledge* (1998. New York: Knopf). The humanist has no such method; he is uncertain about knowledge in general, and humanistic knowledge in particular. With wisdom and eloquence he celebrates endeavors such as poetry and fiction that "don't derive their truth from scientific verifiability" (p 210).

The two occasionally spar with each other, but for the most part genuinely attempt to listen to one another's points of view. Although it is unclear whether they achieve their goal of "bridging the two cultures," the book makes for good reading. The dialogue is substantive, serious, stimulating and, on occasion, fun. It is worthwhile reading for those interested in a novel approach to the subject.

VASSILIKI BETTY SMOCOVITIS, *History, University of Florida, Gainesville, Florida*

IN NATURE'S NAME: AN ANTHOLOGY OF WOMEN'S WRITING AND ILLUSTRATION, 1780–1930.

*Edited by Barbara T Gates. Chicago (Illinois): University of Chicago Press. \$75.00 (hardcover); \$27.50 (paper). xxvi + 673 p; ill.; no index. ISBN: 0-226-28444-1 (hc); 0-226-28446-8 (pb). 2002.*

This thematic anthology arose as a companion volume to Gates's earlier book, *Kindred Nature: Victorian and Edwardian Women Embrace the Living World* (1998. Chicago (IL): University of Chicago Press). It brings together the works of 69 female authors and artists from the Victorian and Edwardian periods in order to provide "new insights into women's role in redefining nature, nature study, and nature writing" (p xxii). Each major section of the anthology treats a particular area of activity or a question related to women's writing on nature and the environment: Speaking Out; Protecting; Domesticating; Adventuring; Appreciating; Popularizing Science; and Amateurs or Professionals? The volume includes biographical sketches of the authors and artists, a chronology that relates the works to their historical context, and a bibliography. The introduction to each section contextualizes the documents and pictures in that section.

Mostly excerpts from larger works, the selections in this volume are well chosen and remarkable for the diversity and richness they exhibit. Readers will be exposed to a wide range of voices—contempla-

tive, analytical, poetic, strident, whimsical, pedagogical, practical, and sublime—addressing an almost equally wide range of audiences. The selections demonstrate how women's writing exemplifies the multiple possibilities for relating to, interpreting, and representing nature and its connections to human beings and to culture. Although the themes and overall focus of the anthology give it coherence, it does not come at the expense of obscuring the diversity among the authors and works included.

Its very nature as an anthology means that *In Nature's Name* is more illustrative than exhaustive, and its treatment of the themes and questions raised is more suggestive than definitive. In that sense, the volume offers the beginning of an inquiry rather than the final product. Readers familiar with the cultural history of the period will have a greater appreciation for the richness of the material collected here than will those who are new to the subject. Advanced students and beginning researchers in women's studies or the cultural history of science should find *In Nature's Name* a good point of departure because of the immediacy and freedom of interpretation that it allows for readers. The literary quality of many of the selections should also make the volume quite useful in classes on literature or literature and science.

KATHRYN A NEELEY, *Technology, Culture & Communication, School of Engineering & Applied Science, University of Virginia, Charlottesville, Virginia*

MESELSON, STAHL, AND THE REPLICATION OF DNA: A HISTORY OF "THE MOST BEAUTIFUL EXPERIMENT IN BIOLOGY."

*By Frederic Lawrence Holmes. New Haven (Connecticut): Yale University Press. \$40.00. xii + 503 p; ill.; index. ISBN: 0-300-08540-0. 2001.*

During the five years following its 1953 *Nature* publication by Jim Watson and Francis Crick, the double structure of DNA was met with polite skepticism. The insightful genetic implications of the structure—that each strand could be used as a template during replication—laconically suggested at the end of that paper, generated even more turmoil and begat about half a dozen different replication models. A single experiment performed by Meselson and Stahl settled both structure and replication questions in one grand stroke. By growing bacteria in a heavy nitrogen isotope medium that was incorporated in the DNA, and later switching the bacterial culture to a regular light nitrogen, Meselson and Stahl demonstrated, using analytical ultracentrifugation, that DNA molecules had densities predicted by semiconservative replication models. The experiment was brilliant in its simplicity and it is fair to consider it the most elegant experiment in molecular biology.

This classic experiment is now shown in general biology textbooks and it is so deceptively straightforward that most of us think we know all about it. So was it really necessary to dedicate an entire book to the minute details of the genesis of the experiment? The answer is undoubtedly “yes” for three main reasons. First, the book is important as it debunks the apparently widespread belief that some people wake up in the morning and come up with genial ideas without much effort. Holmes demonstrates how such a “simple” experiment was extraordinarily complex both conceptually and technically. Although the reality of semiconservative replication now seems obvious, Holmes brings us back to a time where nothing was certain about the structure and function of DNA, particularly on the issue of its replication. It is in this context that the foresight of Meselson and Stahl needs to be judged. Second, Holmes argues that science does not proceed linearly, but uses unlikely routes. In this case, the idea of using different isotopes to uncover functional processes came to Meselson while attending a lecture by Monod on protein synthesis, only much later did Meselson and Stahl think of applying it to DNA replication. Third, this book is written in a gripping style. It is a “story in the form of a drama in several acts, with two central characters” (pp 4–5). At that time, analytical ultracentrifugation was excruciatingly slow. Only one sample could be run every 16 hours. It took an incredible amount of patience, careful planning, and guts to produce this most amazing experiment.

This book is essential for younger readers to learn about the processes of careful scientific method that lead to the “perfect experiment,” and for readers with more experience in molecular biology, it brings back the same unaltered sense of awe that touched the community in 1958.

GIACOMO BERNARDI, *Ecology & Evolutionary Biology*, University of California, Santa Cruz, California



## GENERAL BIOLOGY

### PLANT-ANIMAL INTERACTIONS: AN EVOLUTIONARY APPROACH.

*Edited by Carlos M Herrera and Olle Pellmyr. Oxford and Malden (Massachusetts): Blackwell Science. \$69.95 (paper). xii + 313 p + 4 pl; ill.; index. ISBN: 0-632-05267-8. 2002.*

Thirty years ago, few scientists would have described their fields of study as “plant-animal interactions,” and it was rare to find a symposium

or a session of contributed papers on this topic at a national conference. Times have changed radically. Some such scientists have attained not only tenure, but even a certain respectability, and some universities (mine included) are developing courses in plant-animal interactions. Although the emergence of such courses marks something of a triumph for those of us who are hampered by the old boundaries among botany, zoology, agriculture, and entomology, it is certainly a challenge to characterize and delimit this sprawling “new” discipline. Like Frankenstein’s monster, it has been stitched together from an unmatched set of components, some of which are in better shape than others. Aside from an early and idiosyncratic effort by Henry Howe and Lynn Westley (1988, *Ecological Relationships of Plants and Animals*. Oxford: Oxford University Press), we have lacked textbooks and summaries that span ranges broader than traditional subdisciplines (such as pollination biology). Now Herrera and Pellmyr, whose original and meticulous contributions have done much to inspire and shape current research in pollination and dispersal biology, have recruited a distinguished team of authors to assemble a broader view, aimed at upper-division undergraduate students and those starting graduate studies.

Each of the nine chapters is worthwhile; some are extraordinary. I view the book as an essential volume for active researchers, as well as the graduate students who form part of the intended audience. As for undergraduates, I am not sure how well the book will work to structure a course. First, the level of presentation tends to assume advanced knowledge of organismal biology, ecology, and evolutionary theory. Second, whatever discipline the editors tried to impose on the authors was insufficient to produce an integrated feeling or a homogeneous style to the chapters. Given the patchwork nature of the field itself, this is neither surprising nor fatal, but it may frustrate those undergraduates who simply want a unified account delivered in a magisterial voice. More sophisticated readers should be able to derive both interest and pleasure from the diversity of voices present in the work, but even those readers might wish that the editors had imposed more consistency. For example, empirical support for the Janzen-Connell hypothesis is presented in Chapter 3 as being “broad” (p 103), but in Chapter 5 as “equivocal” (p 145). The references cited by the chapter authors do not overlap. Readers deserve some reconciliation of these viewpoints, as well as elimination of the second, unnecessary, near-duplicate figure. Table 1.3 and Figure 2.23 independently discuss a taxonomy of coevolutionary patterns drawn primarily from the work of John Thompson, but the references differ, the

terminology is inconsistent, and there is no cross-reference that links the material in the two chapters.

It is necessary to consider the chapters largely on their own merits. The outlier is certainly Conrad Labandeira's paleontological/phylogenetic treatment of the history of plant-animal associations. The longest chapter by far, it is so information-dense that it needs its own appendix to explicate the complicated figures. These have audacious titles like "The fossil history of spore and pollen consumption, and pollination," or "The fossil record of plant-associated insect dietary guilds." Perhaps because I seldom read paleontological accounts, I was forcibly struck by this chapter. The volume of scholarship is staggering, as is the ingenuity of interpretation. Yet, I found myself simultaneously overwhelmed by the data density of the figures, but frustrated by the ultimate sparseness of the data. For example, Figure 2.6 records three instances of seed predation by insects from the Carboniferous, one from the Permian, and no more until the Cretaceous. What relationship does this record bear to what was really happening, which is presumably that millions of insects were attacking millions of seeds every day of the intervening hundreds of millions of years? Labandeira points out that certain types of fossil data "provide an inadequate inventory of the totality of past associations, but they are robust at higher taxonomic and ecological scales" (p 73). For a contemporary, process-oriented ecologist like myself, the question becomes "when do the scales addressed by the fossil record overlap usefully with the scales implicit in short-term experiments and fitness estimates in modern communities?"

Except for Peter Price's introductory chapter and John Thompson's concluding synthesis, the other chapters focus on the mechanisms of contemporary interactions. This is mainstream material for most of us in the field. The chapters differ intriguingly in how they use catalogs of case histories, taxonomies of interaction types, or theoretical models to present their syntheses. Kjell Danell and Roger Bergström depend heavily on categorization in their treatment of mammalian herbivory, presenting numerous tables and figures that show how different modes of feeding and digestion are distributed across animal taxa and continents. In contrast, Pellmyr approaches pollination phylogenetically, supplemented with numerous graphs showing the results of key experiments. Herrera masterfully combines these modes to consider seed dispersal, as do Sharon Strauss and Arthur Zangerl in their treatment of insect herbivory. Of these chapters, my favorite was that on granivory, by Philip Hulme and Craig Benkman, because of its

greater emphasis on components of theory, such as the functional dependence of seed removal on seed density.

The complexity of species relationships frustrates attempts to separate this material cleanly. Herrera and Pellmyr recognize this ambiguity by grouping two sets of chapters as Mostly Antagonisms and Mostly Mutualisms. Even so, the chapter by Andrew Beattie and Lesley Hughes reveals such an array of ant-plant interactions that it fits neither of those and must be put in the Synthesis section. The other synthetic chapter is John Thompson's attempt to outline where the field is heading. Posing nine general questions and six more particular ones, he argues that progress will depend increasingly on expanding field investigations to larger spatial scales and enriching them with molecular tools and mathematical theory. Without exception, his questions are well considered, deep, and provocative. On such a rich intellectual diet, the field of plant-animal interactions seems poised to continue its explosive growth, with Herrera and Pellmyr's book attaining foundational status.

JAMES D THOMSON, *Editor*, The Quarterly Review of Biology

#### LIFE AT THE LIMITS: ORGANISMS IN EXTREME ENVIRONMENTS.

*By David A Wharton. Cambridge and New York: Cambridge University Press. \$25.00. xi + 307 p; ill.; index. ISBN: 0-521-78212-0. 2002.*

Extreme environments are popular. *Time* had a five-page spread in its July 27, 2002 issue dealing with microorganisms in such places as deep-sea hydrothermal vents, Antarctic ice, and even inside rocks. These microbes are particularly interesting in view of the possibility that some sort of life could exist on other planets such as Mars, or elsewhere in the universe.

*Life at the Limits* is written at a level suitable for readers with some general science background and an interest in biology. It begins with a general introduction to extreme environments and what makes them extreme, followed by separate chapters on organisms living in very dry, very hot, or very cold environments. There is a chapter dealing with the origin of life and the question of extraterrestrial life. The final chapter recaps some of the previous themes, considers some physiological mechanisms of coping, and looks again at how these could have evolved. The glossary defines even the most basic terms clearly.

The conversational style is somewhat reminiscent of Lewis Thomas's work, *Lives of a Cell: Notes of a Biology Watcher* (1974. New York: Viking Press). The current volume was easy to read, but I found

the amount of repetition rather annoying. The material on molecular and cellular mechanisms is scattered in several places. This is particularly a disadvantage in dealing with the relationship of cold and desiccation stress. Since the author is an expert in the survival of Antarctic nematodes and insects, it is not surprising that most of the examples are taken from the animal kingdom. Plants and microorganisms get rather brief treatment. There is no entry for "seed" in the index.

I found myself wishing for more illustrative material (e.g., diagrams and graphs, and photographs of these interesting organisms in their environments). Perhaps I have been spoiled by the excellent graphics found in most textbooks I use for teaching. Would students react in the same way? I am not sure. In spite of its faults, this book should be useful for students who need general information or are looking for a term paper topic.

BEVERLEY R GREEN, *Botany, University of British Columbia, Vancouver, British Columbia, Canada*

BRANCHING PROCESSES IN BIOLOGY. *Interdisciplinary Applied Mathematics, Volume 19.*

By Marek Kimmel and David E Axelrod. New York: Springer. \$59.95. xviii + 230 p; ill.; index. ISBN: 0-387-95340-X. 2002.

This book presents a coherent account of the uses of branching processes for modeling a range of biological phenomena. There is a clear presentation of both the mathematical and the biological background, so that the book is accessible to mathematicians and biologists.

The complexity of the models is built up systematically. Models start with the simple Galton-Watson process, applicable when there are discrete, non-overlapping generations, and progress to age-dependent processes, first with exponential lifetimes and then to the Bellman-Harris process with arbitrary lifetime distribution. An introduction to the general Jagers-Crump-Mode process, which allows offspring to be produced during the lifetime of an individual, is also provided in Appendix C. The one-type processes are presented initially, then extended in later chapters to multitype processes, which cover both finitely many and countably many types.

A good review of published material on the applications of branching processes to problems in molecular and cellular biology is provided. Applications cover cell cycle models, chemotherapy, evolution theory, gene amplification, loss of telomere sequences, molecule aggregation, mutations, and polymerase chain reaction. Material relating to a particular application is easily traced through the book using the introductory section, Guide to

Applications, or How to Read this Book, which is provided immediately after the Table of Contents.

Throughout the volume there is a nice blend of mathematics and biology, with the mathematical model clearly motivated at all times and a good range of applications provided. A particular feature of the book is the interplay between biology and mathematics, with the biological applications motivating the mathematical models and results, which in turn illuminate the biological problems.

LINDA RASS, *Mathematical Sciences, Queen Mary, University of London, London, United Kingdom*

FLEXIBLE PATTERN MATCHING IN STRINGS: PRACTICAL ON-LINE SEARCH ALGORITHMS FOR TEXTS AND BIOLOGICAL SEQUENCES.

By Gonzalo Navarro and Mathieu Raffinot. Cambridge and New York: Cambridge University Press. \$50.00. x + 221 p; ill.; index. ISBN: 0-521-81307-7. 2002.

SIGNS OF LIFE: HOW COMPLEXITY PERVADES BIOLOGY.

By Ricard Solé and Brian Goodwin. New York: Basic Books. \$17.50 (paper). xi + 322 p + 4 pl; ill.; index. ISBN: 0-465-01928-5. 2000.

It is not a surprise to most biologists that nature is complex, but in the last 50 years or so mathematicians and physicists have formalized the science of complexity offering new models and tools. In the current book, Solé and Goodwin argue that complexity has much to offer, especially for biological phenomena. The reductionist approach to science is inadequate; you cannot understand an ant colony no matter how carefully you examine a single ant. There are emergent phenomena that paint a better picture.

In the first two chapters, the authors review the concepts of nonlinearity, chaos, fractals, emergence, and complexity. They then turn to biological phenomena and trace out the successes biologists have had in applying the complexity paradigm. Genetic networks, cell differentiation, heart rhythms, brain dynamics, ecological webs, and evolution are all visited, as the authors point out how nonlinear dynamics, with the associated phase transitions and emergent properties, offer better explanations of the underlying biological processes than does reductionism. Many of the results come from the authors' own research.

Solé and Goodwin write in an engaging expository style for readers who have heard of complexity and have some biological background; they do not

assume much mathematical background. As they weave through the various biological phenomena, boxed sidebars give the full mathematical details of many of the models (for specific information on the mathematical tools used in complexity analysis, readers will have to look elsewhere). The bibliography organizes references by chapter, presenting a generous, numbered list of citations for readers interested in further investigation.

This book will prove useful for both students and practicing biologists. It effectively shows how the complexity paradigm can bare fruit in the biological setting.

STEVEN JANKE, *Mathematics, Colorado College, Colorado Springs, Colorado*

LINKED: THE NEW SCIENCE OF NETWORKS.

By *Albert-László Barabási. Cambridge (Massachusetts): Perseus Publishing. \$26.00. vii + 280 p; ill.; index. ISBN: 0-7382-0667-9. 2002.*

Networks pervade complexity. We identify food webs, the immune system, the genome map or the internet as entangled nets displaying an extraordinary degree of detail. Such information has been fueling the core of biological research for decades. In biology, despite the recognition that some underlying, higher-level structure was present in terms of the web of interactions among species, cells or genes, the so-called reductionist approach became the dominant view. Under the reductionist program, enormous success was obtained, but in many cases the role of interactions led to unexpected patterns hardly reducible to the properties of the individual units.

The study of complex networks has experienced a revolution in recent years. Using methods deeply rooted in the philosophy of statistical physics, a new generation of researchers (mostly physicists and biologists) have found a number of previously unsuspected, but remarkable set of features that seem common to most complex networks, both natural and artificial. Barabási's book is an account of the historical events on the study of networks, from the 18th century mathematician Leonhard Euler to the latest advances in the area.

The two main achievements that largely shape the emergent area of complex networks are the discovery of the so-called small-world effect and the observation that most webs strongly depart from a purely random system. The first finding (Chapters 1 through 5) deals with the discovery that social webs and protein nets (to mention only two) are somewhat placed between order and disorder. Although these webs are highly clustered and, thus, there is a strong sense of closely related units

(friends or related proteins that perform a given function, respectively), the average number of jumps through the network required in order to go from a given unit to another is extremely low (a property of random webs). Within the sociological context, it means that the average number of jumps needed to reach a given person in a social web is about six, despite the fact that millions of humans might be involved. Small world architectures have been found in different bionets, and have important consequences in understanding how efficient communication arises in evolution.

The second finding (to which Barabási's group largely contributed) is the observation that these nets are characterized by a dominance of units having a small number of links (one or two) together with the presence of a small fraction of units having many connections (the "hubs"). Again, the identification of this architectural property (Chapters 6 through 14) has deep implications. First, it seems to be a highly universal feature that is shared by the internet, but also by metabolic pathways. Second, it underlies the highly effective speed of communication observed, for example, in disease spreading (Chapter 10), and explains the persistence of both computer viruses and real pathogens (such as the AIDS virus). Third, it provides a beautiful metaphor of the complexity-fragility dual character of many complex systems: random mutations of nodes in one of these nets has little effect on the communication capacities, but selective removal of hubs has very strong effects. The consequences in biology can be widespread, from species loss to the development of new types of therapies. Barabási reviews the emerging ideas in a compelling style. Although the book deals with a very diverse zoo of webs, biologists will easily recognize the importance of the ideas presented here. The reading is stimulating and at times fascinating. As it happens with other books that discuss a new area, it is difficult to know how much of these ideas will be shown to be relevant in the future, but as an account of the vibrant origins of the area, it is certainly worth reading.

RICARD V SOLÉ, *Physics, Universitat Politècnica de Catalunya, Barcelona, Spain*

TEMPOS IN SCIENCE AND NATURE: STRUCTURES, RELATIONS, AND COMPLEXITY. *Annals of the New York Academy of Sciences, Volume 879.*

*Edited by Claudio Rossi, Simone Bastianoni, Alessandro Donati, and Nadia Marchettini. New York: New York Academy of Sciences. \$27.50 (paper). x + 450 p; ill.; index of contributors. ISBN: 1-57331-196-0 (hc); 1-57331-197-9 (pb). 1999.*

PRINCIPLES AND PRACTICES OF UNBIASED STEREOLOGY: AN INTRODUCTION FOR BIOSCIENTISTS.

By Peter R Mouton. Baltimore (Maryland): Johns Hopkins University Press. \$34.95 (paper). xi + 214 p; ill.; index. ISBN: 0-8018-6797-5. 2002.

"Prestigious journals and grant-giving organizations now require the use of unbiased stereology in the projects that they support, and this trend is expected to continue," warns the back cover of this primer for biologists, whose author is director and CEO of the Stereology Resource Center, Incorporated, a private enterprise that offers training and software in the methods that are deemed so necessary. The term stereology encompasses a variety of approaches based on the simple observation that the number of objects within a defined space can be determined by multiplying the density of the object by the volume of that space. Although the logic of stereology is straightforward, its application is made difficult to the extent that cells are not distributed evenly or that such factors as method of fixation affect anatomical material differently, depending upon the experimental condition.

These difficulties can be overcome if estimates of cell density are reliable and accurate, but Mouton never provides a satisfactory way to make such estimates. Instead, he cites repeatedly the infelicitous dictum, "do more less well" (p 25), meaning that one can overcome variability by increasing the number of observations. Unfortunately, this advice is not very useful unless one knows how many observations are required to achieve a valid and reliable result.

Careful scientists will want to compare stereological estimates of cell number with the results of three-dimensional reconstructions, an approach never considered by the author. Lacking such experimental verification, such scientists would be hard put to accept as plausible the statement quoted at the outset of this review. The need remains for a book with the goals of this volume, but one that is based more on empiricism and less on formulations whose assumptions have not been experimentally verified.

PAUL B FAREL, *Cell & Molecular Physiology, School of Medicine, University of North Carolina, Chapel Hill, North Carolina*



FOR TYROS & LAICS

MAKING SENSE OF LIFE: EXPLAINING BIOLOGICAL DEVELOPMENT WITH MODELS, METAPHORS, AND MACHINES.

By Evelyn Fox Keller. Cambridge (Massachusetts): Harvard University Press. \$29.95. xii + 388 p; ill.; index. ISBN: 0-674-00746-8. 2002.

In another recent book, Keller explained that the 20th century was *The Century of the Gene* (2000. Cambridge (MA): Harvard University Press), and that the gene's dominance is over. Readers were led to ask: What replaces the gene? Keller offers insights in this important volume.

This book is not about life per se; the author does not seek to tell us what distinguishes life from nonlife, nor about the origins of first life. Rather, this is an exploration of some of the many and diverse ways that 20th century biologists have sought to make sense of life—especially of individual development. What counts as "making sense," or as an explanation or answer to questions that biologists take as central? What is the "making sense" process, and in particular what role do models, mathematics, mechanics, and metaphors play? How do we know when biologists have succeeded—at what? Keller organizes her book around the thesis that there is no simple answer to these questions.

Instead of simple answers, then, Keller give us tantalizing historical examples that fall into loose categories of models, metaphors, and machines. She makes clear that these are just examples and that there could be many others, a wealth of opportunity for other scholars to explore. As Keller examines her example, she offers us "epistemological cultures" and draws on her own experiences as a theoretical physicist turned biologist to make manifest the diversity of approaches, questions, and claims of knowledge that different scientists can have and still fall within the gang of those trying to make sense of life. In Part One, Stephane Leduc, D'Arcy Thompson, and Alan Turing try at mathematic models for life—with varying success. Part Two concentrates on genes—gene action, genetic program, feedback, and positional information as uses of metaphor. The third part brings machines and the new technologies, including most recently, tantalizing episodes with artificial life. Keller shows how so many different people took such diverse paths to try making sense of life, offering more looks at the way life *could* be, then getting at the way it "really is." But that is the

point—if biology is a matter of “making sense” rather than discovering some elusive truth, we can benefit from all these attempts, even those with little impact and those that seem hopelessly silly.

What Keller gives us, as she is fully aware, is a tantalizing taste of divergent epistemological cultures. She invites us to look for more, and to admire her “mosaic,” while seeing this “more as an attempt to raise than to resolve questions, more as an effort to stimulate new kinds of inquiry than to settle old scores” (p 9). Others should accept the invitation and follow the rich opportunities to learn more about the century—and beyond—that was more than the gene.

JANE MAIENSCHNEIN, *Philosophy, Arizona State University, Tempe, Arizona*

#### PRIME MOVER: A NATURAL HISTORY OF MUSCLE.

By Steven Vogel; illustrated by Annette de Ferrari and the author. New York: W. W. Norton. \$25.95. xiii + 370 p; ill.; index. ISBN: 0-393-02126-2. 2001.

It was with great anticipation that I began reading this new book. Vogel's previous work on biological fluid dynamics, *Life in Moving Fluids: The Physical Biology of Flow* (1981. Boston (MA): W. Grant Press), remains one of the most engaging and important volumes that I have read. The centerpiece of this new book was a topic of great interest to me, skeletal muscle. Unlike other volumes on muscle biology, Vogel's new book aims not only to examine the structure and physiology of this vital tissue, but also to explore how its properties have shaped our history, culture, and technology. One-third of the volume covers the stuff of textbooks: sliding filaments, length-tension and force-velocity relations, excitation contraction coupling, fiber types, reflex circuitry, and oxygen transport. What separates this material from that of most textbooks (aside from the clever writing style, wit, and generous use of analogy) is the incorporation of the scientists and some of the stories behind many of these varied topics. Esteemed figures including Sherrington, Hill, Huxley (Hugh and Andrew), and Scholander are given more (and well-deserved) attention than is normally found in textbooks, and I found this greater emphasis on historical figures and context a major novelty and strength of the volume.

Following this highly readable introduction into the structure and function of muscle is a transitional chapter covering the basics of lever systems, fiber-wound hydrostats, and the importance of relengthening muscle. From here, Vogel shifts gears from examining how muscle works to how we put (or have put) it to work. From our construction and use of hand tools and load-carrying devices, to our harnessing of human and animal power for

transport and agriculture, Vogel surveys the impact that these developments have had on our history. As an example, he addresses the importance of animal power, as well as plow and harness design, to the agricultural revolution that took place in medieval Europe. It is impressive what people can put their minds (and bodies) to once they can concentrate their efforts on tasks other than tilling soil. Two chapters near the end of the book, on weapon use and design, provide deeper (or at least more biomechanical) meaning to the idea of “getting medieval” on someone. A penultimate chapter, on muscle as food, includes an intriguing, albeit rather gruesome, foray into the energetics of cannibalism (not to be read before breakfast). The book concludes with brief discussions of more weighty issues, including biomimetics, reductionism, and an inspiring plea to remember the organism in this age of molecular biology.

As is the case with Vogel's other works, readers can expect an enjoyable and thought-provoking read with *Prime Mover*. For scientists there is much to be learned about history and technology, and for those less inclined toward muscles or mechanics, the book provides a nice introduction to these topics as well. I found little to criticize, although as a colleague pointed out, the figures serve their purpose without much flair, and I must confess that I was hoping for more of a synthesis as the volume drew to a close. Nevertheless, I cannot argue with the use of the final chapter as a springboard to larger philosophical issues, in particular the argument for the centrality of the organism in biology.

GARY B GILLIS, *Biological Sciences, Mount Holyoke College, South Hadley, Massachusetts*

#### A PRIMATE'S MEMOIR.

By Robert M Sapolsky. *A Touchstone Book*. New York: Simon & Schuster. \$25.00 (hardcover); \$13.00 (paper). 304 p; no index. ISBN: 0-7432-0247-3 (hc); 0-7432-0241-4 (pb). 2001.

To many people, including myself, who have lived in some remote part of Africa, the countryside, people, culture, animals, and even the rainfall patterns have a mystical quality. Sapolsky captures this spirit better than anyone else. His background and writing style follow quite clearly from Shalom Alecheim, mixing pathos and poignancy, fear and fun, and adventure and awe.

Sapolsky discovered his lifelong passion while visiting the American Museum of Natural History, but unlike Stephen Jay Gould, who fell in love with dinosaurs, Sapolsky became infatuated with gorillas. He ended up spending a quarter of a century studying savanna baboons (*Papio cynocephalus anubis*), but describes his pilgrimage to see the gentle giants dreamed of in childhood. The book contains a series of vignettes that describes baboons

and Sapolsky's experiences. He outlines the lives of his baboon friends (Devorah, Isaac, Rebecca, Benjamin, Rachel, Shem, Adam, Gideon, and Boopsie), as they toil away their day grooming, fighting, mating, sleeping, eating, and wandering about the Masai Mara Game Reserve in Kenya. He reminisces about his lonely, carefree, penniless days on park benches in Nairobi; how he slowly changed into a full-fledged professor worried about students and money; he describes his bout with Uriah in a cave and how he obtained blood samples from the baboon, while a half-crazed impala nearly knocked him unconscious; he explores the bonds of friendship established not only with baboons, but with Laurence of the Hyenas, a fellow researcher in Kenya; he regales readers with tales of how he explained to the Masai warriors how to read a topographic map of the area; how he was punched out by a group of drunken army men after an abortive coup; how he had to rush a naked lady smeared in goat feces to the nearest mental hospital; how he traveled through Sudan nearly delirious from the heat and fearing that he would be dumped in the middle of nowhere; how he tried to stop the spread of tuberculosis among his baboon friends and the angst-filled stages encountered when he had to approve the shooting of a baboon; how he sang folksongs, camp tunes, and union ballads with some local people around evening campfires; and his personal funeral service for one of his dearest and closest friends, who lies buried under the shade of a favorite tree near his camp.

This book successfully opens the spigots of Sapolsky's mind, and is a delightful read. One will learn something about baboons, but will also vicariously experience living in the field.

FRED B BERCOVITCH, *Center for Reproduction of Endangered Species, Zoological Society of San Diego, San Diego, California*



## PALEONTOLOGY

GAINING GROUND: THE ORIGIN AND EVOLUTION OF TETRAPODS. *Life of the Past.*

By Jennifer A Clack. Bloomington (Indiana): Indiana University Press. \$49.95. xi + 369 p; ill.; index. ISBN: 0-253-34054-3. 2002.

Terrestrialization by vertebrates was arguably one of the most important evolutionary transitions among metazoans, yet the character and timing of these events have been the subject of vigorous speculation based on often highly restricted evidence. Clack has been at the forefront of efforts to uncover, both literally and figuratively, fossil data relevant to early tetrapod evolution, for which

*Gaining Ground* serves as a systematic introduction and review. Paleocological considerations, functional morphology, physiology, and evolutionary trajectories are all presented dispassionately relative to the fossil evidence, with balanced treatment of sometimes competing viewpoints. The sequential arrangement of chapters is chronological, as befits a paleontological treatise, and careful attention is paid to timing and geological sequence.

Parallel with stratigraphic calibration, phylogenetic relatedness is now essential for meaningful evolutionary reconstructions. Students of phylogenetics will happily observe here the numerous cladograms that illustrate diverse lineages of tetrapod evolution; character mapping closely follows textual discussion. Similarly, lobe-finned fishes and lungfish receive treatment appropriate to their status as early tetrapod relatives. Complexities and implications of the "fin-to-feet conversion" are discussed in detail, emphasizing the exciting Devonian finds with which Clack has been closely associated. Physiological and biomechanical details are carefully superimposed onto this paleontological skeleton. Carboniferous and Permian tetrapod radiations receive less taxon-specific attention, but similarly broad biological analysis.

Cranial osteology is emphasized throughout the text, but treatments of postcranial and appendicular morphologies are also comprehensive. Particularly informative relative to the cranium is the detailed analysis of various sensory modalities and their likely evolution during terrestrialization. Broader discussions of respiratory and locomotor physiology, although necessarily more speculative given the nature of the fossil evidence, are also provided. It is rare to find more than cursory mention, let alone illustration, of invertebrates and plants in any book on vertebrate paleontology, yet *Gaining Ground* conveys a biotically rich sense of those late Paleozoic terrestrial ecosystems into which tetrapods emerged. In summary, this volume will be of interest to a broad assemblage of biologists interested in tetrapod evolution.

ROBERT DUDLEY, *Integrative Biology, University of Texas, Austin, Texas*

DESOLATE LANDSCAPES: ICE-AGE SETTLEMENT IN EASTERN EUROPE. *The Rutgers Series in Human Evolution.*

By John T Hoffecker; Foreword by Richard G Klein. New Brunswick (New Jersey): Rutgers University Press. \$69.00 (hardcover); \$32.00 (paper). xix + 298 p; ill.; index. ISBN: 0-8135-2991-3 (hc); 0-8135-2992-1 (pb). 2002.

Paleoanthropologists have devoted much research to the origins of modern humans, most of it based on data derived from western Europe or southwest

Asia. In *Desolate Landscapes*, the author addresses the origins of modern humans using data from eastern Europe, including Russia, Ukraine, Belarus, Moldova, western Kazakhstan, Estonia, Lithuania, and Latvia. Archaeological literature from this region has largely appeared only in Russian and has been unknown or ignored by non-Russian paleolithic archaeologists.

In addition to reviewing eastern European Pleistocene archaeology, Hoffecker presents an argument for the spread of anatomically modern *Homo sapiens* and their replacement of other European archaic hominids, the Neanderthals. The author uses human evolutionary ecology, summarized in Chapter 1, as a theoretical background and examines the cultural and biological adaptations of prehistoric human groups to the changing environments in eastern Europe. Chapter 2 summarizes the environmental changes during the Pleistocene and describes major geographic features, particularly the East European Plain, with its often cold, inhospitable environments without modern analog (loess steppe).

Hoffecker moves chronologically through the Pleistocene in Chapters 3 through 6, from *Homo heidelbergensis*, to *Homo neanderthalensis*, and *Homo sapiens*. Each chapter addresses settlement patterns, technology, behavior, and ecology; provides detailed summaries of individual sites; and concludes with discussions that link them to the author's main argument.

The book's strength is that it summarizes a vast literature, which is largely inaccessible in English. It properly calls for the expansion of arguments of modern human origins beyond western Europe and southwest Asia. The drawback of the volume is that it is polemic in tone, returning constantly to the idea of replacement of other groups by modern humans, rather than addressing competing hypotheses. This book will be of interest to researchers who are curious about Pleistocene paleoenvironments as well as hominid adaptations, and would be useful in upper-level undergraduate and graduate courses.

BRUCE L HARDY, *Anthropology, Grand Valley State University, Allendale, Michigan*



## MOLECULAR BIOLOGY

THE LIFE OF A VIRUS: TOBACCO MOSAIC VIRUS AS AN EXPERIMENTAL MODEL, 1930–1965.

By Angela N H Creager. Chicago (Illinois): University of Chicago Press. \$75.00 (hardcover); \$25.00 (paper). xiv + 398 p; ill.; index. ISBN: 0–226–12025–2 (hc); 0–226–12026–0 (pb). 2002.

The tobacco mosaic virus (TMV) is a pioneer in viral and molecular biology research. Being the first to be identified as a nonbacterial pathogen, the TMV was also the first to be purified by the chemist Wendell Stanley back in 1935. This discovery, showing that the viruses can be defined as molecular entities, rather than simply a disease symptom, was the first step toward what we know today as modern molecular virology. This is not a regular science book, since it does not describe in detail the scientific facts of TMV, but rather analyzes the history of TMV research and its contribution to the science of virology.

The author has taken an interesting approach by describing, step by step, how virus research has evolved in time and, in parallel to technical advances, the break of World War II, the Polio epidemics, and the discovery of DNA as the template of all life forms. Creager also describes in the last chapters of her book how TMV was intimately studied down to every possible detail of its structure and genome, and how it became an experimental model for viral research. The book gives readers a unique opportunity to look inside the historical forces that shaped the viral research, and the contribution of TMV to the development of modern virology and molecular biology as we know them today.

TZFIRA TZVI, *Biochemistry & Cell Biology, State University of New York, Stony Brook, New York*

ENZYME ASSAYS: A PRACTICAL APPROACH. *Second Edition. The Practical Approach Series, Volume 257.*

Edited by Robert Eisinger and Michael J Danson. Oxford and New York: Oxford University Press. \$115.00 (hardcover); \$55.00 (paper). xix + 282 p; ill.; enzyme and general indexes. ISBN: 0–19–963821–7 (hc); 0–19–963820–9 (pb). 2002.

LATERAL DNA TRANSFER: MECHANISMS AND CONSEQUENCES.

By Frederic Bushman. Cold Spring Harbor (New York): Cold Spring Harbor Laboratory Press. \$59.00 (hardcover); \$39.00 (paper). xv + 448 p; ill.; index. ISBN: 0–87969–603–6 (hc); 0–87969–621–4 (pb). 2002.

In the age of genome mapping, one is tempted to view DNA sequences of each species as separate from all other species. Instead, as Bushman points

out in this well-written and comprehensive book, genome sequences have revealed the magnitude of sequence sharing between species. The movement of genetic information from parent to offspring (vertical inheritance, which is responsible for our receipt of gene sequences from both mother and father) is well known and carefully documented; it has fully earned its place as a central element of biological science. But lateral transfer—or the movement of DNA from a host to the genome of a recipient organism—is much less well understood. What Bushman makes clear in this volume is that lateral transfer is a frequent and powerful enough biological force to have major consequences in evolution, medicine, and biotechnology.

The book is written to be accessible to a wide audience, and is aided by a clear, dynamic writing style and by the author's careful attention to providing essential background information. For example, an early chapter describes the structure of DNA and basic mechanisms of replication; a later chapter provides an excellent review of retroviral life cycles and structures, as a prelude to discussions of the importance of retroviruses in lateral DNA transfer in eukaryotes. The author has managed to make an accessible and readable volume that still treats this complex subject with depth, breadth, and sophistication.

Each individual chapter is complete and well illustrated; together they cover a tremendously wide range of biological science. Key early chapters focus on the molecular biology of DNA transfer between prokaryotes and eukaryotes: Chapter 3 includes an excellent review of mechanisms of antibiotic resistance, introducing plasmids and transposons; Chapter 4 covers phage transduction; and Chapter 6 discusses retroviruses. These chapters provide the mechanistic underpinning for much of the book. Other chapters discuss the impact of lateral transfer on microbial genomes, evolution, development of the immune system, and the AIDS epidemic.

The heavy influence of lateral transfer is a clear theme of the book. The extent of its influence on populations of organisms is exemplified in microbial systems (such as *E. coli*) in which at least 18% of the genome was obtained by lateral transfer from other species. But it is also clear that lateral transfer has had a substantial impact on the development of humans. As we learn more about the basic biology of DNA movement between cells, the impact of lateral DNA transfer becomes clearer. In addition, as we develop new drugs that influence lateral transfer (such as antibiotics that target new biological mechanisms) and design new laboratory

methods that facilitate DNA transfer between cells, it is probable that lateral DNA transfer will become a more central topic of biology. This book is an excellent introduction, survey, and reference source for this area of science.

W MARK SALTZMAN, *Chemical Engineering, Yale University, New Haven, Connecticut*

PROTEOMICS IN PRACTICE: A LABORATORY MANUAL OF PROTEOME ANALYSIS.

By Reiner Westermeyer and Tom Naven. Weinheim (Germany): Wiley-VCH. \$69.95. xxiv + 316 p; ill.; index. ISBN: 3-527-30354-5. 2002.

A BIOLOGIST'S GUIDE TO ANALYSIS OF DNA MICROARRAY DATA.

By Steen Knudsen. New York: Wiley. \$44.95. xiii + 125 p + 8 pl; ill.; index. ISBN: 0-471-22490-1. 2002.

This book attempts to provide a "good text . . . on analysis of DNA array data" for scientists "who venture into the field . . . for the first time" (p xi). Although it succeeds in presenting a basic overall description of array analysis, it fails to provide the definitive analysis solutions suggested by the title and the chapter headings.

The author describes the theory of the complex bioinformatic manipulations that follow a microarray hybridization in simple terms that are easy to follow, although a prior understanding of the terminology used in the field would make for easier reading of the text. The range of informatics tools described is extensive, and probably beyond the scope of biologists working without the collaboration of a bioinformatics specialist. Chapter 12 focuses on software issues and data formats. This is the point at which the author's goal of a good, basic textbook and the presented information diverge, since he states that in order to analyze microarray data the biologist should "learn a . . . programming language" (p 95). Moreover, most of the analyses described in this chapter assume a knowledge of the programming language Awk and access to a Unix/Linux system, and the tools described are primarily those used in the author's laboratory. Other publicly available software solutions for microarray analysis are discussed only briefly. Some of the commercially available software packages that have useful features for novice microarray analysts are mentioned in the final chapter.

One of the best features of this book is the extensive bibliography (including Web addresses) that provides up-to-date references for all the bioinformatic manipulations described in the text, thereby

enabling readers to gather more information about these complex analysis tools as required.

JANETTE BURGESS, *Pharmacology, University of Sydney, Sydney, Australia*

ARTIFICIAL DNA: METHODS AND APPLICATIONS.

*Edited by Yury E Khudyakov and Howard A Fields. Boca Raton (Florida): CRC Press. \$179.95. xiii + 420 p + 4 pl; ill.; index. ISBN: 0-8493-1426-7. 2003.*

GENE CLONING AND DNA ANALYSIS: AN INTRODUCTION. *Fourth Edition.*

*By T A Brown. Malden (Massachusetts): Blackwell Science. \$54.95 (paper). xii + 363 p; ill.; index. ISBN: 0-632-05901-X. 2001.*

It is always delightful to see the advent of a new version of a volume that has been considered a standard textbook on a specific subject. The last three editions of this book have provided great assistance to molecular biology trainees learning basic concepts of gene cloning. The new edition contains two important additions: how gene cloning and DNA analysis are applied in biological research (Part 2) and biotechnology (Part 3). As was noteworthy for the previous editions, simple layouts, plain language, and over 250 two-color illustrations make this book pleasant to read and easy to understand.

Part I features the basic principles of gene cloning and DNA analysis: plasmids, bacteriophages, DNA purification, restriction enzyme digestion, ligation, transformation, cloning vectors, selection of clones, and PCR. Part 2 discusses the way these principles are harnessed to study the location, structure, expression, and function of individual genes, along with functional genomics, transcriptomics, and proteomics. How production of recombinant protein, medicine, agriculture, and forensic sciences takes advantage of gene cloning and DNA analysis is illustrated in Part 3.

The first part of this book appears relatively unchanged in comparison to the previous edition. As a result, classic but now rarely used methods (e.g., purification of plasmids by CsCl-ethidium gradients and M13 bacteriophage-based cloning vectors) are still described at length, whereas more recent and likely to be used techniques (e.g., TA cloning and TOPO cloning) are not mentioned. Since growing numbers of students and postdoctoral fellows do not understand the underlying principles of commercial kits widely used in modern biology laboratories, it would have been helpful to provide more of this type of information.

Despite these concerns, this book will be a useful resource for anyone entering into gene cloning, and the citations offered as "further reading" will provide direction for those who wish to know more.

SEOK-YONG CHOI and MICHAEL A FROHMAN, *Pharmacology and Center for Developmental Genetics, State University of New York, Stony Brook, New York*



CELLULAR BIOLOGY

MOLECULAR BIOLOGY OF THE CELL. *Fourth Edition.*

*By Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. New York: Garland Science. \$102.00. xxxiv + 1463 p; ill.; glossary (G:1-G:36); index (I:1-I:49); tables (T:1). ISBN: 0-8153-3218-1. [CD-ROM included.] 2002.*

This is not your ordinary textbook. The volume's reputation has been preeminent in the field, and a glance at the back cover of this edition—a tribute to The Beatles' "Sgt. Pepper's Lonely Hearts Club Band"—promises even more. Much is expected from the fourth edition—and much is delivered as well.

The volume is separated into five parts. The first three parts are relatively brief and serve to introduce the subject. Part I covers introductory principles and basic biochemistry. Part II focuses on the expression and transmission of genetic information. The third part summarizes methods for manipulating proteins and nucleic acids and for visualizing living cells. The bulk of the text is separated into Part IV (the internal organization of cells) and Part V (cells in their social—multicellular—context). Throughout, the book is well illustrated and indexed, and helpful summaries appear at appropriate intervals. Each chapter also includes selected references, and additional citations are available at the publisher's website. Although direct attribution is usually avoided, in Part III, landmark methodological advances are indicated in several tables along with the names of the scientists involved.

Clearly, the fourth edition builds on the previous edition, but considerable changes emphasize major developments in the field. In particular, the sequencing of the genomes of many organisms, from bacteria to yeast to humans, has revolutionized the understanding of living things and their relationships. These new genomic perspectives

have resulted in considerable changes to a number of chapters. A decidedly evolutionary and comparative framework begins to emerge (e.g., in subchapters such as Site-specific recombination and How genomes evolve). Elsewhere, greater emphasis on in vivo cellular imaging also parallels advances in the use of these techniques. Finally, a new concluding chapter—Pathogens, Infection, and Innate Immunity—provides a timely reminder of increasing concerns about infectious disease, not to mention summarizing the remarkable advances that have been made in understanding the cell biology of such disease.

It is undeniable that such a comprehensive volume can be a bit cumbersome to use. Typically, readers might want to follow up their readings from the introductory sections of Parts I and II with the more advanced treatments found in Parts IV and V. At times this can be difficult despite the extensive index. For example, students reading Part I might be curious as to why some covalent bonds are “high-energy,” while others are not. Part IV no doubt includes the relevant discussion of how the concept of a “high-energy” bond is an oversimplification, but locating this discussion proved challenging. Nevertheless, such difficulties are more a reflection of the complexity and breadth of molecular cell biology, rather than the qualities of the volume. In fact, as the authors suggest, this complexity should actually encourage students contemplating a career in molecular cell biology, since many mysteries remain to be solved.

Overall, *Molecular Biology of the Cell* once again succeeds admirably in its goal of providing a current and comprehensive resource both for a wide range of students and for scientists tracking progress outside of their specialty. As The Beatles sang, readers are encouraged to dip inside, where “a splendid time is guaranteed for all.”

NEIL W BLACKSTONE, *Biological Sciences, Northern Illinois University, DeKalb, Illinois*

ADIPOCYTE BIOLOGY AND HORMONE SIGNALING. *Based on a symposium held in Madison, Wisconsin, June 1999. Biomedical and Health Research, Volume 37.*

*Edited by James M Ntambi. Amsterdam (The Netherlands) and Washington (DC): IOS Press. \$117.00. viii + 239 p; ill.; author index. ISBN: 1-58603-002-7. 2000.*



## GENETICS & EVOLUTION

WHAT EVOLUTION IS.

*By Ernst Mayr; Foreword by Jared Diamond. New York: Basic Books. \$26.00. xvii + 318 p; ill.; index. ISBN: 0-465-04425-5. 2001.*

In this volume, the author offers the educated public a synopsis of modern evolutionary biology. Mayr—one of the most prominent living evolutionary biologists, largely responsible for shaping the “modern synthesis,” and author of many influential books on evolution—lays out the empirical evidence on how life has evolved and continues to evolve, and provides an introduction to the processes of evolution. The book is organized into four parts: the evidence for evolution; evolutionary processes; speciation and macroevolution; and human evolution.

Mayr begins by recounting the diversity of evidence (morphology, fossils, embryology, biogeography, and molecular genetics) that documents evolution. He acknowledges the important contributions made by molecular phylogenetics. The treatment is up to date—he includes the latest fossil evidence for the evolution of whales, as well as recent advances from evolutionary development about the origin of eyes revealed through the study of the *Pax-6* gene. Mayr lucidly explains the processes that produce the extraordinary variability that biologists observe in natural populations, as well as natural selection, but sexual selection is given only a brief treatment (three pages). The material on speciation is thorough and even contains some surprises. Biologists will also want to know how Mayr’s views of the Cambrian explosion, rates of evolutionary change, species concepts, and neutral theory, among others, have or have not changed.

There was one area that was not covered. In my opinion, some treatment of how scientists use the term “theory” and other aspects of the nature of science are necessary in a book for the general public, but are lacking here. There were a few sections where the writing was dry and lacked illustrative examples, but given the wide coverage that Mayr achieves in 300 pages, this is probably unavoidable. As an instructor who teaches introductory biology for both majors and nonscience majors, there are several excellent chapters that I will have my students read. This volume is also likely to be a useful primer for those scientists who lack academic training in evolutionary principles, and it also offers historians of science a glimpse of

how Ernst Mayr, one of the most influential evolutionary biologists, views the discipline at the beginning of the 21st century.

JOSEPHA KURDZIEL, *Ecology & Evolutionary Biology*, University of Michigan, Ann Arbor, Michigan

**THE NATURE OF DIVERSITY: AN EVOLUTIONARY VOYAGE OF DISCOVERY.**

By Daniel R Brooks and Deborah A McLennan. Chicago (Illinois): University of Chicago Press. \$85.00 (hardcover); \$35.00 (paper). xiii + 668 p; ill.; index. ISBN: 0-226-07589-3 (hc); 0-226-07590-7 (pb). 2002.

Evolution is a historical process. To understand the present-day diversity in adaptation, it is insufficient to evoke the optimizing powers of natural selection alone. We also need to know the historical context and origins of the adaptations. *The Nature of Diversity* is a broad attempt at integrating adaptation, ecology, and phylogeny to explain adaptive and ecological diversity in a historical context. The book is an update of the authors' previous work *Phylogeny, Ecology, and Behavior: A Research Program in Comparative Biology* (1991. Chicago (IL): University of Chicago Press), which clearly and successfully presented the cladistic research program in comparative biology. The update consists mainly in a set of new empirical studies and some more emphasis on biodiversity. The book now also contains a massive 100-page reference list that will be useful, although only a small subset of the citations are discussed in any detail.

Both the current book and its predecessor are strictly confined within the cladistic tradition. Character optimization and phylogeny reconstruction are based exclusively on parsimony. Here, history enters solely through cladograms. There are no branch lengths to be seen, and discussion of molecular data is kept to a minimum. Fossil data are also generally absent, but biogeographic information is amply included in the form of area cladograms.

My criticism of this well-written book is of the research program it represents. There are no statistics here. The historical reconstructions are generally presented as if they were facts. Very little attention is devoted to the great uncertainties of ancestral state and phylogeny reconstructions, and adequate conceptual tools for handling such uncertainty are not provided. This reduces most of the biological analyses based on the historical reconstructions to neat storytelling that may well be true, but we do not know what confidence we should have in them. The confinement to the cladistic tradition also means that the book unfortunately misses out on most of the statistical and

molecular advances in phylogeny reconstruction and comparative methods that have taken place over the last decade.

THOMAS F HANSEN, *Biological Science*, Florida State University, Tallahassee, Florida

**ANNUAL REVIEW OF GENOMICS AND HUMAN GENETICS. Volume 3: 2002.**

Edited by Eric Lander, David Page, and Richard Lifton. Palo Alto (California): Annual Reviews. \$67.00. xii + 459 p + 17 pl; ill.; subject index. ISBN: 0-8243-3703-4. 2002.

**MATHEMATICS OF GENOME ANALYSIS. Cambridge Studies in Mathematical Biology, Volume 17.**

By Jerome K Percus. Cambridge and New York: Cambridge University Press. \$59.95 (hardcover); \$19.95 (paper). x + 139 p; ill.; index. ISBN: 0-521-58517-1 (hc); 0-521-58526-0 (pb). 2002.

This is a lovely, short textbook on selective mathematical models in genomic DNA sequence analysis. Written by a statistical physicist, its style is unique when compared to similar topics treated by a statistician or a computer scientist. It focuses more on basic ideas and analytical formulations of various problems rather than on theorems or algorithms. Many combinatorial manipulations resemble those techniques used in statistical mechanics.

This book begins by introducing the most basic chemical structures of a DNA molecule and the concept of restriction fragments. Next, Percus discusses mathematical models involved in building physical or restriction maps, and then moves on to single DNA sequence statistics: Markov frequencies and long-range correlations. The author details sequence comparison problems that are at the heart of most popular bioinformatics tools, before he concludes with a brief discussion about mathematical models on DNA dynamics.

As stated by the publisher, this book will be of interest to students and professional mathematicians who would like to know how mathematical and statistical models have been used to analyze DNA sequences. Since the author has been interested mainly in basic problems that may be treated analytically or nearly so with controllable approximations, readers may be a little uneasy about the biological motivations of the models, as well as about the functional interpretations of the results. Students may want to brush up on some more background on molecular biology in order to have a firm grasp of some of the basic concepts behind the mathematical models treated in this book.

MICHAEL Q ZHANG, *Biological Sciences*, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York

A DICTIONARY OF GENETICS. *Sixth Edition.*

By Robert C King and William D Stansfield. Oxford and New York: Oxford University Press. \$65.00 (hardcover); \$29.95 (paper). ix + 530 p; ill.; no index. ISBN: 0-19-514324-8 (hc); 0-19-514325-6 (pb). 2002.



## REPRODUCTION &amp; DEVELOPMENT

## MOLECULAR PRINCIPLES OF ANIMAL DEVELOPMENT.

By Alfonso Martinez Arias and Alison Stewart. Oxford and New York: Oxford University Press. £28.99 (paper). xiii + 410 p; ill.; index. ISBN: 0-19-879284-0. 2002.

Mechanisms of development have been long recognized to reside in signaling both within and between cells, but classical embryologists and developmental biologists had little clue until recently of the molecular bases of these mechanisms. In this volume, the authors emphasize molecular signaling mechanisms involving transcription factors, extracellular and cytoplasmic signals, and how networks of these could lead to lineage, cell diversity, and pattern formation. Their approach has the advantage of illuminating underlying processes and the reasoning behind the analyses. By necessity, a good deal of the particulars (and beauty) of various developing organisms is left out.

The discussion is at a high level. Colorful illustrations are copious and the legends are dense with information. The text is intended for graduate students or perhaps advanced undergraduates, all of whom would benefit from the perspective of a first course that exposes them more fully to a wider range of organisms and to evolutionary explanations based in the newly emerging field of "evo-devo." The book will be most accessible to students and workers with strong molecular backgrounds, but it is the organismal diversity and use of common molecular frameworks in different contexts that distinguish development from the subfields of cell and molecular biology concerned with signaling.

For students with a solid foundation in development, this excellent volume contains many examples and discussions beyond those of individual reviews that link concepts in a broad context. As a supplement to a good basic development textbook, this volume will make a solid basis for class

discussion of the breathtaking new developments in this increasingly tractable field.

DOMINIC POCCIA, *Biology, Amherst College, Amherst, Massachusetts*

HUMAN EMBRYOLOGY & TERATOLOGY. *Third Edition.*

By Ronan O'Rahilly and Fabiola Müller. New York: Wiley-Liss. \$295.00. xii + 505 p; ill.; index. ISBN: 0-471-38225-6. 2001.

It is essential that investigators of developmental mechanisms and defects using murine and avian models be able to identify morphological features and processes unique to or exaggerated in human embryos. This requires an authoritative, contemporary account of human prenatal development, which is the niche that O'Rahilly and Müller target. Relying on human specimens, mostly from the Carnegie Embryology collection, the third edition of *Human Embryology & Teratology* presents photographic and reconstructive illustrations, as well as flat artwork accompanying text accounts of early developmental stages, histogenesis, placentation, and organogenesis. The result is a compromise between classical compendia and current medical teaching textbooks. It is a descriptive embryology treatise, light on mechanisms and molecules, and strongly emphasizing normal rather than abnormal development, more so than some of the teaching volumes that do not include the term teratology in their title. What little genetics is included is very classical, with little mention of polymorphisms, as it relates to subjects such as fetal alcohol syndrome, or quantitative effects of most mutations involving genes for transcription factors and many receptors.

The quality and depth of chapters vary greatly. Chapter 10, on histogenesis, is excellent and well illustrated. The chapter on extra-embryonic membranes (a term the authors reject) emphasizes features unique to humans and related primates. Also, the chapters on cardiogenesis and neurogenesis present substantially more information about later stages than is available in other volumes. Craniofacial development is scattered in three chapters, and surprisingly no photographs and only inaccurate drawings of palatogenesis are provided. Discussion of renal development ends with formation of a nephron attached to a collecting duct, omitting stages of organogenesis that are likely more related to common kidney anomalies.

Most of the organogenesis chapters suffer from reluctance to incorporate fate mapping data from other species, especially mice. This is, to be sure, an inexact process, and caution in making extrapolation is better than hyperbole. But excellent

data, many using promoter-driven expression patterns, are available on topics such as neural crest contributions to the calvaria, the origins of primary germ and sustentacular cells, histogenesis of sutures, and sources of cardiomyocytes in outflow and ventricular regions. More disconcerting is the inclusion of several incorrect attributions, including the origins of appendicular angioblasts (substantial contribution from lateral mesoderm), the vomeronasal nerve (not from neural crest), extraocular muscles (only nerve III-innervated muscles receive contributions from prechordal mesoderm), and glossal connective tissues (not from postotic neural crest).

The book is not an easy read. Many sections require visits to previous and later chapters, and although these are often cited, it makes for frequent interruptions in the flow. A majority of the sketches are two-dimensional, and thus do not offer the helpful perspectives found in most current medical embryology textbooks. Certainly, the authors are entitled to opinions and biases, especially if they highlight important areas of uncertainty or debate among embryologists. But dismissing the term gastrulation because among vertebrate classes there are differences in the types of movements displayed by surface epithelial cells overlooks the more fundamental importance of generating three layers, the deeper two of which have a medio-to-lateral history and all of which have their axes established during this stage.

In their introduction, the authors state the importance of clarity in the use of embryological and anatomical terms. Yet, they readily use mesoblast, mesoderm, and mesenchyme interchangeably, talk about ectodermal thickenings (dental laminae) that appear in the underlying mesenchyme, present megacolon as a failure of proliferation or migration of ganglionic cells, and describe the esophageal musculature as being striated above and smooth below. The authors are dismissive of the term branchial, but readily describe a first pharyngeal arch most of which, in fact, is never associated with the pharynx. They state that the allantoic stalk becomes continuous with the urachus, implying it was previously discontinuous. An ectodermal ring, corresponding one supposes to the mammary ridge, is drawn as extending from the optic vesicle to cloacal region, but neither its developmental or evolutionary significance (if any), nor the authors' choice of terms, are discussed.

I find it difficult to identify the audience to whom I can recommend this volume. Neither the presentation nor the price makes it suitable for students. Sadly, the many inaccuracies and eccentricities make this a poor choice for researchers eager to compare events among mammalian species.

There are many specialized textbooks that focus on the development of specific human organ systems, and most of these augment descriptive chapters with genetic and mechanistic chapters. An authoritative, contemporary account of human prenatal development is sorely needed, but this volume is not the solution.

DREW M NODEN, *Biomedical Sciences, College of Veterinary Medicine, Cornell University, Ithaca, New York*



## MICROBIOLOGY

MODERN MICROBIAL GENETICS. *Second Edition.*

*Edited by Uldis N Streips and Ronald E Yasbin. New York: Wiley-Liss. \$115.00. xiv + 657 p; ill.; index. ISBN: 0-471-38665-0. 2002.*

This is an advanced textbook that will be useful to students and teachers of microbiology. It is in a revised and expanded new edition that brings together research and current thinking in microbial genetics. It is a volume of biology that describes living processes in detail. It does not elaborate on experimental methods.

The book consists of 22 chapters in three sections: DNA Metabolism, Genetic Response, and Genetic Exchange. The first section deals with gene expression and how DNA works in bacteria and bacteriophage. The second section is devoted to the interactions of microorganisms with their environment and each other (i.e., how cells can be signaled and induced to react). The final section describes various mechanisms of genetic recombination by which microorganisms ensure their diversity and continued evolution.

Each chapter is an expert contribution by one or more specialists in the field. It is remarkable how well the chapters fit together like the subject itself—the elements of genetics. Just one chapter, Molecular Applications, seemed out of place or did not go far enough into what is now known. For example, it did not describe the use of PCR (polymerase chain reactions) or DNA microarrays for the analysis of gene structure and expression. But this is not a methods and applications book. What it is, without doubt, is an excellent account of the known facts in this area of biology.

The overall consistency and clarity of the book is a credit to its editors. There are helpful diagrams and photographs throughout. Each chapter is followed by a generous list of references pointing to

the original research data and methods, and there is an excellent subject index to the whole book.

ROGER WHEATCROFT, *Food Research Program, Agriculture & Agri-Food Canada, Guelph, Ontario, Canada*

#### INDUSTRIAL MICROBIOLOGY: AN INTRODUCTION.

By Michael J Waites, Neil L Morgan, John S Rockey, and Gary Higton. Oxford and Malden (Massachusetts): Blackwell Science. \$69.95 (paper). xi + 288 p; ill.; index. ISBN: 0-632-05307-0. 2001.

This new volume provides a wide-ranging introduction to the subject of industrial microbiology. It represents a timely, expanded update to currently available textbooks and is aimed primarily at undergraduates studying microbiology, biotechnology, food science technology, and biochemical engineering.

The book is separated into three parts that include broad coverage of microbial physiology; exploration of the versatility and diversity of microorganisms and their metabolic activity and end-products; detailed coverage of important industrial microorganisms and the necessary technologies required for their large-scale propagation and subsequent isolation of their important fermentation products; and a thorough description of established and novel industrial fermentation processes, including new biopharmaceutical manufacturing and clean room technology.

The first part provides a brief overview of the major groups of commercially important microorganisms and covers microbial structure and composition, microbial metabolism, and sufficient biochemistry for students to comprehend the overall diversity of industrial microorganisms and their metabolic activity and important end-products. Part 2 provides a thorough review of various bioprocess technologies in large-scale upstream and downstream processing. One of the weaknesses of the volume is too brief and inadequate coverage of important genetic principles of mutation and selection, recombination, genetic engineering, and their great importance to the manufacturing of commercial bioproducts. The authors recognize this and state that these topics can be adequately provided through supplementary readings. This section does provide extensive coverage of process safety, clean room operations, and Good Manufacturing Practices (GMP) for commercial manufacture. The third part comprises nine chapters on important industrial processes. The chapters on microbial enzymes, biofuels and commodity chemicals, as well as human and animal health products are especially thorough. The authors conclude this section with a brief discussion of animal and plant

cell culture, areas that are becoming increasingly important in the manufacture of biopharmaceuticals.

The volume is extremely well written with excellent organization. It contains many clear tables and figures that are correlated well with the text. This book competes favorably with other available textbooks in this field, and has the important advantage of new updated subject matter. It contains many useful suggested review papers and references at the end of each chapter and provides students or researchers with advanced information in many specialized areas. The suggested readings include publications reported through 1999.

This new volume in industrial microbiology comes highly recommended to undergraduate students in microbiology, biotechnology, food technology, and biochemical engineering. Research scientists, engineers, and technicians will also benefit from this practical and updated overview of this important area of industrial biotechnology.

RICHARD P ELANDER, *La Jolla, California*



#### PLANT SCIENCES

##### TRANSGENIC PLANTS AND CROPS.

Edited by George G Khachatourians, Alan McHughen, Ralph Scorza, Wai-Kit Nip, and Y H Hui. New York: Marcel Dekker. \$225.00. xxv + 876 p; ill.; index. ISBN: 0-8247-0545-9. 2002.

There is much brouhaha about the wisdom of releasing genetically modified (GM) plants into the environment. Yet, in the U.S. alone it is estimated that some 34% of the maize, 74% of the soybean, and 71% of the cotton crops commercially produced are already genetically modified. Other countries are well on the way to doing the same, albeit others, like those of the European Union, have placed a moratorium on planting and release of GM food crops and other "novel foods." The emphasis is nominally on the wisdom of waiting, but it can also be argued convincingly that the "greens have won," by having waged an effective lobby campaign with the political establishment. The arguments against GM food range from the possibility of unanticipated hazards to health (both human and animal) brought on by the potential presence of substances produced by altered metabolic pathways in plants, which itself is brought on by genetic modification, to the implications for exacerbating the already precarious environment by unintended gene flow between GM food species

and their wild relatives, even producing in some cases Frankenstein-like superweeds. Add to this a genuine ethical and moral concern for the nominal threatening of the food supply of the world's poor by an ever-increasing number of patents on food staples such as rice, maize, wheat, and sorghum and one has a real dilemma. As a not-so-aside "aside," the rumor has been that genetically modified foods have been around for years (e.g., tomatoes), and I wish now that I had frozen some alleged samples, so that suspicion could be scientifically validated. In short, much of this opposition is purely ignorance-driven and can be likened to locking the proverbial barn door after the fact.

It is well to see what those who are involved in "biotechnology" research of this sort might have to say about any of this. The editors of this heavy volume have succeeded admirably, I believe, in touching all bases, so to speak. My only fear is that they are preaching to the converted. For reasons that will become apparent below, no one other than professional scientists will ever refer to this book. And this is a pity, for the presentations are not only scientifically detailed, accurate, and as complete as possible given the realities and constraints of publishing deadlines, but the whole volume is straightforward, realistic, and responsible. It would be nice if the balanced arguments for genetic engineering so cogently made in bits and pieces throughout the chapters could be culled and published in a separate position paper or defense of the process (the scientists in the "pro" camp have not been very effective in putting forward their case and need to do their homework). Indeed, the volume emphasizes the constraints and the current limitations to progress in the field. No one suggests that genetic engineering is a substitute for conventional plant breeding; it is an adjunct, a supplement. But the feeding of the world will continue to be a challenge for the 21st century—the estimate is that some 10 billion people will be on Earth by mid-century—and few seem to want to handle the delicate problem of the limited capacity of the world to accommodate ever-increasing numbers. In view of this, capacity-increasing technologies, such as genetic engineering, are needed now more than ever. Since little is being done to curb population growth, my prediction is that it will be shown that responsible use of GM crops will eventually prevail to the benefit of all concerned. A benefit that is not emphasized in this practically oriented volume is that much can be learned about plant development, physiology, and biochemistry using transgenic systems.

But defense of genetic engineering is only a modest aside in this volume; the emphasis is understandably on the scientific details for the practi-

tioners of the art and science. Fifty-five chapters are separated into four sections: Principles and Applications; Fruits; Vegetables; and Grains and Other Seeds. These chapters are dedicated to the coverage of a wide range of problems. Section I is especially useful. Dynamics of genome organization; embryogenesis; shoot regeneration and proliferation; techniques for gene marking, transferring and tagging; pollen biotechnology; parent-of-origin and seed development and epigenetics; direct DNA delivery into cells; electroporation; cell culture and regeneration; starch modification; modification of flowering; enhanced grain quality; resistance to nematodes, insects, and viruses; improving levels of phytonutrients; intellectual property protection; public perceptions of transgenic plants; industry perspectives; and political and economic consequences are all expertly covered.

In Section II, apples, avocado, bananas, melon, cranberry, grape, Kiwifruit, mango, papaya, and strawberries and raspberries are dealt with. The rubric followed for each of these is more or less standardized and the flow is logical: introduction, genetics and breeding, limitations of conventional breeding, *in vitro* culture and plant regeneration from somatic tissue, transformation, selection and screening of transformants, expression of genes with potential practical application, conclusions, summary, and future prospects and references. Section III covers asparagus, bean, beet, carrot, cassava, cauliflower, chili pepper, cucumber, eggplant, cowpea, lentil, chickpea, lettuce, onions and related alliums, and potato—both sweet and white. Section IV deals with barley, coffee, linseed flax, macadamia nuts, oilseed brassicas, rice, sorghum, sunflower, and wheat. A detailed index concludes the book.

The editors are to be congratulated for having taken on the challenge of producing this volume. I believe that one day, historians of science will view this book as a landmark publication in that it signaled the coming of age of a "new enabling biotechnology" called the production of Genetically Modified Organisms. Little can be said now about the consequences of the restraints and constraints of the regulatory processes already being put in place in connection with GM plants by various governments. My only fear is this: although the costs of registration will probably not be as high as those associated with drug discovery and release of new pharmaceuticals, involvement of governments in oversight of the area will inevitably be associated with increased costs of food. Like everything else, "following the money trail" will disclose the answer. My prediction is that in the near future GM plant production will be very selectively practiced due to cost constraints of getting government approval for

the end product. It is my hope that this constraint, a necessary evil if you will, will force ever-diligent scrutiny of what is done or not done on the part of those involved in bringing GM products to market.

A D KRIKORIAN, *Biochemistry & Cell Biology, State University of New York, Stony Brook, New York*

CARNIVOROUS PLANTS OF THE UNITED STATES AND CANADA. *Second Edition.*

By Donald E Schnell. Portland (Oregon): Timber Press. \$39.95. 468 p; ill.; index of plant names. ISBN: 0-88192-540-3. 2002.

Botanists, carnivorous plant enthusiasts, and natural history buffs will welcome this comprehensive treatment of the carnivorous plants of the United States and Canada. This new version of Schnell's classic, out-of-print book is nearly three times as long as the previous edition. The author has added an enormous amount of detail on the biology of these botanical curiosities, and greatly expanded the attention paid to their conservation. *Carnivorous Plants* also is a welcome complement to Peter D'Amato's *The Savage Garden: Cultivating Carnivorous Plants* (1998. Berkeley (CA): Ten Speed Press), as the latter focuses almost exclusively on cultivation of carnivorous plants in the greenhouse and backyard bog. In contrast, the current volume will be an invaluable addition to the bookshelf and field backpack.

The first part of the book is an introduction to the natural history and biology of carnivorous plants. This section draws heavily on older literature, with few citations beyond the mid-1980s. The author's biomedical background shows through on occasion, as when he describes bladderworts as "aqueous" (as opposed to aquatic). But by and large, this section provides a reasonable introduction to these plants. More technical reviews of the recent scientific literature have been published (for example, see A M Ellison and N J Gotelli. 2001. *Trends in Ecology & Evolution* 16(11):623-629).

The bulk of the book, and its main attraction, is composed of descriptions, photographs, and range maps of each species of carnivorous plant in America north of Mexico. For each species, Schnell provides taxonomic synonymy; common names; botanically technical description; flowering phenology; geographic distribution; habitat; ecological comments; cultivation notes; marvelous photographs; and, when appropriate, discussion of infraspecific taxa and hybrids. In making decisions and suggestions about infraspecific taxa, Schnell is conservative. He favors varieties over subspecies, and subspecies over species, and emphasizes mor-

phological data and field traits over molecular data in his arguments.

The book concludes with a discussion of conservation issues and threats. Carnivorous plants are zealously overcollected for commercial sale, and their wetland habitats are disappearing as subdivisions are constructed, mosquito ditches are dug, and water tables are lowered as people demand more water or surrounding forests are cleared. Few solutions are in sight; Schnell favors private initiatives such as land purchase by land trusts and The Nature Conservancy over government intervention. There are also groups (especially in the southeastern United States) that rescue populations of carnivorous plants growing in the paths of bulldozers. These can be propagated and used later in restoration and recovery efforts, which are the best hope for preserving these plants for future generations.

AARON M ELLISON, *Harvard Forest, Harvard University, Petersham, Massachusetts*

ENVIRONMENTAL PHYSIOLOGY OF PLANTS. *Third Edition.*

By Alastair Fitter and Robert Hay. San Diego (California): Academic Press. \$49.95 (paper). xii + 367 p + 16 pl; ill.; name, species, and subject indexes. ISBN: 0-12-257766-3. 2002.

For years, two books on the physiology of plants in their environment have stood side by side on my bookshelf—Larcher's *Physiological Plant Ecology* (1975. Berlin (Germany): Springer-Verlag), and Fitter and Hay. I have valued the wonderful comparative tables in Larcher, and the analytical approach of Fitter and Hay. Now the third edition of Fitter and Hay has appeared, with the same basic layout as before. The acquisition of resources by plants is rightly given primacy, followed by responses of plants to environmental stress (mainly temperature and toxicity). A final chapter puts the plant into a community, covering interactions between plants and other organisms. The third edition is an improvement on an already valuable work: it is accurate, well organized, and readable.

A problem faced by authors of such a book is whether to include basic physiology or to assume that it will be learned elsewhere. Should the pathways of photosynthesis, or the mechanism of nitrate uptake, or the regulation of gene activity, be treated in depth? This book generally assumes that the basics are known, and concentrates on the plant functioning in its environment. There are areas where I would have wished for different emphases—for example, the section on water transport avoids some current controversies. The biggest disappointment is the last chapter, where

the individual plant is placed in the community. This chapter is short—too short on leaves mingling in canopies and roots mingling in soil, too short on parasitism and herbivory, and too short on key questions such as niche differentiation and mechanisms of competition. Given the expertise of the authors, this is surprising as well as disappointing. We would do well to train more plant ecologists who can address ecological questions mechanistically. So now I have three books on my shelf—the relatively new *Plant Physiological Ecology* (H Lambers, F S Chapin, and T L Pons. 1998. New York: Springer) has joined Larcher, while Fitter and Hay's volume still earns its place.

JOHN FARRAR, *Institute of Environmental Science, University of Wales, Bangor, United Kingdom*

ANNUAL REVIEW OF PHYTOPATHOLOGY. *Volume 40: 2002.*

*Edited by Robert K Webster, Gregory Shaner, and Neal K Van Alfen. Palo Alto (California): Annual Reviews. \$67.00. xii + 539 p + 11 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 31–40). ISBN: 0–8243–1340–2. 2002.*

ESSENTIAL SOIL SCIENCE: A CLEAR AND CONCISE INTRODUCTION TO SOIL SCIENCE.

*By M R Ashman and G Puri. Oxford and Malden (Massachusetts): Blackwell Science. \$39.95 (paper). viii + 198 p; ill.; index. ISBN: 0–632–04885–9. 2002.*

This book is targeted mainly at students, with the goal of introducing them to the basic principles of soil science. It is written primarily for more general students who are not specializing in soil science, but need to acquire skills in the subject as part of a broadly based modular-type degree course. Hence, it is designed to be an inexpensive, but informative guide to the general principles of soil science subjects, including soil formation, soil structure, microbial activity and nutrient cycling, soil classification, soil improvement for agricultural production, and soil contamination and erosion.

The book was written by two scientists at the Institute for Arable Crop Research, Rothamsted, U.K., an institution that has a long-standing history of excellence in soil science. It is written clearly, well illustrated, and achieves its aim (to present the more important physical and chemical aspects of soil science to students) in a relatively brief and succinct format. The main shortcoming of the book is that it deals relatively superficially with some of the biological components of soil systems, such as soil-inhabiting invertebrates, which are

increasingly recognized as of major importance in the function of soil systems and the maintenance of soil fertility. For example, the discussion on earthworms, which play a major role in organic matter breakdown and nutrient cycling, is limited to a single paragraph in the chapter Soil Microbes and Nutrient Cycling.

Within these limitations, the book will be a useful and relatively inexpensive source for students and anyone requiring information on the basic principles of soil science, provided they are prepared to supplement their reading by consulting textbooks on soil microbiology and ecology.

CLIVE A EDWARDS, *Entomology & Environmental Science, Ohio State University, Columbus, Ohio*

MECHANISMS IN PLANT DEVELOPMENT.

*By Ottoline Leyser and Stephen Day. Oxford and Malden (Massachusetts): Blackwell Publishing. \$49.50 (paper). xiii + 241 p; ill.; index. ISBN: 0–86542–742–9. 2003.*

This is a “must have” volume for any scientist with even a peripheral interest in plant development. Leyser and Day have provided a welcome addition for anyone looking for an up-to-date book for an upper-level undergraduate or graduate course in plant development.

The classic book in the field, *Patterns in Plant Development*, by Steeves and Sussex (Cambridge: Cambridge University Press), was last updated in 1989. Since then, plant development has been revolutionized by molecular genetic approaches, primarily in *Arabidopsis*. What is nice about Leyser and Day's treatment is that it is not simply a compilation of molecular genetic experiments, but incorporates the older literature (e.g., description of Satina and Blakeslee's experiments on periclinal chimeras) and nonmolecular techniques (e.g., cell ablation studies in the root). Chapters are arranged with a brief overview followed by a series of “case studies” that look in detail at specific areas of progress in the last decade. Leyser and Day provide just enough detail to illuminate complex topics without bogging readers down. Figures and diagrams have been redrawn using two-color shading that very effectively illustrates essential points. Chapters deal with the development of the major organs in the adult plant: leaves, trichomes, roots, and flowers. Considerable focus is also given to classical developmental biology topics such as stem cell (meristem) initiation and maintenance, axis formation in the embryo, and polarity of organ development. The effects of light and other environmental stimuli on plant development are also considered. The ubiquitous role of auxin in plant development is interspersed throughout (not sur-

prising considering that Leyser's laboratory focuses on the mechanism of auxin action).

Not only is *Mechanisms in Plant Development* an excellent learning tool for students, but it will also serve as a valuable resource for practitioners in the field for years to come.

THOMAS JACK, *Biological Sciences, Dartmouth College, Hanover, New Hampshire*

WILDFLOWERS AND OTHER PLANTS OF TEXAS BEACHES AND ISLANDS. *Treasures of Nature Series.*

By Alfred Richardson. Austin (Texas): University of Texas Press. \$65.00 (hardcover); \$29.95 (paper). xxiii + 247 p; ill.; index. ISBN: 0-292-77115-0 (hc); 0-292-77116-9 (pb). 2002.

PLANT STRATEGIES, VEGETATION PROCESSES, AND ECOSYSTEM PROPERTIES. *Second Edition.*

By J Philip Grime. Chichester (United Kingdom) and New York: John Wiley & Sons. \$55.00 (paper). xxxvii + 417 p; ill.; species list and index. ISBN: 0-471-49601-4. 2001.

More than 20 years after the publication of the first edition, Grime has meticulously reexamined and expanded the scope of his original CSR theory on plant functional types. The framework of his argument is based on the idea that there are two fundamental divisions of a plant's habitat: stress (inversely related to productivity) and disturbance. He uses these divisions to categorize habitats into four groupings, three of which favor a particular functional type of plant: competitors (C) are favored in low-stress/low-disturbance environments; stress-tolerators (S) in high-stress/low-disturbance environments; and ruderals (R) in low-stress/high-disturbance environments. The fourth category, high-stress/high-disturbance, is argued to be an unsatisfactory environment for plant growth.

The book's ten chapters are separated into three parts. The first three chapters focus on plant strategies and detail the theoretical framework of the CSR model. The following six chapters examine vegetation processes (e.g., dominance, succession, and coexistence) and their relationship to the CSR model. The final chapter looks at how C-, S-, and R-strategists potentially influence ecosystem properties. The concluding chapter, one of the most intriguing, presents evidence of the effects of plants on the trophic structure, productivity, and stability of ecosystems. One interesting example given is a case study involving the effect of the 1986 Chernobyl accident on contaminated sheep pastures in Great Britain. The evidence presented suggests that in productive pastures dominated by fast

growing C-strategists, contamination declined more rapidly than in less productive pastures of slower growing S-strategists. Other support within this chapter is drawn from an extensive literature review of field observations and manipulative experiments. Generally, Grime's evidence is convincing. Further, he does a good job of examining competing theories and explaining how they fit into the framework of his model. Overall, this is a commendable book. Grime has convincingly laid out evidence of his CSR theory from a wide array of sources and has presented an excellent synthesis of work done in this area over the last 20 years. This clearly written volume should be of great interest to researchers involved in plant ecology generally, and plant functional types in particular.

BRENT C BLAIR, *Natural Resources & Environment, University of Michigan, Ann Arbor, Michigan*

SEVENTH CATALOG OF THE VASCULAR PLANTS OF OHIO.

Edited by Tom S Cooperrider, Allison W Cusick, and John T Kartesz. Columbus (Ohio): Ohio State University Press. \$65.00 (hardcover); \$30.00 (paper). x + 195 p; ill.; indexes to scientific names and common names. ISBN: 0-8142-0858-4 (hc); 0-8142-5061-0 (pb). 2001.

MOLECULAR BIOLOGY OF FUNGAL DEVELOPMENT. *Mycology Series, Volume 15.*

Edited by Heinz D Osiewacz. New York: Marcel Dekker. \$195.00. xvi + 607 p; ill.; index. ISBN: 0-8247-0744-3. 2002.

Numerous publications, books, and textbooks are available that treat the subject of developmental biology. Far less is available detailing the fungi, an important group of organisms that have implications in a broad variety of contexts from medical to agricultural to food, and of course as model systems for "higher" eukaryotes. This nicely edited book by Osiewacz is an attempt to fill that gap. He has compiled an impressive list of authors, who represent leaders in their respective fields. This gives readers a detailed and current view of a broad array of fungal processes and lifestyles, ranging from saprophytes to pathogens of both plants and animals to symbionts. This volume contains 20 articles that review research from a broad base of fields relating to fungal developmental biology. They are grouped in two major sections: Basic Developmental Processes (11 chapters) and Interactions of Fungi with Different Hosts (nine chapters).

The first part of the book deals with model fungal organisms, beginning with yeast. These articles are particularly strong, with topics ranging from tip

growth (Bartnicki-García) through conidiation. Two very informative and interesting systems describe senescence in *Podospora anserina* and vegetative incompatibility (VCG) in *Neurospora crassa*. With respect to vegetative compatibility, when two hyphal propagules contact each other, there are two possible outcomes: successful fusion can occur (termed vegetative compatibility), which results in two genetically distinct nuclei/cell; or failure to fuse, resulting in an incompatible or nonviable response. The genetic determinants that mediate the process are being identified in large part in the Glass laboratory and raise issues pertaining to the recognition of self versus nonself, which is not only fascinating, but has ramifications for higher eukaryotes (as do many of these chapters).

The chapters that review light perception (Linden) and circadian rhythms (Bell-Pederson) are given fairly comprehensive treatments and again are not only relevant to fungal biology, but also plants and animals. The second section involves the dynamics associates (pathogen/symbiotic) between fungi and their hosts (plants/humans). Again, the range of systems is impressive, from mycorrhizae through plant pathogens to human pathogens. The chapters are generally well done and comprehensive.

On balance, this book will be an excellent resource for graduate students and others who work with fungi, but also for researchers interested in the broader aspects of eukaryotic development. It is my hope that researchers will look at this book as a great introduction to world of fungal development.

MARTY DICKMAN, *Plant Pathology, University of Nebraska, Lincoln, Nebraska*

#### FIELD GUIDE TO LIVERWORT GENERA OF PACIFIC NORTH AMERICA.

By *W B Schofield; illustrated by Patricia Drukker-Brammall and Muriel Pacheco. Alberta (Canada): Global Forest Society; Seattle (Washington): University of Washington Press. \$25.00 (paper). viii + 228 p; ill.; index. ISBN: 0-295-98194-6. 2002.*

#### INTRODUCTION TO PLANT POPULATION BIOLOGY. Fourth Edition.

By *Jonathan Silvertown and Deborah Charlesworth. Oxford and Malden (Massachusetts): Blackwell Science. \$49.95 (paper). viii + 347 p; ill.; index. ISBN: 0-632-04991-X. 2001.*

The fourth edition of this volume is a collaboration of Silvertown with a new coauthor, Deborah Charlesworth. Their knowledge of this expansive and complex subject imbue the current edition

with an integrated perspective that intertwines the ecological and evolutionary perspectives on topics in plant population biology. The book has a relaxed, conversational tone and reads as if many of the chapters were truly coauthored.

Although this edition retains the ten chapter headings used in the previous edition, much has changed here. Most chapters have been significantly reorganized and expanded, including many new topics that were not previously covered. Notable additions are new large sections on molecular genetic markers and their uses in population biology (Chapter 2); density dependent population growth (Chapter 5); regional dynamics and metapopulations, including extinction, invasion, phylogeography, and the genetic consequences of metapopulation dynamics (Chapter 7); and a greatly expanded chapter covering breeding systems (Chapter 9). Throughout the book there are new or reworked figures, tables, and text, with updated examples and references. The authors have retained the Summary section from previous editions, with key terms from the chapter highlighted in bold text. In this edition, two new sections follow each chapter Summary. The Further Reading section provides two to five suggestions for gaining more in-depth knowledge, while the Questions section challenges readers on their understanding. The questions on structured populations (Chapter 6) even provide matrix population problems to work on using spreadsheets. These practical additions and the expansion of the scope of subject areas make it an excellent, current textbook for use in upper-division undergraduate classes or for beginning graduate students.

SUSAN KALISZ, *Biological Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania*



#### ANIMAL SCIENCES

#### PARASITES AND THE BEHAVIOR OF ANIMALS. *Oxford Series in Ecology and Evolution.*

By *Janice Moore. Oxford and New York: Oxford University Press. \$85.00 (hardcover); \$45.00 (paper). xi + 315 p + 1 pl; ill.; species and subject indexes. ISBN: 0-19-508441-1 (hc); 0-19-514653-0 (pb). 2002.*

Nowhere are marvelous stories about intricate adaptations more prevalent than in discussions of parasites and their effects on host behavior. The

ant commanded by a pathogen to climb to the top of a grass blade, the better to be consumed by a browsing sheep, the rabid dog spreading its infection in ferocious unprovoked attacks, the grasshopper driven to water only to burst open and free its enormous horsehair worm—this is the stuff that inspires both science fiction movies and careers in biology. A book merely recounting such tales would be fascinating in itself. The beauty of Janice Moore's volume is that it combines this compelling natural history with a clear-eyed critical skepticism, challenging conventional wisdom as it explores the ways that parasites and their hosts alter their behavior, while each struggles for reproductive superiority. Moore has carefully documented examples from many taxa and from research laboratories all over the world, demonstrating parasite manipulation of host, host defense against parasite, and changes in behaviors ranging from habitat selection to intelligence. Throughout, she emphasizes the need to test hypotheses and question generalizations, an emphasis that is welcome in a field where anecdotes and just-so stories abound. The writing is lively and often personal; in discussing the airborne transmission of human pinworm eggs, Moore confesses, "I had grown up with the knowledge that I might acquire all manner of viruses and bacteria simply by breathing; I was, however, unprepared for the idea of aerial attack by worms" (p 19).

The book is shorter than it first appears, mainly because of the 60-page appendix of tables and a 68-page bibliography. The former is a potential gold mine for comparative studies, offering lists of behaviors that may render intermediate hosts more susceptible to predation, strategies enhancing parasite transmission, and host defensive behaviors. As Moore points out, parasites and their effects are everywhere, and *Parasites and the Behavior of Animals* would be appropriate on the shelves of graduate students and other scientists from most areas of ecology and evolutionary biology.

MARLENE ZUK, *Biology, University of California, Riverside, California*

ROTIFERA. *Volume 6: Asplanchnidae, Gastropodidae, Lindiidae, Microcodidae, Synchaetidae, Trochosphaeridae, and Filinia. Guides to the Identification of the Microinvertebrates of the Continental Waters of the World, Volume 18.*

By Thomas Nogrady and Hendrik Segers. *Leiden (The Netherlands): Backhuys Publishers.* \$63.00 (paper). vi + 264 p; ill.; index. ISBN: 90-5782-111-7. 2002.

INTRODUCTION TO THE CLASS BRANCHIOPODA. *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World, Volume 19.*

By Henri Dumont and Stefan V. Negrea. *Leiden (The Netherlands): Backhuys Publishers.* \$86.00 (paper). 398 p; ill.; taxonomic and general indexes. ISBN: 90-5782-112-5. 2002.

THE SOCIAL BIOLOGY OF *ROPALIDIA MARGINATA*: TOWARD UNDERSTANDING THE EVOLUTION OF EUSOCIALITY.

By Raghavendra Gadagkar. *Cambridge (Massachusetts): Harvard University Press.* \$90.00. xiii + 368 p; ill.; index. ISBN: 0-674-00611-9. 2001.

In the preface of this book, the author states that this "is the story of my adventures with *Ropalidia marginata* during the last twenty years, of my dream of understanding the evolution of that pinnacle of social life in animals, eusociality" (p x). Having completed the book I can conclude his dream has been a fruitful one, and that the volume will be of significant value to all those interested in studying and understanding the dynamics of social systems, whatever species they happen to study.

The book meets its goals at a number of levels, reflecting the manner in which it is organized. Starting with a personal introduction to how the author became interested in the wasp *R. marginata* and the evolution of eusociality, the first of four parts contains a valuable overview of the distribution of eusociality within the animal kingdom and a discussion of the value of long-term studies on individual species. This is followed by detailed discussions of the biology of *R. marginata*, organized within topics of particular interest to social biologists: caste differentiation, dominance hierarchies, age, and division of labor. The third part, *The Evolution of Eusociality*, discusses in detail the major theories invoked to explain the evolution of eusociality, and does so in a highly informative way. Each chapter in this section outlines the significant theoretical background, introduces the relevant studies of *R. marginata*, then integrates both to summarize the current status of each approach and to suggest areas of future research. The final part places *R. marginata* into an even greater context, in which the author develops his "unified theory" for the evolution of eusociality. Ecological, physiological, and demographic factors are considered to be far more significant determinants than the more typical kin-selection arguments.

As a whole, this book represents a nice synthesis of theory, experimental design, statistical analysis, and interpretation, and will be of great assistance to any researcher looking for a crash course on the state of the field and the value of appropriate

experimental techniques. Each section on *Ropalidia* presents results chronologically, with due reference to coauthors and collaborators, providing a wonderful example of the progress of knowledge over the last 20 years and the contributions that studies of *Ropalidia* have provided. Although the book argues for the significant role of intensive studies on individual species, it does not do this exclusively. Rather, it presents an extensive and balanced view of the literature, citing both contradictory ideas and references in areas not covered in detail that may still be of interest to readers. It is the nice mixture of enthusiasm, theory, and experiments that will make this book appropriate for a wide audience.

SIMON K A ROBSON, *School of Tropical Biology, James Cook University, Townsville, Queensland, Australia*

THE AMPHIBIANS AND REPTILES OF COSTA RICA: A HERPETOFAUNA BETWEEN TWO CONTINENTS, BETWEEN TWO SEAS.

By Jay M Savage; with photographs by Michael Fogden and Patricia Fogden. Chicago (Illinois): University of Chicago Press. \$75.00. xx + 934 p + 516 pl; ill.; systematic and subject indexes. ISBN: 0-226-73537-0. 2002.

With this magnificent and long-awaited book, the culmination of 40 years of research in the field, Savage has delivered the first full account of the herpetofauna of any Central American country. By drawing upon the work of hundreds of scientists and over 60 of his own visits to this beautiful country, Savage has compiled an impressive amount of useful information pertaining to the taxonomy and biology of Costa Rican amphibians and reptiles.

The bulk of the book is dedicated to accounts of the country's 396 known species (which, incidentally, also cover 89% of Nicaragua's and 87% of western Panama's herpetofaunas). Each species account consists of a detailed description of the organism, similar species, habitat, biology, and a useful distribution map of all documented records for that species. For hardcore biologists, dichotomous keys are provided for identification of all taxonomic levels down to species, including one for tadpoles (which covers 85% of anuran species with tadpoles in Costa Rica). But Savage's volume provides much more—hundreds of pages introduce readers to basic notions of taxonomy, phylogenetic analysis, scientific methods, as well as the political history, the history of herpetology, and the biogeography and climate of Costa Rica. The abundant information will make this hefty book a useful reference for serious biologists, and a steal given its relatively low retail price (generously subsidized by

several biological organizations). In fact, the world-class photographs of nearly every described species alone will warrant the price of the book. I suspect, however, that casual biologists or ecotourists will prefer to wait for an abridged, field guide version.

*The Amphibians and Reptiles of Costa Rica* reveals how much knowledge has been acquired since naturalists first began documenting the wonders of the Costa Rican herpetofauna. But, as Savage points out, large gaps in our knowledge remain, notably in anuran calls, larval life stages, and behavioral ecology. The author has set a solid stage, and this book will certainly serve as the foundation for decades of ecological, behavioral, and phylogenetic work to come.

MARTIN A SCHLAEPFER, *Neurobiology & Behavior, Cornell University, Ithaca, New York*

EVOLUTIONARY ECOLOGY OF BIRDS: LIFE HISTORIES, MATING SYSTEMS, AND EXTINCTION. *Oxford Series in Ecology and Evolution*.

By Peter M Bennett and Ian P F Owens. Oxford and New York: Oxford University Press. \$90.00 (hardcover); \$45.00 (paper). xiii + 278 p; ill.; author, family names, and subject indexes. ISBN: 0-19-851088-8 (hc); 0-19-851089-6 (pb). 2002.

Using modern comparative methods, Bennett and Owens address many of the same questions originally posed in David Lack's *Ecological Adaptations for Breeding in Birds* (1968. London: Methuen). The book is comprised of four major sections (14 chapters) plus a section of Conclusions. The first section provides an excellent description of the benefits and limitations of modern comparative analysis methods in understanding bird diversity. Section II tests competing hypotheses regarding natural selection and life-history variation. The third section examines how natural and sexual selection can lead to diversity in mating systems. The final section is an exploration of the ecological mechanisms that underlie bird extinction and variations in species richness.

As the authors emphasize, this book is not meant to be a complete review of the topics covered in each section, but rather a research monograph of their own investigations into avian life-history questions. I found the book extremely easy to read, and the sections and chapters were well laid out in an accessible style. The analyses conducted were cogent to the questions posed. Also, the tables and figures nicely complemented the text throughout, and there were very few typographical errors that I noted. My one criticism of the work is that the Conclusions (Section V) and many of the summary subsections in each of the chapters could have

been longer and included a bit more speculation and synthesis by the authors.

Most of the chapters in the book are liberally sprinkled with quotations from Lack's work, which I felt helped to focus readers on the question at hand and, at the same time, pay deserved tribute to one of the 20th century's preeminent evolutionary biologists and ornithologists. In order to increase the accessibility of the work, the authors have used common names throughout the text, with scientific names included for individual species. My sense is that the book's intended audience is graduate students and also professionals in the fields of evolutionary biology, ornithology, conservation biology, and behavioral ecology. For anyone working in these areas, this book would make an excellent addition to their library.

RICHARD H M ESPIE, *Fish & Wildlife Branch, Saskatchewan Environment, Regina, Saskatchewan, Canada*

#### A FIELD GUIDE TO THE BIRDS OF PERU.

By James F Clements and Noam Shany; illustrated by Dana Gardner and Eustace Barnes. *Temecula (California)*: Ibis Publishing. \$60.00 (paper). xvii + 283 p + 128 pl; ill.; indexes of scientific and English names. ISBN: 0-934797-18-8. 2001.

About 18% of all the avian species of the world occur in the highly diverse habitats of Peru, ranging from the Pacific coast and nearby desert to the Puna and 23,000-foot snow-capped Andean peaks, along with the rich cloud forests and tropical rainforests of eastern Peru. No country has a richer avifauna, although some of Peru's neighbors come close. If you are planning a birdwatching tour or an ornithological expedition to Peru, there are some decisions to make on which books to take along. This is the first field guide devoted exclusively to Peru, and almost all 1,800 species are illustrated in the 127 color plates. No other guide covers all the birds of Peru, and because of its completeness alone, this may be the book that will always be in your knapsack. Be aware, however, that it has several shortcomings, and falls far short of the two excellent volumes by Ridgely et al., which also are relevant to Peruvian birds.

The color plates are generally adequate, but not excellent. Usually, only one plumage is presented, and look-alike species or families are not grouped together for comparison on the same page. Thus, the black-crested and collared antshrikes, which look almost identical and are in the same genus, are on plates 68 and 71, respectively. The barbets are on plates 49 and 52, with many jacamars, puffbirds, and three woodpecker species between them. The rest of the woodpeckers are on plates

55 and 56. Each species has a brief (3 to 6 lines) paragraph mentioning major features of the bird, along with its range. Vocalizations are ignored, except by giving reference to cassettes and CD-ROMs listed in the front of the book for approximately two-thirds of the species.

My conclusion would be that if one were to take this book, most species will be identifiable by its use, but that some of the more difficult flycatchers, antbirds, or ovenbirds will not be identifiable with this book alone. For northern Peru, the two-volume set *The Birds of Ecuador* (R S Ridgely and P J Greenfield. 2001. Ithaca (NY): Comstock Publishing Associates) is a far superior treatise and field guide that includes almost all species along the border with Ecuador, but farther south in Peru, increasing numbers of species will be missing. Ridgely and Tudor's superb *The Birds of South America* (1994. Austin (TX): University of Texas Press) includes all passerine species (the second half of the checklist) in South America, but treatment of nonpasserines is yet to come. The weight of these volumes is daunting and would require a larger knapsack or a porter to carry them.

CHARLES F WURSTER, *Marine Sciences Research Center, State University of New York, Stony Brook, New York*

#### HANDBOOK OF THE BIRDS OF THE WORLD. Volume 7: *Jacamars to Woodpeckers.*

Edited by Josep del Hoyo, Andrew Elliott, and Jordi Sargatal. *Barcelona (Spain)*: Lynx Edicions. \$145.00. 613 p; ill.; index. ISBN: 84-87334-37-7. 2002.

The editors of this volume have once again produced a masterpiece. This 613-page addition to the Handbook of the Birds of the World series continues, and even improves upon, the excellence seen in earlier volumes. The current book provides comprehensive coverage of the members of two orders: the Galbuliformes, which includes the jacamars (Galbulidae) and puffbirds (Bucconidae), and the Piciformes, which includes the barbets (Capitonidae), toucans (Ramphastidae), honeyguides (Indicatoridae), and woodpeckers (Picidae). The volume is organized into extensive family sections, followed by descriptions of individual species. The family sections provide representative photographs and information on systematics, morphology, habitat, general habits, voice, food and feeding, breeding, movements, relationship with man, and status and conservation. The species sections offer color plates, range maps, and species-specific information on taxonomy, ecology, and conservation. The visual resources of the book are enormous (there are 70 multispecies color plates and 317 photographs) and the textual resources

combine readability with extensive technical coverage. The volume provides about 4000 bibliographic references and is authored by ten leading ornithologists from around the world.

This volume begins with a 57-page foreword on extinct birds. This section, a mini-text in itself, comprehensively documents known birds that have gone extinct, organized by order and species. It details information on such long vanished species as the Mauritian red rail and the Rodrigues solitaire, as well as more recent losses such as the Carolina parakeet and the bay thrush. The foreword provides a definitive and memorable view into the birds that have been lost and why.

This outstanding volume offers a rich and unerringly readable overview of our current state of knowledge of the members of the Galbuliformes and Piciformes. Readers will enjoy an expanded knowledge and appreciation of the biology of birds, and an eagerness to read the next volume in the series.

JOHN P ROCHE, *Biology, Boston College, Chestnut Hill, Massachusetts*

#### RACCOONS: A NATURAL HISTORY.

By Samuel I Zeveloff; drawings by Elizabeth Dewitte. Washington (DC): Smithsonian Institution Press. \$35.00 (hardcover); \$17.95 (paper). viii + 200 p; ill.; index. ISBN: 1-58834-008-2 (hc); 1-58834-033-3 (pb). 2002.

The natural history of a well-known animal is reviewed in this book. The author presents a well-balanced and thorough compilation of the natural history of raccoons. Although the book appears to be written for the general public, there are several areas that scientists interested in raccoons will find beneficial. Chapters 1 and 10 are concerned with the taxonomical history and the relationship of the species with humans. These chapters were very interesting and provided many historical accounts of both areas.

Chapters 2, 3, and 5 detail the evolutionary history and status of raccoons and the relatives of the Family Procyonidae. Several topics are presented that will be of interest for further research on the species. Chapter 4 introduces readers to several aspects of anatomy, physiology, and behavior of the raccoon. The author presents a large amount of material that is known about the raccoon in these areas. I would have liked to have seen the section in this chapter that deals with tactile function expanded. The author does, however, present an extensive amount of material for future research.

The remaining chapters of the book detail the habitat, social behavior, mortality factors, and management of raccoons. As with the rest of the vol-

ume, the author covers these subjects very well. The section on management is the most detailed of the four chapters, and coincides with the fact that the raccoon is a popular game animal and much is known about its management. As with the earlier chapters, several areas for further research are evident. This is a book that anyone with an interest in raccoons will find interesting to read, regardless of their scientific endeavor.

TROY A LADINE, *Biology, East Texas Baptist University, Marshall, Texas*

#### BIOLOGY OF THE DOMESTIC PIG.

Edited by Wilson G Pond and Harry J Mersmann. Comstock Publishing Associates. Ithaca (New York): Cornell University Press. \$75.00. ix + 745 p; ill.; index. ISBN: 0-8014-3468-8. 2001.

It has been 25 years since *The Biology of the Pig* (W G Pond and K A Houpt. 1978. Ithaca (NY): Comstock Publishing Associates) was published. This 1978 book was intended as a useful reference for information on the domestic pig (*Sus domesticus*). The "goal in *Biology of the Domestic Pig* is to present an integrated description of the current knowledge of the biology of the normal pig" (p vii). This is an important animal model for many types of research in biomedicine and agriculture.

Recognized authorities in their specialties were invited to review and summarize relevant recent literature in 17 chapters. Pond and Mersmann set the stage with an insightful description of general characteristics of pigs (i.e., phylogeny, domestication and selection, breeds and types, chromosomes, life cycle and ontogeny, and gross anatomy). The ethology and comparative and experimental psychology of this interesting species in natural habitats and confined spaces is thoroughly reviewed. This discussion is extended to include a consideration of modern husbandry practices to meet the animals' biological needs, and some aspects of anesthesia and surgery. Genetics includes not only classical selection and estimates of heritability, but also consideration of gene mapping technology to reveal economically important traits. Reproductive physiology of the male and female covers embryonic and fetal development and postpartum lactation. The three chapters on growth and body composition, nutrient requirements and metabolism, and the digestive system are extensive in covering the recent literature and are accompanied by useful summary graphs, figures, and anatomical line drawings. Descriptions of the skeletal and muscular systems, respiratory tract, and cardiovascular system focus on the developmental and comparative aspects of the normal animal and not on disease states. The hematology and blood constituents, the

excretory system, and the integument of the pig are thoroughly reviewed. An overview of the recent literature on porcine endocrinology and immunology is summarized. Finally, xenotransplantation is briefly considered, with a focus on prospects for clinical application.

Although the chapters were written by different authors, they provide a balanced summary of recent research with little overlap. Each chapter includes extensive references. *Biology of the Domestic Pig* will serve as a valuable source of information for researchers and students in animal and medical sciences.

LLOYD L. ANDERSON, *Animal Science, Iowa State University, Ames, Iowa*

FIELD GUIDE TO THE WILDLIFE OF COSTA RICA. *The Corrie Herring Hooks Series, Volume 51.*

By Carrol L. Henderson; Foreword by Alexander F. Skutch; photographs by Carrol L. Henderson; illustrations by Steve Adams. Austin (Texas): University of Texas Press. \$95.00 (hardcover); \$39.95 (paper). xx + 539 p; ill.; index. ISBN: 0-292-73128-0 (hc); 0-292-73459-X (pb). 2002.

The target audience, wildlife enthusiasts who do not need a specialized field guide, will enjoy this book, which is full of interesting natural history and striking photographs. Henderson's casual, personal tone, combined with his enthusiasm and extensive experience, will make readers feel like they are in the field with the author. The book begins with a good overview of the conservation history, biogeography, and ecology of Costa Rica. Species coverage is biased toward birds since they are easily observed and many ecotourists are bird-watchers. Most of the frequently observed species are included, although some common species such as crimson-fronted parakeet, rufous motmot, masked tityra, and white-breasted wood-wren, along with all Furnariids, are missing, possibly due to the lack of satisfactory photographs. The majority of the good wildlife areas are covered, the likelihood of seeing a species is quantified well, and there is adequate information on the best places for each species. Photographic quality is exceptional, although some beetle photographs seem to be of museum specimens. The species accounts are full of interesting data on ecology, behavior, and conservation, and references are provided for anyone who wants to know more. The appendix provides helpful lists of sound recordings, conservation organizations, research stations, travel essentials, wildlife sites, and their specialties.

The personal perspective and emphasis on photography have resulted in a few weaknesses. The thick, glossy paper, ideal for displaying photo-

graphs, makes the book bulky. The large font and spacious layout are easy on the eyes, but information on additional species could have been included in a more portable book by reducing font size, photograph size, and empty space. Henderson acknowledges a seasonal and locational bias in his visits. Each species' known distribution should have been included on the species' map, since the author's sightings sometimes give a misleading impression, especially for some widespread species such as army and leafcutter ants, smoky jungle frogs, cane toads, collared trogons, bicolored antbirds, jaguarondis, and armadillos.

This will be a useful book for anyone interested in Costa Rican wildlife, but are not after a big "trip list" of animals seen. Serious wildlife enthusiasts who want a less specialized guide for their more casual travel companions will also find it useful. It is impressive that Henderson has taken such good photographs of so many species. This is one of the few volumes that can serve both as a coffee-table book and a field guide.

CAGAN SEKERCIOGLU, *Biological Sciences and Center for Conservation Biology, Stanford University, Stanford, California*



## AQUATIC SCIENCES

TO TOUCH A WILD DOLPHIN: A JOURNEY OF DISCOVERY WITH THE SEA'S MOST INTELLIGENT CREATURES.

By Rachel Smolker. Anchor Books. New York: Random House. \$26.00 (hardcover); \$14.95 (paper). ix + 274 p + 16 pl; ill.; no index. ISBN: 0-385-49176-X (hc); 0-385-49177-8 (pb). 2001.

This is an adventure story about the discoveries the author made during 15 years of observing bottlenose dolphins at Monkey Mia, Australia. These discoveries include both scientific insights into the social relationships, life history, and intelligence of the dolphins and introspective insights into how the author felt about herself and her fellow humans. Smolker began this adventure because of her romantic ideas about dolphins and her burning desire to "know a dolphin personally" (p 8). She states: "I wanted to put my hand against its skin, look it in the eye, and develop and explore some sort of more personal rapport" (p 8). At Monkey Mia she accomplished this and more. Along with the other researchers, Smolker discovered things were not so romantic. She found that dolphin watching was usually tedious and boring. She

discovered that dolphins were not always those happy, smiling animals we were led to believe they were. Instead, males formed alliances that, at times, forcefully excluded other males and sometimes forced females to stay with their male group and mate with them.

This book is a story, using lay terms and easily understood examples on how scientific research of animal behavior has evolved over the years, how these behaviors could be explained in evolutionary terms, and how they relate to ideas about the intelligence of the species. At the end, the author discusses how and why areas such as Monkey Mia should be preserved to ensure the survival of dolphins and other species that share coastal waters with humans. Overall, this book is fun to read, maybe a bit too sweet, but it still is an entertaining way to learn science.

DEBRA PALKA, *Protected Species Branch, National Marine Fisheries Service, Woods Hole, Massachusetts*

**MARINE BIOLOGY: FUNCTION, BIODIVERSITY, ECOLOGY. Second Edition.**

By Jeffrey S Levinton. Oxford and New York: Oxford University Press. \$72.95. xi + 515 p + 32 pl; ill.; index. ISBN: 0-19-514172-5. [CD-ROM included.] 2001.

Marine biology is a popular subject taught at hundreds of colleges and universities. Despite its popularity, it is a complicated and interdisciplinary science that builds upon wide-ranging aspects of basic biology, ecology, and oceanography. Condensing this enormous field into a single college-level textbook is a tall order, indeed, and many authors have tried, with varying levels of success. Part of the problem in writing such a volume is identifying the target audience. Many textbooks are little more than picture books with additional textual information seemingly included almost as an afterthought. Others probe deeper into the subject matter, but somehow they do not seem capable of capturing the interest of more inquisitive students. Not so with this volume. Levinton has prepared a book that he claims is designed for a one-semester undergraduate course, but which could easily be used at the beginning graduate level. It is jam-packed with a wealth of information, including some 20 fascinating "side-box" essays on current hot topics in marine biology. Complicated subjects are not avoided or significantly watered down—they are skillfully presented and explained with examples.

Being a "university press" product, the author has apparently been given liberties that the big publishing houses do not provide; he is free to explain. The organization and layout of the book

are both interesting and effective, covering the basic principles and processes at work in the ocean's various environments, and the biological communities and organisms themselves. The numerous figures and art work, with color used only sparingly, are very effective, as is the periodic use of text boxes, offset from the main text, which explain principles in greater depth, often with excellent examples. Levinton's new edition is outstanding, and it is probably the most complete and scholarly treatment of the subject available today.

DAVID W TOWNSEND, *Marine Sciences, University of Maine, Orono, Maine*

**DRUGS FROM THE SEA.**

Edited by Nobuhiro Fusetani. Basel (Switzerland) and New York: Karger. \$80.50. vi + 158 p; ill.; author and subject indexes. ISBN: 3-8055-7098-8. 2000.

Aboard the *R/V Atlantis I* wait anxiously for *Alvin's* return from a 4200-meter dive to "Neptune's Beard," a Russian-discovered deep-sea hydrothermal plume; an appropriate venue for writing about *Drugs from the Sea*. Fusetani, from the Aquatic Natural Products Chemistry Laboratory at the University of Tokyo, has gathered ten papers, mostly from the 1997 Naito Conference on Chemical and Biological Basis for the Diversity of Marine Life.

The book is separated into three sections: Discovery, Development, and Production. The four chapters in the Discovery section cover marine microorganisms, microalgae (are they not microorganisms?), marine sponges, and opisthobranch mollusks. The Development section's three chapters discuss conotoxins; KRN7000 (from an Okinawan sponge) and alkaloids from zoanthid anemones. The Production section has three chapters, covering bioactive substances from sponge bacterial symbionts; aquacultural production potential, with two interesting examples using Pacific Ocean bryozoans and Florida Keys ascidians; and, finally, halichondrins, sponge-derived antitumor agents.

Missing from the book, however, are overviews of the three sections. Readers would be helped with answers to many questions that are basic to the book's topic: Where might one look for drugs from the sea? Why should certain environments be targeted for exploration? What are the developmental processes that span from the collector's net to the prescribing physician's pen? Accordingly, three editorial review chapters added to the book would have helped a great deal: First, an overview of the rationale of the drug discovery process, including exploration, extraction, and screening. Second, a description of development and the problems that are attendant to candidate

drugs. Third, a review of production processes and their attendant challenges. Some of these topics are discussed, but not in an integrative manner. Jensen and Fencal mention discovery in their chapter, but focus on microorganisms. Similarly, Olivera approaches expeditionary "discovery" in a nice description of the historical context of snail toxin research and development, including the people and the companies involved. Hart et al. describe some of the "down stream" aspects of the production of halichondrins, including issues of drug supply and delivery.

In summary, the book is a collection of articles that one would expect to find in a scientific specialty journal. As such, the volume does add value to the field, but is not the resource that anyone interested in drugs from the sea would specifically seek.

JOSEPH BONAVENTURA, *Marine Laboratory, Duke University, Beaufort, North Carolina*

BIOLOGY, MANAGEMENT, AND PROTECTION OF NORTH AMERICAN STURGEON. *Based on a symposium held in St. Louis, Missouri, 23–24 August 2000. American Fisheries Society Symposium, Volume 28.*

*Edited by Webster Van Winkle, Paul J Anders, David H Secor, and Douglas A Dixon. Bethesda (Maryland): American Fisheries Society. \$60.00 (paper). xvi + 258 p; ill.; no index. ISBN: 1–888569–36–0. 2002.*

Sturgeon populations throughout the world have declined from historical abundance levels primarily due to overfishing and habitat loss associated with anthropogenic activities. This symposium volume contains 20 articles (1 review, 19 original) that examine short- and long-term studies on habitat use, movement patterns, behavior, protection strategies, and species identification for a variety of North American sturgeon species.

The opening paper, by the editors, provides an excellent review of sturgeon life history, habitat requirements, and restoration strategies (e.g., stock enhancement) in a "what we know and what we do not know" format. This approach synthesizes a large amount of information from a variety of sources (both new material in this volume and other published articles) and various sturgeon species into a single resource. With common population challenges and missing gaps in basic life-history requirements for so many species of sturgeon, this format works well. Another important paper in this volume (by Gross et al.) uses elasticity analysis to evaluate the potential to increase sturgeon population growth rate by improving survival and maturity. This paper shows that three different North American sturgeon species have similar elasticity values for population growth rate and

that early-life survival (as opposed to adult survival with other long lived species; e.g., sea turtles) strongly influences population growth.

Missing in this volume is a position paper that outlines what steps should be taken to preserve and protect North American sturgeons. Throughout the volume, authors of individual papers point out common challenges to the population recovery of various sturgeon species, but a paper that consolidates these issues would have been an excellent addition. Overall, I recommend this book primarily to anyone interested in sturgeon management, although those researching long-lived animal species or populations in peril would also find portions interesting and helpful in their research.

WILLIAM E PINE, III, *North Carolina Cooperative Fish & Wildlife Research Unit, North Carolina State University, Raleigh, North Carolina*

WHIRLING DISEASE: REVIEWS AND CURRENT TOPICS. *Based on a symposium held in Salt Lake City, Utah, 8–9 February 2001. American Fisheries Society Symposium, Volume 29.*

*Edited by Jerri L Bartholomew and J Christopher Wilson. Bethesda (Maryland): American Fisheries Society. \$69.00 (paper). x + 247 p; ill.; no index. ISBN: 1–888569–37–9. 2002.*

MARINE MAMMALS: BIOLOGY AND CONSERVATION.

*Edited by Peter G H Evans and Juan Antonio Raga. New York: Kluwer Academic/Plenum Publishers. \$110.00 (hardcover); \$60.00 (paper). xi + 630 p; ill.; index. ISBN: 0–306–46572–8 (hc); 0–306–46573–6 (pb). 2001.*

This edited volume represents one of four new textbooks on marine mammals to have been published in the past four years. Given this plethora of new works to choose from, one should ask: What is the niche for this particular volume? The editors have successfully defined and filled this niche. The book has two distinctive viewpoints. First, all of the chapters focus on issues relating to conservation. For example, sensory systems are covered because such knowledge is relevant for the later chapters that deal with net entanglement and noise pollution. In contrast, general anatomy and physiology are not covered. The second distinction is that most of the authors are non-U.S. scientists. This provides an often subtle, but refreshing alternative viewpoint to most other recent books on marine mammals. Exemplary of this are the interpretations of the U.S. Marine Mammal Protection Act, arguably the most protective legislation for a taxonomic group that is not uniformly threatened with extinction.

The book is organized into five sections: life history and ecology; sensory systems and behavior; survey and study techniques; health, parasites, and pathogens; and conservation and management. This organization has its logic, but it results in disaggregating some subject matter (for example, sound perception is discussed several hundred pages distant from the chapter on sound and the environment). As with all edited volumes, the writing varies by chapter. Several contributions (such as the ones on population status, environmentalists and fisherman, and the influences of noise) are particularly well written. The inclusion of a discussion on parasites is a welcome addition. Given the great length of this volume, it might serve better as a reference than a textbook. I found it to be an excellent contemporary summary into a wide range of disciplines.

JOHN E HEYNING, *Natural History Museum of Los Angeles County, Los Angeles, California*

#### FISHES OF ALASKA.

By Catherine W Mecklenburg, T Anthony Mecklenburg, and Lyman K Thorsteinson. Bethesda (Maryland): American Fisheries Society. \$129.00. xxxvii + 1037 p; ill.; index of scientific and common names. ISBN: 1-888569-07-7. 2002.

Alaska truly is the "last frontier" of the United States. Detailed, accurate information on its fishes will be but one prerequisite for wise management of Alaska's vast fisheries resources. This volume helps satisfy that need by providing an inventory of the marine, anadromous, and freshwater fishes of Alaska.

A brief introduction describes the environments of Alaskan fishes and summarizes the history of faunal accounts. Most of the book comprises species accounts. Species are listed in a conventional taxonomic classification. Keys to the families and to species within families are an extremely valuable component. Color plates illustrate some species, and every account includes a good line drawing of an adult, a range map within Alaska (with individual observations for rare species), and text. Supplementary illustrations of important characters appear in some family and species accounts.

The book describes the higher taxa, working down from the Agnatha and Gnathostomata to families, and one-page species accounts are grouped within genera. External appearance, habitats, geographic range, and diversity of higher taxa are summarized. Species accounts include scientific and common names, range and habitat, useful characters for identification, important literature citations, a species description, distribution within Alaska, and other information. Checking the

group I know best (Gasterosteidae), a major 1994 book on the threespine stickleback was overlooked. Numerous papers on Alaskan sticklebacks were also omitted, although older, less important papers were cited. Treatment of diversity within the two Alaskan stickleback species was typological and outdated. The genetic and demographic substructure of exploited species is crucial for conservation and management, but the authors did not attempt to cover the vast literature on this subject for some groups (e.g., salmon).

This book will be indispensable for ichthyologists, fisheries biologists, and natural historians working in Alaska or adjacent regions. Judging from the stickleback section, however, the volume is only a starting point for individual species; one must seek the current state of knowledge elsewhere. Nevertheless, this book brings together a vast body of information that will allow readers to identify Alaskan fish species and obtain an introduction to their biology. This volume will be essential for libraries whose users study Alaskan fishes.

MICHAEL A BELL, *Ecology & Evolution, State University of New York, Stony Brook, New York*

#### KILLER WHALES: THE NATURAL HISTORY AND GENEALOGY OF *ORCINUS ORCA* IN BRITISH COLUMBIA AND WASHINGTON. *Second Edition.*

By John K B Ford, Graeme M Ellis, and Kenneth C Balcomb. Vancouver (Canada): UBC Press; Seattle (Washington): University of Washington Press. \$22.50 (paper). 104 p; ill.; no index. ISBN: 0-7748-0800-4 (Canada); 0-295-97958-5 (U.S.). 2000.

This is an unusual book in that it will be an essential addition to the libraries of both laics and every killer whale field researcher on the west coast of Canada. In the early 1970s a brilliant young scientist, the late Michael Bigg, was tasked to count the killer whales of British Columbia. In the course of this work, Bigg discovered that every whale could be individually identified by the shape of its fin and the grey "saddle" patch behind the fin. In this way he arrived at the startling conclusion that there are only a few hundred, not thousands, of killer whales on the entire coast. His work not only warded off overharvesting for marine parks, but introduced a powerful tool that has enhanced whale research worldwide—photo identification.

*Killer Whales* is the result of thousands of photographs taken by many researchers painstakingly pulled together to map the lineage, over three to four generations, of every member of the fish-eating killer whale population in British Columbia. It is an astonishing work and a labor of love by the authors. In addition, this beautiful book, full of

color and black-and-white photographs, describes the cutting edge of killer whale research, in a highly readable format, by three of the world's most prominent cetacean researchers. I would not cast off my lines without this book aboard.

ALEXANDRA MORTON, *Raincoast Research, Simoom Sound, British Columbia, Canada*

#### ECOLOGY OF THE MARINE FISHES OF CUBA.

*Edited by Rodolfo Claro, Kenyon C Lindeman, and Lynne R Parenti. Washington (DC): Smithsonian Institution Press. \$55.00. xv + 253 p; ill.; index. ISBN: 1-56098-985-8. 2001.*

This book is a completely revised and updated English version of *Ecología de Los Peces Marinos de Cuba*, edited by Rodolfo Claro (1994. Cuba: Instituto de Oceanología Academia de Ciencias de Cuba). Although the approach and topics treated have been preserved, the presentation style has been greatly improved, resulting in a book of much better quality that is less than half the size of the original Spanish version. The book is separated into eight chapters. The first chapter provides an excellent introduction to the physical characteristics of the coast of Cuba, complete with maps illustrating the coastline, general circulation patterns, and sediment and habitat types. Chapter 2 introduces the diversity and abundance of fishes by habitat, and includes a reviewed species list for Cuban waters. The next five chapters comprise the core of the book. They summarize what is known of the behavior (primarily spatial and temporal activity patterns), reproduction, trophic biology, growth, and ecophysiology of Cuba's fishes, treating each topic in a separate chapter. Each chapter typically relies on accounts of well-studied species to illustrate concepts, emphasizing differences among taxa and habitats. Because of this approach, the book is packed with data in the form of figures and tables, and most chapters have one or more appendixes that compile large amounts of supplemental data. The massive amount of data is undoubtedly one of the volume's most appealing features. The final chapter, on historical trends and the current status of Cuban fisheries, elaborates on many of the references to localized overfishing that are scattered throughout the book.

There are some minor problems. For example, a lack of information on less commercially important species makes some chapters biased in their treatment, and some figures attempt to present too much information, making them difficult to understand. Nonetheless, *Ecology of the Marine Fishes of Cuba* superbly succeeds in summarizing the current knowledge on the subject. It brings a relatively poorly known literature to a broad audience in a

highly readable, data-rich account, which promises to become an indispensable resource for anyone interested in Caribbean ichthyology.

WINDSOR E. AGUIRRE, *Ecology & Evolution, State University of New York, Stony Brook, New York*

#### WHALES AND DOLPHINS IN QUESTION: THE SMITHSONIAN ANSWER BOOK.

*By James G Mead and Joy P Gold; photographs by Flip Nicklin. Washington (DC): Smithsonian Institution Press. \$55.00 (hardcover); \$24.95 (paper). xvi + 200 p + 8 pl; ill.; taxonomic and subject indexes. ISBN: 1-56098-955-6 (hc); 1-56098-980-7 (pb). 2002.*

This is a generally delightful book, aimed mainly at interested grade and high school students who have "all those" questions about whales and dolphins. The book presents about 150 of these questions, with succinct easy-to-digest commonsense answers from What Are Whales? to How Can Someone Become a Whale Expert? James Mead is a marvelous resource of knowledge on the Order Cetacea, and Joy Gold is a fine writer and editor. The book is well illustrated with photographs by the legendary marine mammal photographer Flip Nicklin. Every photograph is sharp and appealing and their well-constructed legends educate.

The book is stronger on facts about morphology, physiology, life history, and evolution than on behavior and ecology of animals in the wild. I found this latter aspect to be a bit weak, and the information on the marvelous ways we now see animals in nature to be somewhat outdated. Remarkably, a brief bibliography of whales includes references mainly from the 1960s through 1980s, with not a single reference from the 1990s or beyond. Yet, "the best" compilations have been accomplished of late, and we now know tremendously more than we did in those earlier decades of research. I cannot complain about early references (it is good to obtain a sense of history of research), but can complain about the lack of modern information; even the two excellent guides to marine mammals, *Biology of Marine Mammals* (J E Reynolds and S A Rommel. 1999. Washington (DC): Smithsonian Institution Press) and *Conservation and Management of Marine Mammals* (J R Twiss and R R Reeves. 1999. Washington (DC): Smithsonian Institution Press), are, curiously, missing from the list.

Overall, I recommend this little book to eager young people who wish to obtain knowledge of whales and dolphins. But, I would be sure to tell them that this is but one reference among many, and that they need to look elsewhere for more up-to-date knowledge as well.

BERND WÜRSIG, *Marine Biology, Texas A&M University, Galveston, Texas*



## ENVIRONMENTAL SCIENCES

THE LOVE OF NATURE AND THE END OF THE WORLD: THE UNSPOKEN DIMENSIONS OF ENVIRONMENTAL CONCERN.

By Shierry Weber Nicholzen. *Cambridge (Massachusetts): MIT Press.* \$27.95. x + 216 p; name and subject indexes. ISBN: 0-262-14076-4. 2002.

It has become a common refrain in the environmental movement that we protect what we love. Upon this powerful axiom is built the agenda of teaching us to understand, to care about, and thus to treat the more-than-human world with gentleness and respect.

Nicholzen finds the relationship between what we care about and how we live to be of central importance. But she explores its darker side, and its often unacknowledged tensions. We do not, as a matter of fact, consistently protect what we love: we live divided, on the one hand intensely valuing our connection to nonhuman others and, on the other, behaving in destructive ways and accepting with apparent calm the degradation and loss that surrounds us. Her task here is to evoke the reader's own experience of the tension between connection and destruction and ultimately to open the mental and emotional space needed for transformation of self and society.

Nicholzen seeks to deepen our understanding of that personal experience by shedding light on it from multiple, often unfamiliar, always tantalizing sources. The book is perhaps best read as a series of meditations, an exploration of the central question from an impressive range of perspectives: psychoanalysis, aesthetic theory, and environmental philosophy to name only a few. We read the words of Thoreau and Tolstoy and Rilke and Gary Snyder; we listen to a Papago elder, Beethoven, and survivors of Hiroshima and the Holocaust; and we contemplate the paintings of Cézanne. As intended, the primary experience is one of reflection, often in stream-of-consciousness fashion, of flirting briefly with the insights others offer from their own experience of ambiguity and self-contradiction.

Having considered both sides of this complex psychological "coin"—our joy in and appreciation for the multifaceted connection with the natural world that in so many ways grounds our lives and our apathetic acceptance of the loss and isolation that lie at the heart of environmental degradation—poses a most appropriate question: "[H]ow are we to think about our engagement with the process by which the future comes into being" (p

162)? Among her suggestions: we need to understand ourselves as members of groups who collaborate in creating the future; we need to learn from experience and use that learning to meet currently unanswered challenges; and, most importantly, we need to face the truth of our destructive practices, mourn a dying way of life, and transform ourselves and the systems we live within.

Nicholzen argues that we need a mature, experimental hope. She offers this volume as support for the creation of the sort of space we need to think about our complex relationship with the natural world, space in which to become more curious, more attentive, more reflective, and more creative—in short, more engaged in providing leadership in the co-creation of the future. It is a well-conceived task and an intriguing, highly interdisciplinary effort. And it produces a book that bears close and repeated reading, or better yet, reflective experiencing.

PATTI H CLAYTON, *Multidisciplinary Studies, North Carolina State University, Raleigh, North Carolina*

LESSONS FROM AMAZONIA: THE ECOLOGY AND CONSERVATION OF A FRAGMENTED FOREST.

Edited by Richard O Bierregaard, Jr, Claude Gascon, Thomas E Lovejoy, and Rita C G Mesquita; Foreword by Edward O Wilson; Prologue by Eneas Salati. *New Haven (Connecticut): Yale University Press.* \$65.00. xv + 478 p + 13 pl; ill.; index and taxa index. ISBN: 0-300-08483-8. 2001.

This volume details more than 20 years of research on the Biological Diversity of Forest Fragments Project (BDFFP). This study is the world's longest and most comprehensive assessment of the effects of habitat fragmentation on a tropical rainforest. Brazilian law requires developers to leave one-half of the rainforest intact. Taking advantage of this provision, the BDFFP team sampled data in replicated 1-, 10-, and 100-ha plots before and after they became isolated by clearing for new cattle pastures. The original goal of the massive study, which began as the Minimum Critical Size of Ecosystems Project, was to determine the size of the smallest tropical forest patch that could maintain most of the biological diversity found in a continuous forest.

*Lessons from Amazonia* is organized into five parts: fragmentation theory and effects; woody flora; fragmentation effects on plants and animals; conservation applications; and synthesis. Each chapter concludes with a list of several "conservation lessons." The BDFFP has generated 60 graduate theses and 300 scientific papers, which are listed at the end of the volume. The data presented and analyzed here are significant. Some of the 1-ha plots sampled in the study contain more than 300 spe-

cies of trees (dbh > 10 cm), making this area one of the most diverse in the world. Within five years of isolation, small fragments and edges of larger ones showed significant decrease in tree diversity and biomass. Experiments with seedlings found lower survival in these areas as well. Clearings of only 100 m prevented euglossine bees, an important pollinator, from recolonizing patches. Ant following birds and primates also were eliminated in the smaller patches.

What then is the minimal patch size big enough to preserve forest diversity? The authors can offer only a necessarily ambiguous answer to the question of what size is needed to maintain forest structure and function. It depends on the species. For example, some invertebrate taxa were abundant in smaller patches than larger ones. Species that can utilize the surrounding matrix habitat are less affected by isolation. More important than the question of size, BDFPP researchers have demonstrated the pronounced structural and functional changes that occur in forest patches along with the effects of matrix habitat on patches.

There are a few inconsistencies or errors in the volume: precipitation for the study area is cited as 1,900–2,500 mm per year (p 32) and 1,900 to 3,500 per year (p 47); the dry season is either July through September (p 54) or June through October (pp 32 and 47); Chlorotic (p 90) and *Dicranostyles* (p 276) are misspelled; Ultisols and Oxisols are soil orders not great groups (p 292); and the mesocarp of *Socratea* and *Oenocarpus* is mistakenly called an aril (p 319). In addition, a few statements are misleading or erroneous. For example, the editors aver, “[s]imply scattering seeds of species that provide valuable woods, fruits, and oils, for example, under the canopy of the pioneer trees in abandoned pastures can turn these areas into economically productive property” (p 286). This is a gross oversimplification of tropical restoration. Moreover, merely establishing plants that yield useful products, does not guarantee economic success. Arnold and Ruiz-Pérez (2001. *Ecological Economics* 39(3):437–447) showed that the harvesting and sale of nontimber forest products was not financially rewarding, except in a few areas with abundant products and easy access to markets. Elsewhere, a widely cited study (C M Peters, A H Gentry, and R O Mendelsohn. 1989. *Nature* 339:655–656) is misinterpreted. “Estimates for the value of currently used nontimber products found in a Peruvian Amazonian forest can reach up to \$7,000 (U.S.) per hectare” (p 321). The net present value, excluding timber, was closer to \$6,000 in Peters et al. (1989). This value is not the value of the forest products, rather it is the net present value of product extraction.

Nonetheless, these errors detract little from the book’s value. Although not intended as such, the volume could serve as a textbook on tropical forests. The editors describe Philip Fearnside and Niwton Fihlo’s contribution as an “encyclopedic primer on tropical soils.” They are right. All tropical biologists should read this chapter. The lessons from *Lessons from Amazonia* extend far beyond the Amazon. Studies at La Selva (Costa Rica) and Barro Colorado Island (Panama) have dominated neotropical research. Yet, both of these sites are forest fragments. *Lessons from Amazonia* is one of the most significant publications on tropical forests in recent years. It should be on the shelves of anyone interested in tropical biology and conservation.

BRADLEY C BENNETT, *Biological Sciences, Florida International University, Miami, Florida*

THE ECOLOGY OF TREES IN THE TROPICAL RAIN FOREST. *Cambridge Tropical Biology Series.*

By I M Turner. Cambridge and New York: Cambridge University Press. \$80.00. xiv + 298 p; ill.; indexes of scientific names of plants and animals, general index. ISBN: 0–521–80183–4. 2001.

This book tackles the immense subject of the tropical rainforest tree comparative ecology. The book’s chapters roughly follow the life cycle of a tree, with sequential chapters discussing growth, performance, reproductive biology, and seeds and seedling development. The final chapter aims to define some uniform “classificatory systems” in which tropical trees can be categorized based on characteristics such as height at maturity and pioneer or climax habits. Within each chapter, sections generally are initiated with a broad discussion of the issue—not specific to tropical rainforests—and conclude with examples and unifying characteristics, if available, of tropical rainforest trees. Many case studies are presented that provide interesting tidbits and examples of unique adaptations of tropical trees.

The book is well written, organized clearly, and includes many excellent figures redrawn from the literature, as well as extensive tables compiled by the author. Although many of the examples are derived from two stalwart field sites of the tropics (La Selva in Costa Rica and Barro Colorado Island in Panama), Turner incorporates studies from a diverse array of field sites, including many from the Paleotropics. In particular, many studies from Malaysia are cited, as well as those from New Guinea, Australia, Madagascar, and the Ivory Coast.

The book serves as a reminder of how much remains to be studied in tropical ecology. Despite the extensive literature review there are sparse examples for many of the topics discussed. For

example, the section that describes tropical tree population dynamics is based entirely on only two studies with a total of fourteen species, seven of which are palms. In contrast, seedling dispersal and survival probability are discussed very thoroughly and with many examples, presumably due to the large quantity research in tropical forest ecology that was inspired by the Janzen-Connell hypothesis.

Perhaps as a result of the diversity among rainforest trees, much of the book reads as a discussion of general tree ecology, rather than a specific discussion of tropical trees. I was frequently left wondering what characteristics distinguish tropical rainforest trees from other trees. Similarly, many parts of the volume read more like a list of specific case studies than as a synthesis of tropical tree ecology. For example, a ten-page discussion of tropical tree defenses from herbivores lists a wide variety of defensive adaptations and cites many specific examples. There is, however, little discussion of the unifying environmental factors that might lead to reliance on specific defenses, or of differences in the relative frequency of defenses between tropical rainforest trees and trees in other biomes.

Turner concludes the final chapter with a lament that this book has not produced a "new synthesis" of tropical rainforest tree ecology. He observes that scientists "like simple, elegant solutions to problems, but rain forests just do not work that way" (p 247). This book should be an inspiration to ecologists to pursue studies on comparative ecology of tropical trees, and the magnitude of the literature review will certainly provide tropical ecologists with considerable assistance in studying these issues. Perhaps this will help lead to a more synthetic understanding of tropical rainforest tree ecology in the future.

HEATHER THROOP, *Biology, Beloit College, Beloit, Wisconsin*

**TROPICAL FORESTS AND THE HUMAN SPIRIT: JOURNEYS TO THE BRINK OF HOPE.**

By Roger D Stone and Claudia D'Andrea. Berkeley (California): University of California Press. \$50.00 (hardcover); \$19.95 (paper). x + 315 p; ill.; index. ISBN: 0-520-21799-3 (hc); 0-520-23089-2 (pb). 2001.

The title of this volume provides a sense of what the authors of this accolade for community-based forest management apparently tried to accomplish. Advocates of devolution of authority over forests to local communities and opponents of industrial forestry, national governments, and large development projects may judge that they were successful. In contrast, readers who accept that governments

and industry have mostly made a mess of tropical forests, but nevertheless have some reservations about wholesale devolution will be unsatisfied with the superficiality of their treatment of the process. Obviously, communities of forest dwelling people can manage forests if they are permitted to do so, but manage for what? For subsistence use, certainly; for profit in national and international marketplaces, only after overcoming substantial obstacles that were unspecified.

In reading this volume I hoped to learn more about the conditions under which forests can be transformed from poverty traps, or at best, safety nets for the poorest of the poor, into viable livelihood sources for rural communities. Instead, logging is equated with deforestation and industrial loggers are consistently vilified. The few comments about the challenging biophysical basis of sustainable tropical forest management are based on the best science of the 1960s. And the few moderately successful community-based programs in the tropics, from which much has been learned about the challenges of participatory approaches to conservation and development, are presented as almost unmitigated successes. The overview chapters are a bit more balanced, but still this volume has more advocacy than analysis.

FRANCIS E PUTZ, *Botany, University of Florida, Gainesville, Florida*

**PEOPLE AND FORESTS: COMMUNITIES, INSTITUTIONS, AND GOVERNANCE. *Politics, Science, and the Environment.***

Edited by Clark C Gibson, Margaret A McKean, and Elinor Ostrom. Cambridge (Massachusetts): MIT Press. \$55.00 (hardcover); \$22.00 (paper). xxv + 274 p; ill.; index. ISBN: 0-262-07201-7 (hc); 0-262-57137-4 (pb). 2000.

This edited volume focuses on how local groups can and do manage forest resources in the tropics. The primary thesis being explored is that local management offers an important complement (or alternative) to national governmental efforts to curb habitat degradation. The book includes nine chapters and an appendix. Six central chapters present case studies from around the tropics (India, Nepal, Uganda, Bolivia, and Ecuador). Flanking these discussions are two introductory chapters (that review tropical deforestation and the role of local institutions and the socioeconomics of common property) and a final summary chapter. The Appendix presents the guidelines of the International Forestry Resources and Institutions research program, a methodology followed by all the research projects described in the case studies. The results are far from clear-cut, but the

chapters provide ample grist for discussion of the issues.

The intended audience for the book is policy-makers, but the real value will be for graduate-level courses in conservation biology and resource management. My only frustration was that although a spectrum of local management and use of tropical forests is documented, the measures used to assess biotic diversity of managed fragments (and therefore the "health" of the ecosystems) are limited to plants, sometimes only those plants harvested by the local communities. As valuable as this book and the methodology appears to be, future efforts to bring more biological data into the databases and discussions about the status of management of such forest fragments are warranted. The study areas focused on here would be great places to initiate this synthesis.

JOHN BATES, *Zoology, Field Museum of Natural History, Chicago, Illinois*

THE CUTTING EDGE: CONSERVING WILDLIFE IN LOGGED TROPICAL FOREST. *Biology and Resource Management Series.*

*Edited by Robert A Fimbel, Alejandro Grajal, and John G Robinson. New York: Columbia University Press. \$120.00 (hardcover); \$55.00 (paper). xxiv + 808 p; ill.; index. ISBN: 0-231-11454-0 (hc); 0-231-11455-9 (pb). 2001.*

During my work and travels throughout tropical Central and South America, I have had the opportunity to observe, measure, and contemplate the effects of timber harvesting on forest structure and composition. While reading *The Cutting Edge* and writing this review during another visit to eastern Brazilian Amazon, I am doing so among a sea of human activity and with continual landscape change all around me. Logging trucks and sawmills operate in an almost frenzied state. Harvesting of the forest is everywhere it seems and will be everywhere globally, at least according to projections highlighted in this book. Despite the increasing local-, regional- and global-scale demand for timber products, there has been surprisingly little knowledge gained regarding the impacts of logging on tropical forest wildlife. *The Cutting Edge* represents a monumental contribution to our knowledge base on tropical forest logging and its varied effects on mammal, bird, and insect populations, as well as whole ecosystems.

*The Cutting Edge* is an edited volume, with chapter contributions provided by many of the leading scientists in the areas of tropical ecology, land use, and conservation research. This volume is extremely well organized, with seven major parts, each led by a concise summary section that both

orients readers to the forthcoming chapters and stitches the different sections together. This approach results in an easy-to-read book packed with enlightening ideas, summaries of observations collected from around the globe, and suggestions for improved timber harvest management based on a balanced set of ecological criteria.

Part I broadly covers the areas of tropical forest structure, seed dispersal, and regeneration following selective logging. This section is critical to an understanding of the wildlife responses to timber harvest or its management implications, all of which are covered in Parts II through VI of the book. Part II focuses on the direct effects of logging on wildlife, with foci in the areas of primate, ungulate, small mammal, bat, bird, reptile, soil faunal, and aquatic ecology. This is by far the largest section of the book, and it demonstrates the highly varied responses of wildlife populations and communities to logging. Although the different responses are quite apparent, the editors synthesize the information in their summary to highlight important trends in wildlife ecology following timber harvests. Part III focuses explicitly on hunting as a postharvest activity that increases the susceptibility of an ecosystem to "defaunation," as stated by some of the authors in this section. Case studies drawn from Bolivia, Sarawak, and the Congo are employed to highlight the issue of hunting in logged forests. Parts IV and V cover the areas of conservation research and forest management as they relate to logged tropical forests. This is the best compendium and synthesis I have found on these topics, and it provides some important new insight (backed by examples) as to what works and what fails in trying to create a sustainable use of forest resources from both the timber and wildlife viewpoints. Part VI presents several important chapters related to the current and potential incentives for integrating forest management with wildlife conservation. Topics covered range from international carbon dioxide credits to economics. Finally, Part VII is a synopsis of the entire volume—I suggest reading this section first, as it describes in concise yet thorough detail how the issues relating forest management, wildlife conservation, and ecologically based resource use are integral components to any future sustainable use of tropical forests of the world.

This is a "must read" book for anyone interested in tropical forest ecology and management. It is also important for those involved in resource planning, policy, and economic development related to tropical forests. At last, there is a single volume that brings readers up to the present state of knowledge on wildlife responses to logging in the tropics. Yet, this book goes much further by intro-

ducing new concepts and integrated approaches critically needed to create a more sustainable use of tropical forest resources.

GREGORY P ASNER, *Global Ecology, Carnegie Institution of Washington, Stanford, California*

**OAK FOREST ECOSYSTEMS: ECOLOGY AND MANAGEMENT FOR WILDLIFE.**

*Edited by William J McShea and William M Healy. Baltimore (Maryland): Johns Hopkins University Press. \$60.00. xv + 432 p; ill.; index. ISBN: 0-8018-6745-2. 2002.*

The relationship between oaks and wildlife is well established, but an integration of the many current and past studies has been lacking until now. With 500 species worldwide, and about 20 percent of them in North America, oaks are widespread and have significant interactions with many vertebrate wildlife species (over 75 in North America). *Oak Forest Ecosystems* brings together the current state of our knowledge in an edited volume that contains three major parts. The first part focuses on the distribution of oaks, native diseases, disturbance (primarily by fire), and silviculture. These chapters provide the setting for the other sections of the book. Part II defines interactions between acorn ecology and oaks, including a chapter on bird dispersal of acorns and chapters on acorn interactions with mice, squirrel, turkey, bear, and deer. The third part showcases regional oak ecosystems. Although oak ecosystems are more widespread in the eastern United States, they are critically important in the west, and chapters on southwestern and California oaks complement the third chapter on northern Appalachian oaks. This part also provides goals and management guidelines for oak ecosystems.

Many oak species are in an ecological tension zone either between forest and grassland, or in forests that contain associated, more shade-tolerant species. Active management may often be needed to maintain oak dominance, and this book covers the subject well. Of particular value is the discussion of acorn ecology and its relation to wildlife, including nutrients in acorns, variation in mast production by year, and how these affect wildlife. The one disappointment is the lack of coverage of the new canker disease, sudden oak death, which since the mid-1990s has killed substantial numbers of at least three oak species in California and may spread to the oaks of eastern North America.

This volume will be of substantial value to students of oaks and wildlife. Many of the findings for one oak ecosystem will in some way be transferable to other oak ecosystems. McShea and Healy have assembled a well-qualified cast of chapter authors.

The volume presents a unique blend of plant and animal ecology, and will be useful for those working in oak ecosystems around the globe.

JAMES K AGEE, *Forest Resources, University of Washington, Seattle, Washington*

**WILDLIFE RESPONSES TO CLIMATE CHANGE: NORTH AMERICAN CASE STUDIES.**

*Edited by Stephen H Schneider and Terry L Root; Foreword by Mark Van Putten. Washington (DC): Island Press. \$60.00 (hardcover); \$27.50 (paper). xvii + 437 p; ill.; index. ISBN: 1-55963-924-5 (hc); 1-55963-925-3 (pb). 2002.*

In 1997, the National Wildlife Federation provided three-year fellowships to eight graduate students to study the potential impacts of global climate change on U.S. ecosystems. This book is a culmination of that research. According to its editors, the common purpose of the fellowships and book was two-fold: first, to establish a credible scientific link between the health of natural ecosystems and human-induced global climate change and, second, to create a community of young scholars who would be as much interested in the policy components of their work as they were with traditional research. In my opinion, the book falls short on the first objective and should probably have avoided the second.

Arranged as individual research papers with some form of an introduction, literature review, presentation of research methods, results, conclusions, and references, each chapter of the book investigates the likelihood that human-induced global climate change is currently affecting, or may affect, ecosystem species. Along the way, many interesting relationships are presented between the ecosystem species under study and various climate-related variables that seem to support a link between ecosystem change and 20th-century global warming. As such, each author ultimately accepts the conventional wisdom of the United Nations that humans are harming these ecosystems via the carbon dioxide emitted by the burning of fossil fuels and that such harm will only intensify in the future. But, such conclusions are mystifying when one considers the numerous uncertainties presented in each chapter that call into question the credibility of an anthropogenic link. Furthermore, absent the noted uncertainties, each of the observed ecosystem trends could well have resulted from natural *nonanthropogenic*-induced warming, as the Earth simply recovered from the natural—or possibly solar-induced—coldness of the 16th- to 19th-century Little Ice Age.

CRAIG D IDSO, *Center for the Study of Carbon Dioxide and Global Change, Tempe, Arizona*

CHASING THE DRAGON'S TAIL: THE STRUGGLE TO SAVE THAILAND'S WILD CATS.

By Alan Rabinowitz. *Shearwater Books*. Washington (DC): Island Press. \$17.00 (paper). xv + 247 p + 16 pl; ill.; index. ISBN: 1-55963-980-6. [Originally published by Doubleday in 1991.] 2002.

GEOSPHERE-BIOSPHERE INTERACTIONS AND CLIMATE. *Based on a conference held in Vatican City, 9-13 November 1998.*

Edited by Lennart O Bengtsson and Claus U Hammer. Cambridge and New York: Cambridge University Press. \$74.95. xvi + 302 p + 11 pl; ill.; index. ISBN: 0-521-78238-4. 2001.

This book contains contributions to a "study conference" at the Pontifical Academy of Sciences in 1998. The volume includes 18 chapters that range from detailed analyses of the chance discovery of the ozone depletion (Crutzen) to three different treatments of how to meet the challenge of human disruption of global biophysics. Thirteen of the 18 contributors are from Europe, and seven are from Max Planck Institutes. The volume is dedicated to Hans Oeschger, a favorite of all who were fortunate enough to know him.

The contributions span the full range of information and utility, with Fung offering a characteristically comprehensive and confident analysis and interpretation of the climatic disruption. Her papers are always instructive and interesting, and her comprehensive summaries, despite their somewhat dogmatic finality and freedom from the uncertainty that dog so many authors, are admirable. Broecker also contributes a chapter, with his own imaginative and informative diagnosis of the carbon cycle and the role of the oceans, only somewhat more tentatively advanced. Broecker comes to the conclusion that there is no way to escape massive efforts at sequestering carbon dioxide in the oceanic depths, if we are to be successful in avoiding an unacceptable accumulation in the atmosphere. Schneider offers a major analysis of models and modeling as applied to climate, also highly instructive. And Kasting, after putting to rest the idea that the absorption bands of carbon dioxide in the infrared will become saturated and will absorb no more heat, offers insights into paleochemical interpretations of how the Earth got to where it is over a 4.5 billion-year history. The ice-core records are dissected again here by Jouzel. The biogeochemical modelers have yet another unpersuasive field day with putative carbon dioxide stimulation of carbon storage on land, and parallel effects from human expansion of the global nitro-

gen budget. It is a mixed bag, certainly informative and interesting in some quarters; useless, but not harmful in others.

The editors did not use a great deal of discrimination, if any at all, in deciding what to include in this volume, or even in determining the length or substance. Even the format varies; some papers have summaries, and others do not. In the front of the volume readers will encounter a collection of color plates with no captions or other explanation. They are accumulated from all the papers and might normally either be distributed properly throughout the volume or positioned at the end and found through reference in the chapters. But in this volume they make a strange frontispiece that introduces an immediate element of puzzlement as to what they are.

The book offers a wonderful chance for a glimpse of some distinguished scholars and their interpretations of the current biophysical status of the Earth. But it is an expensive investment, and is at least 30% empty words.

GEORGE M WOODWELL, *Woods Hole Research Center, Woods Hole, Massachusetts*

INTERNATIONAL RELATIONS AND GLOBAL CLIMATE CHANGE. *Global Environmental Accord: Strategies for Sustainability and Institutional Innovation.*

Edited by Urs Luterbacher and Dellef F Sprinz. Cambridge (Massachusetts): MIT Press. \$65.00 (hardcover); \$25.00 (paper). x + 343 p; ill.; index. ISBN: 0-262-12240-5 (hc); 0-262-62149-5 (pb). 2001.

Now that climate change is a subject of global concern, how do we arrive at international agreements for mitigating its harmful impacts and how do we ensure that agreements are effectively implemented? This collection of 14 essays highlights current approaches to these questions. It was through the mechanism of international conferences that the idea of climate change was transformed from a scientific question to one of public policy; an institutional framework to pursue it was created; and international agreements such as the Rio Declaration and the Kyoto Protocol were arrived at. As can be expected, the responses of the individual countries are expressions of perceived self-interest as determined by their domestic power structures. An interesting finding is the considerable influence exerted by nongovernmental organizations (NGOs), including environmentalists, trade and business associations, as well as civic and religious organizations. The question of fairness in allocating responsibility for containing climate change is

a major issue. Fairness is not an easily defined criterion because change of climate will redistribute resources among countries, and also among regions within large countries. The amount and type of change that is likely to occur is uncertain. Also, we have to pay attention to equity between rich and poor countries, and between the present and future generations. Two chapters that describe game theoretic and simulation models to analyze possible responses of participants in multistate negotiations provide fresh points of view. There are several articles that address issues related to compliance once an international agreement is reached. The book is intended primarily for students of international relations and policymakers, but could be of interest to environmental scientists. The style of writing is wordy and repetitious, which will make it difficult to maintain focus.

SULTAN HAMEED, *Institute for Terrestrial & Planetary Atmospheres, Marine Sciences Research Center, State University of New York, Stony Brook, New York*

#### ECOLOGY OF DESERT SYSTEMS.

By Walter Whitford; illustrations by Elizabeth Ludwig Wade. San Diego (California): Academic Press. \$74.95. xvi + 343 p; ill.; index. ISBN: 0-12-747261-4. 2002.

The book's 12 chapters summarize the comprehensive experiences and knowledge of a scientist with an extensive research background on a wide variety of physical and biological aspects of desert ecology. Whitford illustrates the facts and concepts presented in the book with his first-hand research experience, drawing most examples from the Chihuahuan Desert of southern New Mexico where he has spent the majority of his career, and with knowledge gained from his visits to Australian and African deserts. Whitford's background is as an ecosystem/landscape level ecologist, and indeed much of the book approaches desert ecology from the "big picture." Whitford also highlights the importance of many smaller scale phenomena—from microsite effects of raindrop splash to seed trap pits and redistribution of seeds by individual seed-eating animals. In this book, I found numerous fascinating facts regarding desert biology about which I was previously unaware. For example, Whitford describes quantitatively how the architecture of branching morphology on desert shrubs plays a major role in determining how much rain that falls on a shrub is channeled directly to deep roots (pp 73–76). Recently, I was intrigued when I first noticed an obvious case of desert termite activity in the Great Basin Desert, but after reading this

book, I now realize the fundamental importance of termites in most desert systems; in various parts of the book, Whitford illustrates their ubiquity, their essential roles in driving many ecosystem processes, and even speculates about their future potential as a protein source in commercial animal feed (in the final chapter, *Desert Ecosystems in the Future*). Many chapters are organized around ecosystem processes, including Wind and Water Processes (Chapter 4), Primary Production (Chapter 7), and Decomposition and Nutrient Cycling (Chapter 9). The final chapters deal with contemporary issues in conservation and sustainable use of deserts, including a much needed call for standardized, effective monitoring and assessment techniques for arid systems (Chapter 11).

Although the author introduces new terms and concepts without assuming that they are familiar to readers, the text requires a reasonable familiarity with ecology, geology, and their associated jargon. Consequently, the book will be useful for an upper-division undergraduate or graduate class in desert ecology, but will generally be beyond the interests of beginning students. Although I generally found the author's diverse research experiences and first-hand accounts to be a strong aspect of this book, I sometimes felt like important research and references from other desert biologists were glossed over or conspicuously missing from the text and literature citations. This was particularly noticeable in the areas with which I was most familiar, where I also found occasional unsupported statements that I believe were incorrect. The volume includes numerous misspellings, omitted words, and other minor distractions such as unbalanced parentheses. Several figures show conceptual flow charts or diagrams that add little to the accompanying discussions. Sometimes, too much complicated, unessential detail is provided to support relatively simple points. For example, the point that plants utilizing different photosynthetic pathways also differ in water use efficiency did not benefit from a preceding paragraph that describes some of the biochemical details of the alternate pathways (p 134).

Despite these few shortcomings, this book presents a holistic view of desert ecology from the perspective of a dedicated scientist and natural historian who has devoted an entire career to understanding deserts. I have no doubt that Whitford's understanding of these seemingly simple, but (in reality) amazingly complex systems is among the most comprehensive in the world community of desert ecologists.

WILLIAM S LONGLAND, *Agricultural Research Service, U.S. Department of Agriculture and University of Nevada, Reno, Nevada*

THE LAGUNA MADRE OF TEXAS AND TAMAULIPAS.  
*Gulf Coast Studies, Volume 2.*

Edited by John W Tunnell, Jr, and Frank W Judd;  
Foreword by Richard C Bartlett. College Station  
(Texas): Texas A&M University Press. \$60.00. xxii  
+ 346 p; ill.; index. ISBN: 1-58544-133-3. 2002.

The Laguna Madre is one of a handful of hypersaline lagoons in the world. The lagoon is long, narrow, very shallow, and relatively pristine with extensive seagrass meadows. There are many features both physical and biological that make this ecosystem unique and interesting. In the early 1990s, the Nature Conservancy took an interest in the lagoon due to mounting human-induced stresses (especially in Texas). This book was written at the request of the Nature Conservancy as a means to gather and organize information and determine the key issues of the Laguna Madre. Amazingly, the book, at the Nature Conservancy's urging, was completed in nine months.

This compendium was written to serve both scientists and nonscientists, but unavoidable use of technical language in some chapters reduces readability for laics. The book is written primarily by three authors, although there is a total of nine contributors. Part I (Overview) provides information on geography, climate, hydrography, lagoon origin and geology, the Tamaulipan biotic province, and ranching heritage. This last topic makes perfect sense as large ranches have had a significant effect on the lagoon largely by limiting development and access. In Part II, Natural Resources, there are chapters on the environment, seagrass meadows, open bay, wind-tidal flats, barrier islands, redheads and other wintering waterfowl, colonial waterbirds and rookery islands, shorebirds and wading birds, sea turtles, and fish and invertebrate fisheries organisms. One topic not well covered is water and sediment quality, which has an obvious influence on the biota of the lagoon. Part III (Special Issues and Concerns) has chapters on red and brown tides, a conservation framework, information gaps and needs, and conservation issues and recommendations.

In the center of the book are 30 pages of good quality color plates showing some of the interesting and important features of the system. One unusual aspect of this book is the list of contacts of researchers and interested parties. Besides contact information, areas of geographic and research or management interest are given for each person.

The book admirably achieves its goal. It will be a valuable resource for anyone interested in this threatened ecosystem.

HUDSON DEYOE, *Biology and Center for Subtropical Studies, University of Texas-Pan American, Edinburg, Texas*

FUNDAMENTOS DE CONSERVACIÓN BIOLÓGICA: PERSPECTIVAS LATINOAMERICANAS.

By Richard Primack, Ricardo Rozzi, Peter Feinsinger, Rodolfo Dirzo, and Francisca Massardo. México: Fondo de Cultura Económica. \$392.25 Pesos. 797 p; ill.; índice de términos. ISBN: 968-16-6428-0. [In Spanish. An adaptation of *Essentials of Conservation Biology*, published in 1998 by Sinauer Associates, Sunderland (Massachusetts).] 2001.

SOIL ECOLOGY.

By Patrick Lavelle and Alister V Spain. Dordrecht and Boston: Kluwer Academic Publishers. \$295.00. xxvii + 654 p; ill.; index. ISBN: 0-7923-7123-2. 2001.

This book provides a compilation of fascinating information about soil environments, soil forming factors, soil organisms, and nutrient cycling. Abundant data tables summarize abiotic and biotic characteristics of soil systems from around the world. This wealth of information is presented in an outline format, with relatively little linkage among sections. Certain topics are more thoroughly developed than others. For example, the book culminates with in-depth discussions of the drilosphere (earthworm galleries) and the termitosphere (zone of influence of termites), but there is no finale to stress the broad ecological relevance of the information and articulate future research needs.

Pedologists, agronomists, ecologists, and advanced students will find this a useful reference; however, the book's encyclopedic format and vocabulary minimizes its suitability as a textbook. The outline style expedites navigation, but there is no conceptual framework to justify the organization and communicate a holistic science. Also, advanced pedological and biological terminology is not always sufficiently defined, and there is no glossary to guide students who are new to this field.

Recent recognition that ecosystems and civilizations rely upon services provided by the functioning of soil systems validates the need for books about soil ecology. The introduction states that this book is designed to provide "a preliminary synthesis that conceptually integrates biological, physical and pedological structures and processes over the broadest range of spatial and temporal scales" (p xxvi). Although this volume brings together a great deal of information spanning a broad range of spatial and temporal scales, it falls short of synthesis and conceptual integration. This shortcoming reflects the fact that the young field of soil ecology is still more of a descriptive than a predictive science. Few of the integrative ecological paradigms developed from aboveground studies have been successfully applied to belowground systems.

Advancement of the field of soil ecology requires a solid understanding of biological, physical, and pedological information and a conceptual framework upon which research hypotheses can be formulated and theory can be built. This book will help advance the field through contributing information, but few concepts.

NANCY COLLINS JOHNSON, *Environmental & Biological Sciences, Northern Arizona University, Flagstaff, Arizona*

TERRESTRIAL ECOREGIONS OF THE INDO-PACIFIC: A CONSERVATION ASSESSMENT.

By *Eric Wikramanayake, Eric Dinerstein, Colby J Loucks, David M Olson, John Morrison, John Lamoreux, Meghan McKnight, and Prashant Hedao; Foreword by Stuart L Pimm. Washington (DC): Island Press. \$85.00 (paper). xxxi + 643 p; ill.; index. ISBN: 1-55963-923-7. 2002.*

Covering an area of more than 4 million km<sup>2</sup> from India to New Guinea and the Solomon Islands, the Indo-Pacific is remarkable for its biotic diversity. Among its biomes are tropical and subtropical moist broadleaf forests; tropical rain forests; tropical coniferous forests; temperate broadleaf forests; tropical, subtropical, and montane grasslands; deserts; and mangrove forests. Neglected freshwater aquatic systems are equally rich. The area can be separated into five main bioregions: Indian subcontinent, Indochina, Sunda Shelf and Philippines, Wallacea (the island belt between Borneo and New Guinea), and New Guinea and Melanesia. With each there are dozens of subregions, of which 140 are identified on the maps by color coding, and all are characterized by centers of endemism. The richness of the area stems not only from its tropical position and climate, but also the Pleistocene speciation processes that broke up the area into segments and, through isolation, accelerated biological diversity.

Today, this floral and faunal wonderland is under siege due to logging and increased human settlement. Satellite imagery produces a very unhappy picture. Whereas a dozen or so years ago there were huge belts of pristine forest, today there are vast cleared areas, or areas planted with oil palm; logging roads extend through the remaining pockets of forest (allowing the entry of settlers), and pockets of smoke reveal accelerated clearing. In Indonesian Borneo (Kalimantan), deforestation over the past decade has increased from about 1.0 million to at least 1.7 million hectares per year.

This magnificent and richly illustrated volume documents each of the regions and summarizes its environment and biota. The degree of threat is identified. A series of splendid introductory essays

discuss the various components, history, and contemporary status of large mammals such as the tiger, three rhinoceros species, and primates. One learns that many of the areas remain little known in terms of various vertebrate groups (e.g., Amphibia), and grossly understudied in the way of plants and insects. In accounts of the individual groups one reads with great interest of the bizarre morphology types (such as gliding frogs). The volume is a huge catalogue, but the essays and amount of supportive material make for easy and fascinating reading. Documentation of the biodiversity features, status, and priority conservation areas provide readers with a unique opportunity to face up to trying to save remaining pockets.

The volume contains a large number of magnificent color maps, illustrations of some important faunal elements, and a huge biogeography that will ensure that this is also an outstanding reference.

ALLEN KEAST, *Biology, Queen's University, Kingston, Ontario, Canada*

MARINE CHEMICAL ECOLOGY. *Marine Science Series. Edited by James B McClintock and Bill J Baker. Boca Raton (Florida): CRC Press. \$99.95. xii + 610 p; ill.; index. ISBN: 0-8493-9064-8. 2001.*

Marine chemical ecology is a diverse field that employs biology, physics, and chemistry to examine the impact of chemical cues on interactions between animals. The field consists of a large body of work, on topics ranging from the molecular identity of chemical signals to patterns of community organization, which the editors attempt to summarize in this recent volume. Although the field itself is not new, McClintock and Baker have made the first serious attempt to cover the various components of marine chemical ecology in a single volume. The book is a solid contribution despite unevenness in the quality and coverage of various aspects of the field.

The volume is organized into four sections that cover background, organismal patterns in chemical ecology, cellular and physiological aspects, and practical applications. This is a valuable organizational scheme that emphasizes both the diversity of subjects in chemical ecology, as well as the connections between the topics that together comprise the field. Some strong chapters, particularly in the second section, highlight the theoretical relevance and underpinnings of chemical ecology and provide critical reviews of recent approaches and controversies. Other chapters are taxon or system-specific summaries on types of interactions and their chemical basis.

Many chapters are, by themselves, authoritative and exhaustively referenced. Taken as a whole,

however, the predominance of the ecology of chemical deterrence and the emphasis on detailing chemical structures has produced a volume that is less diverse than the entire field. Although the evolutionary context is discussed in the first section, the range of topics is eclectic; basic themes such as coevolutionary arms race scenarios and the use of chemistry as a phylogenetic character could be more developed. The chemical ecology of algal gamete attractance is described, yet discussion of pheromonal communication in marine animals is curiously absent. The treatment of consumer-resource interactions is overwhelmingly from the perspective of defenses against predation, whereas little space is devoted to the ecology of chemically-mediated predator attraction. A number of chapters reference the importance of understanding flow and chemical signal structure, yet there is no treatment of this area in spite of burgeoning literature that has made a significant impact on the field.

Overall, the impression created by this book is of a collection of individual contributions (much like a symposium volume). Investigators will find this a useful source for specific aspects of the chemical ecology of given systems, and as a single reference for the vast material devoted to the topic of chemical deterrence.

MARC J WEISSBURG, *Biology, Georgia Institute of Technology, Atlanta, Georgia*

AN ISLANDED NATURE: NATURAL AREA CONSERVATION AND RESTORATION IN WESTERN STATEN ISLAND, INCLUDING THE HARBOR HERONS REGION.

By Peter P Blanchard III, Paul Kerlinger, and Mark J Stein; bird and insect pen-and-ink drawings by Louise Zemaite; photography by Peter Blanchard III, Dwight Hiscano, Scotty Jenkins, Don Riepe, Ken Sherman, and Tom Vezo; botanical illustrations courtesy of The New York Botanical Garden. Published by The Trust for Public Land, New York, and The New York City Audubon Society. \$10.00 (paper). 224 p + 3 separates; ill.; no index. No ISBN. 2001.

This volume has a semirigid cover and glossy paper to support multiple color, black-and-white, and aerial photographs, line drawings of plants and animals, and maps. The illustrations are of such high quality that the book could be placed on a coffee table. But its purpose is of a serious nature, to present the history and rationale for a regional preservation plan of the fragmented nesting and feeding habitats for wading birds (such as herons, egrets, and ibises) in the New York/New Jersey Harbor Estuary urban area. It concentrates on the three roosting islands, and on 20 feeding sites

along the coastal portion and uplands of western Staten Island. Together, these 23 sites comprise 2558 acres of which 71% is still unprotected open space, exposed to residential and industrial development, and to the resulting pollution. Each of these sites is treated in detail in terms of location, size, ownership, zoning classification, current protective/development status, nesting and visiting bird species, past and present vegetation, and human impacts from Native Americans, Old World peoples, and individuals currently immigrating from surrounding regions. It also documents the activities of local environmental groups and agencies, such as the New York City Department of Parks and Recreation.

In one of the appendixes, information is also given for other roosting islands in the Lower Bay, Jamaica Bay, and the East River. Other chapters deal with land conservation, stewardship, and building constituencies. Maps also show extensive upland and freshwater sites in the surrounding region that these birds make use of. In addition, general information is provided in pale green boxes, including how birds feed; vegetative enhancement for nesting; types of wetlands; classification of rare, endangered, threatened species; the chestnut blight; and neotropical songbird migrants.

The book is recommended for use in graduate conservation courses, and as a guide for local environmental and land preservation groups, politicians, and governmental agencies.

JOHN R OPPENHEIMER, *Biology, College of Staten Island, City University of New York, Staten Island, New York*

THE LAKE FOODWEB: MODELLING PREDATION AND ABIOTIC/BIOTIC INTERACTIONS.

By Lars Håkanson and Viktor V Bouillon. Leiden (The Netherlands): Backhuys Publishers. \$101.00. xiv + 344 p; ill.; index. ISBN: 90-5782-110-9. 2002.

This volume presents a comprehensive lake food web model designed to predict the interactions of nine food web compartments using seven driving variables to simulate the functioning of lakes across gradients of productivity, size, depth, and pH, among others. The validation of the model is thoroughly discussed, and the references and appendixes provide useful information, especially from European lakes. The authors also discuss specific applications of the model, such as biomanipulation, lumbering operations, global change, lake liming, and fish farming. The book should be of interest to academics and lake managers who require information regarding the simulation of

lake dynamics or predicting the outcome of management efforts.

The authors have generally avoided the pitfalls of presenting too much detail to be useful or providing an oversimplification that does not realistically simulate general lake dynamics. The model is quite complex, as each driving variable and component impacts nearly every other component, and yet the model can be tailored to a particular system by modifying only a handful of variables.

One drawback is that the model does not capture the complexity of fish diets, as modeled prey fish consume a mix of benthic and planktonic foods, instead of having submodels for planktivores, benthivores, smaller piscivores, and omnivores that may include detritus in their diet. Other investigators may make the same argument for other submodels, depending on their area of specialty. The reason for the simplification is to make the model general and easy to use, and experienced modelers could fine-tune the model to more accurately depict a particular system.

Overall, the authors do a good job of acknowledging the shortcomings of the model, usually where empirical data do not permit further refinements (e.g., macrophytes). This, in turn, points out areas where further research could substantially advance our understanding of the functioning of lake ecosystems.

MAYNARD H. SCHAUS, *Biology, Virginia Wesleyan College, Norfolk/Virginia Beach, Virginia*

ADAPTIVE HERBIVORE ECOLOGY: FROM RESOURCES TO POPULATIONS IN VARIABLE ENVIRONMENTS. *Cambridge Studies in Ecology.*

By R Norman Owen-Smith. *Cambridge and New York: Cambridge University Press.* \$90.00. xvi + 374 p; ill.; index. ISBN: 0-521-81061-2. 2002.

"Although the original task of models was to explain nature, this is the task they perform least well" (E C Pielou. 1981. *QRB* 56(1):17). This statement reflects, in part, concerns about the unnaturalness of the assumptions underlying models designed to explain the functioning of natural systems. The author's own motivation for writing this book stems, in part, from a similar view. To Owen-Smith, the assumptions of near-equilibrium conditions and constant, homogeneous environments fail to reflect ever-changing conditions observed in nature. This criticism is certainly shared by many ecologists in the field and is a welcomed acknowledgment.

In this book Owen-Smith uses a growth, metabolism, and mortality (GMM) metaphysiological approach in an effort to circumvent these prob-

lems and capture the dynamic interactions between herbivores and their temporally and spatially varying plant food resources, focusing on large mammalian herbivores occupying seasonally variable environments (such as African savannas where much of his work has been conducted). The basic goal was to incorporate the functional outcome of lower-level processes (namely adaptive behavior) into higher-level population and community dynamics. This is accomplished by measuring the basic processes governing consumer biomass dynamics: GMM using a metaphysiological approach (which is surprisingly not explicitly defined anywhere in the book). This method treats the population as a metaorganism, wherein biomass dynamics are determined by the rate at which the population consumes resources and the efficiency with which these resources are incorporated into the biomass of the population. From my perspective, the overall exciting outcome of these modeling efforts highlights how adaptive behavior allows herbivores to cope with variable environmental conditions: "[p]ersistence . . . depends crucially on adaptive steering to dodge the pitfalls and traverse seasonal ravines" (p 345).

The book is separated into 14 chapters. The first two discuss the conceptual issues and modeling approaches used throughout the book, the next four cover the ecology of resource use by herbivores, which is followed by four additional chapters that link resources to the dynamics of populations, and three that apply the GMM model to specific problems in resource conservation (the assessment of habitat suitability, species coexistence, and population instability). The final chapter summarizes and discusses what has been achieved and the problems that need to be addressed.

Overall, this volume is well written, with a list of modeling acronyms and symbols in the front of the book that I found particularly useful as a quick reference. It was a bit of a tedious read due to the level of detail, the somewhat artificial breakdown of topics by chapter (particularly the resource ecology of herbivores), and the nature of models in general. Because of the amount of detailed discussion it was often difficult to see the forest for the trees. The overviews at the end of each chapter, however, were helpful in maintaining focus. In my opinion there is not enough data or conceptual ideas in most of the chapters for a graduate seminar, but I would recommend this book to graduate students and researchers interested in modeling the dynamics of large mammalian herbivores and their food resources under seasonally varying environments.

KEN N PAIGE, *Integrative Biology, University of Illinois, Urbana, Illinois*

DIFFUSION AND ECOLOGICAL PROBLEMS: MODERN PERSPECTIVES. *Second Edition. Interdisciplinary Applied Mathematics, Volume 14.*

By Akira Okubo and Simon A Levin. New York: Springer. \$64.95. xx + 467 p; ill.; author and subject indexes. ISBN: 0-387-98676-6. 2001.

In late 1971 while completing my graduate studies, I responded to an advertisement in the *Vancouver Sun* for a "marine mathematician" at the Bedford Institute of Oceanography in Halifax, Canada. Several months after my arrival, a scientist in another group told me that they planned to hire someone named Akira Okubo, but that they had to hire me because I am a Canadian. Looking back today, after coauthoring a paper with Akira and spending too brief a time with him, I might claim that had Okubo come to Halifax (instead of me), he might not have met Simon Levin, and neither the first English edition of his monograph nor this second edition would have been published. The original monograph, published in 1980, became a standard reference for a generation of mathematical ecologists.

For me, it seems logical that the mathematics of diffusion can be applied to chemicals and passive organisms such as spores and phytoplankton, but applying such ideas to swarming by locusts, schooling of fish, migration of green turtles, and even to herds of elephants was an inspiration. Okubo did inspire many colleagues and students by both his intellect and quiet free spirit. An issue of *Oceanography* (1999) was dedicated to his personality and work. This book, coauthored with Simon Levin, is no less a dedication to the memory of Akira Okubo. He had planned to write a second edition and before his death left many notes to himself, which his friend, the late Keiko Parker, assembled and forwarded to Simon Levin. Simon enlisted 11 colleagues and friends of Okubo to revise the book chapter by chapter according to his notes. Even without this background, the resulting book is destined to become a standard reference for the next generation of mathematical ecologists. But it is a more meaningful book for its history. This is a lasting tribute both to the scholarship and spirit of Akira Okubo, and to the loyalty, scholarship, and leadership of Simon Levin.

KENNETH L DENMAN, *Institute of Ocean Sciences, University of Victoria, Victoria, British Columbia, Canada*

ECOLOGY, ENGINEERING, AND MANAGEMENT: RECONCILING ECOSYSTEM REHABILITATION AND SERVICE RELIABILITY.

By Michel J G van Eeten and Emery Roe. Oxford and New York: Oxford University Press. \$50.00. x + 268 p; ill.; index. ISBN: 0-19-513968-2. 2002.

Paradigms of ecosystem management have sat at the fore of debate in conservation biology with varying regularity. No matter how it is defined, eco-

system management is generally fraught with paradoxes—biological, socioeconomic, and otherwise. In this volume, van Eeten and Roe distill the problems associated with ecosystem management to a central paradox—that between ecosystem functions and services—and elucidate a general, if complicated, paradigm for its resolution, and for programmatically accommodating the strange but necessary bedfellows of ecology and engineering. The authors are quite explicit in providing examples for their terms, most notably for ecosystem functions, criteria for which have eluded many previous authors. In so doing, van Eeten and Roe attempt to lay the groundwork for a decidedly policy-oriented approach aimed at identifying the kinds of management-related options desirable, available, and feasible in a given situation. Drawing on examples from three complex case studies in ecosystem management—the San Francisco Bay Delta, the Columbia River Basin, and the Everglades—the book serves its purpose reasonably well, clearly explicating the means, terms, and conditions desirable for the coupling, decoupling, and recoupling (CDR) of ecosystem functions and services in the complex organizational milieu of managing large natural areas, while addressing the responsibilities of multiple agencies and the pressures of multiple economic demands.

Following the introductory chapters, the authors set about framing their discussion in two carefully organized chapters, where the intricacies of adaptive management and management regimes are explored in considerable conceptual detail, and two chapters in which the dynamic of coupling, decoupling, and recoupling of ecosystem functions and services under various management umbrellas is introduced. This loose paradigm surfaces as a theme in each of the three primary case studies. In their final chapter, van Eeten and Roe describe a case study from the western Netherlands as an example of a paradox resolved.

The central shortcoming of *Ecology, Engineering, and Management* (and this will no doubt be seen as reflecting my professional bias) is the fact that the broader issues and problems facing biological conservation may come across as somewhat summarily treated, most frequently by the oversimplified characterization as comprising the protection of federally protected species and problems identified with the Endangered Species Act. Although such problems do indeed exist, the authors may have missed an opportunity to address the related importance of linking abstract ecosystem functions to species and populations, and identifying organismal criteria for adaptive management. Discussion of the CDR dynamic, which forms the book's central message, is largely restricted to functions and

services, thus disregarding the needs of wildlife and natural areas with no recognized or immediate service potential. I would hope that nonbiologists reading this volume will not be left with the impression that the needs of biodiversity can be met exclusively by the protection of putative umbrella or keystone species or, worse, abstract measures of ecosystem function. Nevertheless, the authors are careful to address several of the conceptual pitfalls in ecosystem management (e.g., delineation of the ecosystem) and in such cases the fact that they do so in a biomanagement-related context is an important bonus.

Although the book is rather laden with jargon (a glossary would have been helpful), and the writing varies with respect to style and clarity, this is a well-referenced volume in which patient readers will find conceptual anchors for problems in seemingly unnavigable organizational and programmatic waters. The authors have been careful to emphasize the importance of the collaboration among biologists, engineers, and policymakers, despite professional language barriers. Occasionally, it seems as though the authors risk falling into this very trap with respect to their usage of words such as "management" in an organizational rather than biological or ecological context. That being said, this volume provides reasonable guidelines for interorganizational structuring and cooperation, provided that conservation organizations, governmental bodies, and other stakeholders are interested in cooperating.

PAUL Z GOLDSTEIN, *Zoology, Field Museum of Natural History, Chicago, Illinois*



## NEURAL SCIENCES

THE COGNITIVE NEUROSCIENCE OF CONSCIOUSNESS. *COGNITION Special Issues.*

*Edited by Stanislas Dehaene. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$40.00 (paper). v + 243 p; ill.; index. ISBN: 0-262-54131-9. [Reprinted from COGNITION: International Journal of Cognitive Science, Volume 79, Numbers 1-2, April 2001.] 2001.*

The eight chapters that comprise this volume have the format and substance of articles in a professional scientific or scholarly journal. The book originated as a special issue of *COGNITION: An International Journal of Cognitive Science*. The issue is special in that it is supposed to be "readily accessible" (p ii), and in that the authors had access to one

another's contributions before publication, and therefore were able to include a response to them.

The first six chapters are by neuroscientists who report on research and theoretical models of brain organization and dynamics supported or suggested by it. Much of the work concerns the localization of brain areas underlying visual awareness. Evidence from patients with parietal brain damage, ingenious experiments on the conscious and unconscious perceptual performances of monkeys and people, and the use of brain imaging and evoked potential technology have built up a picture involving both precise localization and diffuse connectivity. Particular areas have been shown to be necessary to specific kinds of awareness, such as conscious recognition of faces, but not sufficient in the absence of connection to numerous sites elsewhere.

As a consequence, the old assumption that consciousness is seated in a single center in the brain has had to be abandoned in favor of some kind of "global workspace" theory (p 14). As Stanislas Dehaene and Lionel Naccache note in the first chapter: "An information [*sic*] becomes conscious . . . if the neural population that represents it is mobilized by top-down attentional amplification into a brain-scale state of coherent activity that involves many neurons distributed throughout the brain . . . this global availability of information through the workspace is what we subjectively experience as a conscious state" (p 1).

There are differences of opinion about the nature of this combination of modularity and holism, and about the relative merits of introspective reports and objective indices of awareness as sources of scientific evidence. Such differences are taken up by Ned Block, one of two philosophers who contribute the final two chapters (the other is Daniel Dennett). Block maintains that two perspectives are represented here: a functionalist view according to which "[c]onsciousness is defined as global accessibility" (p 204), and a physicalist view that identifies consciousness with a "biological property that fills or implements or realizes" the role of accessing global availability (p 203). He also thinks that three different concepts of consciousness need to be distinguished to avoid paradox and cross-purposes: phenomenality, or first person subjective experience; access consciousness, which corresponds to the concept applying in the global workspace models; and reflexive consciousness, an introspective state of being conscious about being conscious.

Dennett takes issue with Block. He argues for the functionalist position that global accessibility itself constitutes consciousness, not the cause of a separate state of subjective awareness, and that this dissolves the confusions canvassed by Block. Dennett recycles his metaphor of consciousness as "fame in

the brain" or "cerebral celebrity" (p 224) as a means of reducing the so-called Hard Problem of consciousness to tractable terms. By functionally analyzing the phenomena of subjective awareness into "complex dispositional traits distributed in space and time in the brain" (p 236), he concludes that the mystery attaching to them is dispelled and can be left to those who prefer perplexity to perplexity.

Despite expressions of confidence in a converging consensus on how to explain consciousness, this book is an interim report on work in progress rather than a taking stock of achieved goals. And, despite the claim that the volumes in this series are readily accessible, readers who lack a background in cognitive science will find some rough going, which will not be helped by a spattering of typographical errors and a perfunctory index. Nevertheless, the effort will be worthwhile. The book presents a fascinating sampling of recent research in the cognitive neuroscience of consciousness, and philosophical perspectives to which it relates.

COLIN BEER, *Psychology, Rutgers University, Newark, New Jersey*

CENTRAL NEURAL STATES RELATING SEX AND PAIN. *Advances in Systems Neuroscience and Behavioral Physiology*.

By Richard J Bodnar, Kathryn Commons, and Donald W Pfaff. Baltimore (Maryland): Johns Hopkins University Press. \$64.95. xiii + 258 p; ill.; index. ISBN: 0-8018-6827-0. 2002.

As the authors claim, this book was born of an opportunity and desire to unite two major sets of neurobiological data, both of which are of basic experimental and practical clinical importance. Hence, they deal in steroid effects on behavior and neural controls over pain. They argue that central nervous system (CNS) states of arousal and motivation can be heightened by sexually-related stimuli, as well as by painful stimuli, and these states influence the production of both responses to sexual behavior (to facilitate them) and responses to pain (to reduce them). They set out to show that these close relations are fostered by an overlap between two sets of neuroanatomical pathways and mechanisms; and damping of pain responses permits sexual responses to proceed normally. The operations of the ascending arousal system and the descending controls that subservise these functions are described in detail, together with the hormonal controls and the behavioral changes, both with respect to sex and nociception that are involved.

The reduction of nociceptor responses by the female rodent accompanies lordosis permitting insemination and is shown to be critically related

to hormonal controls. Ordinarily, adult animals that are prey in nature must maintain a distance from contact with other creatures for safety's sake. The changes the authors describe follow from the need to make an exception for the purpose of reproduction.

The authors' argument commences with a chapter on the requirement for concepts of motivational states and thereafter proceeds through a long account of the relevant ascending arousal systems and further detailed review of descending systems, with particular respect to the importance of opioid peptides and analgesia that is produced. A final short chapter deals with inferences and arguments.

The bulk of the book demonstrates detailed information for specialist behavioral scientists or physiologists. The clinical relevance is emphasized by the authors, but is only briefly discussed. The greater part of the text is likely to be of substantial interest to basic scientists, but only to a few clinicians. Anyone looking for illumination of clinical phenomena from basic material will find this to be an important, even exciting, contribution.

HAROLD MERSKEY, *Psychiatry, University of Western Ontario, London, Ontario, Canada*

PROBABILISTIC MODELS OF THE BRAIN: PERCEPTION AND NEURAL FUNCTION. *Neural Information Processing Series*.

Edited by Rajesh P N Rao, Bruno A Olshausen, and Michael S Lewicki. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$50.00. x + 324 p; ill.; index. ISBN: 0-262-18224-6. 2002.

Brain modeling has gone through a series of stages. Early connectionist models of Pavlov and his contemporaries, positing direct connections between sensory and motor areas, gave way to vague box models, then to parallel distributed processing models that promised not only to simulate everything, but to organize themselves. It has not worked out that way. Now, finally, modeling is reaching maturity. The cycles of enthusiasm and disillusionment with particular designs are giving way to models constructed on the basis of principles and standards approved by consensus. They meet not only requirements of fitting the data, but also of biological applicability and a host of architectural constraints.

In such a maturing environment, it seems inevitable that probabilistic models should increase in prominence, because much of what the brain does is guesswork. For example, in perception the brain begins with a set of expectations, picks up hints from the environment, and arrives at a conclusion. These three steps fit naturally into Bayesian mod-

els; the expectations are the Bayesian prior probability, the hints from the environment constitute the likelihood function, and the conclusion is the posterior probability. Bayes's theorem then states that the posterior probability is just the product of the prior and the likelihood function. Chapter 1 applies these ideas to perception with workable strategies for optimizing the brain's guesses about what is in the world. The first half of the book is concerned with perceptual models at this level.

Neural models, all the way down to the analysis of spike trains in single neurons, fill the remainder of the book. The seemingly random nature of the microstructure of action potential sequences has been a puzzle since the discovery of the potentials—the broad strokes of activation and inhibition seem clear, but the data are always “noisy,” with unexplained variations in the microstructure. Probabilistic models step in here to order the chaos, showing how probabilities of firing, rather than deterministic triggers of spikes, can reproduce the stochastic characteristics of neural behavior in astonishing detail.

*Probabilistic Models of the Brain* gives a thorough review of the range and power of models at levels from the behavioral to the microscopic, in well-written, carefully selected descriptions. Knowledge of matrix algebra and probability theory is helpful in interpreting the mathematics, but even those whose eyes glaze over at formulas will benefit from this summary of the state of the art in brain modeling.

BRUCE BRIDGEMAN, *Psychology, University of California, Santa Cruz, California*

**THE NEURAL SIMULATION LANGUAGE: A SYSTEM FOR BRAIN MODELING.**

By Alfredo Weitzenfeld, Michael Arbib, and Amanda Alexander. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$55.00 (paper). xix + 439 p; ill.; index. ISBN: 0-262-73149-5. 2002.

**NEUROTRANSMITTERS AND NEUROMODULATORS: HANDBOOK OF RECEPTORS AND BIOLOGICAL EFFECTS.**

By Oliver von Bohlen und Halbach and Rolf Dermietzel; language editing by David J Ballantyne. Weinheim (Germany): Wiley-VCH Verlag GmbH. \$75.00. viii + 285 p; ill.; index. ISBN: 3-527-30318-9. 2002.

This volume is intended to serve as a convenient handbook of neurotransmitters and neuromodulators. In light of the range of neuroactive substances that have been identified this is an ambitious goal, particularly when the book is simultaneously tar-

geted to students, teachers, and researchers. It is successful, in that it provides a concise summary of a wide range of substances, but as the authors admit, the format gives little room for discussion or explanation.

Substances are dealt with as either neurotransmitters or neuromodulators. As the individual entries make clear, this distinction is blurred at best. The effect of any substance reflects the postsynaptic receptor it activates, rather than the nature of the substance released. For example, the “classical” neurotransmitters acetylcholine, glutamate, and GABA can all act as neuromodulators by acting on G protein coupled receptors, while biogenic amines, included here as neurotransmitters, are often associated with slow G protein mediated modulatory effects. In contrast, purines, which are included in the neuromodulator section, can elicit fast neurotransmitter-like responses. Criticism of this sort is not confined to this volume; textbooks and articles often present a dichotomy between substances instead of between effects. A discussion of the dual nature of most neuroactive substances and the removal of separate transmitter and modulator sections would eliminate this potentially confusing categorization. This would not necessarily change the format of the book, since the substances have to be arranged in some sort of order, and it, of course, does not affect the information given on each substance.

This is potentially useful as a laboratory handbook, but in this capacity it would benefit from a more extensive and, in particular, updated bibliography. Approximately two-thirds of the references are prior to 1995. The book could serve as a resource for advanced students, although more discussion would be welcome.

DAVID PARKER, *Zoology, University of Cambridge, Cambridge, United Kingdom*

**NEUROSCIENCE: A MATHEMATICAL PRIMER.**

By Alwyn Scott. New York: Springer. \$99.00 (hardcover); \$49.95 (paper). xx + 352 p; ill.; index. ISBN: 0-387-95403-1 (hc); 0-387-95402-3 (pb). 2002.

This book covers several topics in theoretical neuroscience in a way that is accessible to most mathematicians. The main topics are the propagation of action potentials on excitable axons and their interactions.

The book consists of 12 chapters and several mathematical appendixes that cover related material. It is not clear to whom the book is intended. There are no exercises, so it could not be used as a textbook. The material contained in the volume focuses on areas that have not been actively pur-

sued in the last two decades. Chapter 1 begins with a short history of neuroscience, the organization of the brain, and a brief note on excitability of axons. Chapter 2 describes the basic structure of neurons and discusses some very old models, including a rather dated “multiplex” neuron. I would guess that the original motivation for these simplified models came from the lack of fast, accessible computers. These days, such models are generally of historical interest only. Chapter 3 contains a standard discussion of the Nernst equation and passive membrane properties (resistance and capacitance). The Hodgkin-Huxley theory of voltage gated channels is described in Chapter 4. No other channel types or models of such channels are described in the book. Readers will have to go to other sources to get the actual equations for the channels and gates. The author describes a numerical shooting method for finding the traveling pulse. Chapter 5 continues with the traveling pulse equations, proceeding in the standard manner of breaking the solution into fast and slow parts. The fast equations are solved using a phase-plane method.

In Chapter 6, several simplified versions of the nerve axon equations are analyzed. Discussions of existence and stability are provided, although none of the beautiful and deep theory developed by Evans is described. The theory for propagation and saltatory conduction in myelinated axons is developed in Chapter 7. The author makes a case for the importance of ephaptic conduction between two neighboring axons in Chapter 8. The idea is that two nearby axons can be coupled through the extracellular medium and, thus, spikes in neighboring axons may interact. The linear theory for dendrites is covered in detail in Chapter 9. Interesting nonlinearities due to shunts in the cable are discussed and, at the end of this chapter, the author provides a list of outstanding research problems. A few examples of neural networks (McCulloch-Pitts, feedforward, and some continuous models) are briefly described in Chapter 10, but there are no applications of these to any interesting problems. The following chapter discusses the idea of cell assemblies as put forward by Donald Hebb. Again, there are no applications of the theory or any computational explorations. The only theory explored in this chapter is the analysis of a simple competitive system based on Lotka-Volterra equations. The book concludes with some philosophical discussions of causality and the neural bases of emotions. In sum, it is a clearly written book covering material that is of primarily historical interest.

BARD ERMENTROUT, *Mathematics, University of Pittsburgh, Pittsburgh, Pennsylvania*



## BEHAVIOR

ALTRUISTICALLY INCLINED?: THE BEHAVIORAL SCIENCES, EVOLUTIONARY THEORY, AND THE ORIGINS OF RECIPROCITY. *Economics, Cognition, and Society.*

By Alexander J Field. Ann Arbor (Michigan): University of Michigan Press. \$54.50. xvi + 373 p; ill.; index. ISBN: 0-472-11224-4. 2001.

In this volume, the author, an economist, sets out to explain why humans are so much nicer than rational choice theory says they should be. For example, why do people cooperate in one-shot Prisoner's Dilemmas when a rational chooser would certainly defect? And how could a tendency to cooperate have established itself in a world of defectors?

The biologist's answer is simple: people are not rational choosers. In evolutionary theory, *natural selection*, not the individual, plays the role of rational chooser. Natural selection “chooses” between alternative designs of organisms; and selection evidently favored a “Tit-for-Tat” design in the context of repeated Prisoner's Dilemmas (see R M Axelrod. 1984. *The Evolution of Cooperation*. New York: Basic Books). Given that such designs do not always work perfectly in novel contexts, it should come as no surprise that a veteran cooperator such as *Homo sapiens* is insensitive to artificial, laboratory conditions of anonymity and one-shotness, and open with a “nice” move.

A lone cooperator is a vulnerable creature; and so how did this cooperative tendency get off the ground in the first place? The biologist has several nonexclusive answers. Perhaps a mutant cooperator was clustered with its cooperative offspring. Perhaps reciprocity was a cue of (distant) kinship. Perhaps mutualism shaded into reciprocity via small increases in the time-lag between rounds of mutual benefit—from milliseconds, to minutes, to months. Perhaps the attention to reputation and the punishment of infractions that are common in dominance hierarchies were deployed, more benignly, to maintain reciprocal schemes. Any combination of routes provides ample “preadaptations” for full-blown reciprocity. Problems solved.

The economist's answer is less straightforward. Along with other economic migrants to evolutionary theory, Field assumes that the *individual* is the rational chooser, fitness maximizer, or unit of selection. He correctly deduces that this *creates* the “problem of altruism,” but he then incorrectly concludes that this problem can be solved only by group selection. Field does not consider any of the

alternative routes to reciprocity. And the author's sole evidence of group selection in our species' past is our current tendency to cooperate in one-shot dilemmas; he does not present any independent evidence that the "right conditions" for group selection were present during human evolution. His defense of group selection therefore carries little weight.

A book on this topic could have provided a much-needed overview of the emerging synthesis of evolutionary psychology and behavioral economics. Unfortunately, this volume is skewed toward promoting group selection, and its structure is dizzyingly repetitive. Interested readers are advised to turn instead to Robert Frank's *Passions within Reason: The Strategic Role of the Emotions* (1988. New York: Norton).

OLIVER CURRY, *Government, London School of Economics, London, United Kingdom*

#### SEXUAL SELECTIONS: WHAT WE CAN AND CAN'T LEARN ABOUT SEX FROM ANIMALS.

By Marlene Zuk. Berkeley (California): University of California Press. \$24.95. xi + 239 p; ill.; index. ISBN: 0-520-21974-0. 2002.

Does the study of animal behavior tell us about human sex roles, or is it unintentionally the other way around? In her new book, Zuk addresses the relationship between feminism and behavioral ecology, particularly the study of sexual selection. It advances two main themes. First, that human understanding of animal behavior can be distorted by our cultural biases, especially sexual stereotypes. Second, that the behavioral diversity of animals should be appreciated for its own sake, not just for what it can ostensibly teach us about ourselves (i.e., sometimes a duck is just a duck, not a role model).

The 12 chapters are separated into three parts. Part One reviews how human-based sexual stereotypes (e.g., males are aggressors, females are passive, selfless mothers) can prevent us from objectively seeing how animals behave. In this section and elsewhere, Zuk also argues against using the behavior of nonhuman animals as justification for human behavior and political agendas, including "ecofeminism." Part Two deals with biases associated with the lingering concept of the *scala naturae*, the Aristotelian chain of being from "higher" to "lower" forms of life, with humans (of course) at the top. Part Three consists of four chapters, each addressing a different aspect of human biology—female orgasm, menstruation, homosexuality, and putative differences in spatial ability between males and females. Zuk discusses how these traits might have evolved, and how tradi-

tional gender biases have impeded the study of these topics.

The book is easy to read, insightful, and frequently very funny. Overall, Zuk makes a valuable contribution by showing how sexism can stand in the way of doing good science in behavioral ecology and evolutionary biology (even if not every example is compelling). For this reason, *Sexual Selections* should be essential reading for scientists and students in the field of behavioral ecology. Zuk's book seems accessible for nonspecialists as well, and includes a good introduction to some basic evolutionary concepts. For all readers, it offers a plethora of fascinating, natural history stories, as it exposes many myths about animal behavior, human sexuality, and the putative conflicts between science and feminism.

JOHN J WIENS, *Amphibians & Reptiles, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania* and MOLLY R MORRIS, *Biological Sciences, Ohio University, Athens, Ohio*



#### HUMAN BIOLOGY & HEALTH

##### SCOURGE: THE ONCE AND FUTURE THREAT OF SMALLPOX.

By Jonathan B Tucker. New York: Atlantic Monthly Press. \$26.00. vii + 291 p; index. ISBN: 0-87113-830-1. 2001.

With the current public concern over the potential use of smallpox as a biological weapon, this recent book is a most timely addition to the literature on this disease's history. Using journalistic jargon rather than the traditional academic format, the author traces the impact of smallpox on previous societies up through the current threats to world health.

Tucker briefly reviews the history of smallpox in the ancient civilizations of Egypt, Mesopotamia, India, and China. His main interest, however, is discussing how this disease has been used as a biological weapon, from the French and Indian War through today. Coverage of the pre-World War II history of smallpox is very limited, and Tucker fails to cite some of the standard secondary sources for this earlier period, such as John Blake's major study on smallpox variolation in 1721 Boston and Genevieve Miller's classic work, *The Adoption of Innoculation for Smallpox in England and France* (1957. Philadelphia (PA): University of Pennsylvania Press). After this superficial treatment of earlier smallpox epidemics, Tucker spends the vast major-

ity of his book on the two stories he really wants to tell: the fascinating account of the efforts of the World Health Organization (WHO) during the 1960s through 1980 to eradicate smallpox, and the terrifying specter of the Soviet effort to use this disease as an effective, massive biological weapon. These well-told stories are both the strength and weakness of this volume.

In relating the successful WHO attempts to stop the global threat of smallpox, Tucker introduces readers to Donald Henderson, who was the driving force behind the WHO's antismallpox crusade. Probably the book's major value is tracing the events, country by country, that lead to the May 8, 1980 announcement proclaiming a final victory over smallpox. The WHO operatives had to overcome such major obstacles as political instability, severe weather, terrible overcrowding, and local religious beliefs to achieve what they thought was a final victory over this disease.

Tucker's second story, and his book's main focus, examines in great detail how the Soviets, beginning in the late 1940s, worked ceaselessly to develop biological weapons, including specific strains of smallpox. This section is a continuation of the author's previous writings on ongoing biological and chemical terrorists' threats—*Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons* (2000. Cambridge (MA): MIT Press). Written from the viewpoint of an old Cold War Warrior, this section reveals the secret Siberian laboratory and the Soviet infrastructure that ran the covert biological weapons research for decades and into the 1990s. Tucker relies heavily on the accounts by Kanatjan Alilskov, a leading scientist in this clandestine research who defected to the U.S. in 1992. Tucker's message is clear: the Soviets could not and still cannot be trusted in the area of biological weapons.

Although not challenging Tucker's accuracy, there are several points that differentiate his book from mainstream history of medicine scholarship. First, while using numerous direct quotes in the text, the author fails to clearly footnote his sources, leaving readers to guess where the quotes originated. Secondly, Tucker's writing style more closely resembles Tom Clancey's than a traditional historical volume. Statements such as "[h]aving read the tea leaves" (p 223), and "[s]mallpox was such a repulsive, awful disease that it made Brilliant angry at God" (p 101) appear throughout this volume.

Despite these criticisms, Tucker's book is a contribution to both the history of smallpox and bioterrorism. His coverage of the WHO's successful smallpox eradication campaign is very useful. Whether one accepts his anti-Soviet agenda totally, Tucker's concluding warnings that the U.S. needs

to be part of an international health initiative to protect itself from both biological terrorism and the natural threat of global infectious diseases is an important message to take from this volume.

JONATHON ERLÉN, *Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pennsylvania*

#### MANAGING THE HUMAN ANIMAL.

By Nigel Nicholson. London and New York: Texere. £18.99. ix + 310 p; ill.; index. ISBN: 1-58799-031-8. [First published in the United States in 2000 by Crown Publishers, New York.] 2000.

The author introduces aspects of Evolutionary Psychology (EP)—a view of psychology that takes the mind as designed and constrained by natural selection—to business managers interested in questions of what makes good leadership in good organizations. The book is not intended to be scholarly, although the endnotes and references make it more usable by scholars than most practitioner-oriented management books. Even with the warning that it is not a scholarly book, biologists might find themselves shocked by other aspects, if they are not familiar with the genre. In most sciences giving specific practical recommendations based on the most preliminary science is discouraged; in management, such speculation is positively encouraged, both in the popular literature and in leading academic journals. So although readers might be horrified by what they see, the good news (for Nicholson) and the bad news (for the field of management) is that this book is better than most in this regard.

Much of the volume is useful for its intended audience, giving insight into things such as the role of gossip in organizations (Chapter 7), taking an increased understanding from the social psychologists who study such things from an evolutionary/functional point of view. The importance of feeling valued and respected within various processes in an organization (Chapter 6) is also addressed from this perspective. And there are others. These well-written discussions will help readers see their organizations in a new and helpful light.

Where the book breaks down is also where it is most interesting to explore. Nicholson argues that organizations do not function as well as they could and that people in them are not as happy as they could be because we "manage against the grain of human nature" (Chapter 2). He commits what I have elsewhere called the "happiness fallacy." In its rarest and most extreme form, the happiness fallacy states that if our current environment were closer to the social and physical environment of the bulk of our evolution we would be happier. The extreme form is obviously false, and nobody really states it that way. But it does come up more subtly.

Often stress and unhappiness are diagnosed as coming from a mismatch between the environment our minds were designed to find themselves in and the environment in which they actually are in. Nicholson, who would never commit the extreme form of the happiness fallacy, establishes a prescriptive approach to organizing that is based on the subtler form of it. The fallacy of course is that nature may have equipped us to desire certain things, not necessarily to achieve them. Our taste for sweets is the obvious example. There is no reason to believe that the Pleistocene hunter-gather was any happier without sweets than we are with unlimited access, as eating too much sweets leads to obesity and related health problems. We seem to be miserable either way.

Chapters 3 and 4 explore Nicholson's area of expertise within management scholarship: Leadership. The core of the argument is that some personalities work as leaders in some environments. What Nicholson's take on EP adds to this argument is that personality is substantially innate and the kinds of leaders that work in different sorts of situations is consistent with what we know about the variety of human societies. Chapter 5 is close to my area of interest: how systematic cognitive errors (the reasoning equivalent of systematic optical illusions) come about and play a role in the decisions we make. Because of my own interest in this area, I think that this chapter is most useful, but there are other popular books that address this topic better.

This is not the volume for biologists to see what management scholars are doing with EP. Biologists who are interested should familiarize themselves with EP from primary sources, and if they are curious about how this is panning out in management scholarship, they should look at the tiny but growing interest in the academic literature in management. But biologists may be gratified to learn that from Dobzhansky's statement "nothing in biology makes sense except in the light of evolution," the understanding of the human mind/brain as an organ designed by natural selection is leading to an interest in evolution in places that you may not have expected it.

LIVIA MARKÓCZY, *Anderson Graduate School of Management, University of California, Riverside, California*

**THE EVOLUTION OF HUMAN SOCIALITY: A DARWINIAN CONFLICT PERSPECTIVE.**

By *Stephen K Sanderson. Lanham (Maryland): Rowman & Littlefield. \$89.00 (hardcover); \$34.95 (paper). xi + 393 p; index. ISBN: 0-8476-9534-4 (hc); 0-8476-9535-2 (pb). 2001.*

This interesting book's title fails to convey its content. The first two-fifths of the volume consists of synopses and critiques of major sociological theo-

ries, which Sanderson faults for erroneous implicit theories of human nature, insufficient concern with the facts of history and cross-cultural diversity, and failure to develop in synergistic interaction with empirical research. The "Darwinian conflict perspective" that he espouses as a corrective combines an individual-selectionist view of human actors as inclusive fitness maximizers and a cultural materialist view of cross-cultural diversity as a product of ecological diversity, with those parts of mainstream sociological theories that he deems worth salvaging. Most of the book's second half then consists of a "review of the evidence," which mostly means a review of work by people who call themselves human behavioral ecologists and evolutionary psychologists.

Sanderson's critique scores some devastating hits, and it is hard to quarrel when he insists that sociologists should stop treating theory as an enterprise apart from empirics, learn some anthropology, and join the Darwinian revolution. Nevertheless, evolutionists will find much to criticize. His dismissal of group selection as a force in human genetic and cultural evolution is doctrinaire rather than reasoned; he sometimes falls into the trap of treating inclusive fitness as a goal, rather than as the criterion of ancestral selection among alternative phenotypes; and the cross-cultural analyses that pepper the book's second half and constitute its only empirical content are presented without regard for the problem of statistical nonindependence and the "phylogenetic" methods that have been developed to solve it. But despite these shortcomings, this ambitious book is chock full of telling criticisms and worthy efforts at interdisciplinary synthesis. I hope that sociologists read it and take it seriously, and any evolutionist who is willing to push on despite finding nits to pick will get a lot out of it, too.

MARTIN DALY, *Psychology, McMaster University, Hamilton, Ontario, Canada*

**THE MATING MIND: HOW SEXUAL CHOICE SHAPED THE EVOLUTION OF HUMAN NATURE.**

By *Geoffrey Miller. New York: Anchor Books. \$27.50. vii + 503 p; index. ISBN: 0-385-49516-1. 2000.*

This book is about the biological evolution of humans in sport, art, morality, language, and creativity. It embodies what is essentially a set of opinions. In the evolution of human behavior and mind, Miller favors sexual over natural selection, inter- over intrasexual selection, choice over sensory exploitation, choice for genes over resources, choice for good genes somewhat over the runaway process, and symmetric over asymmetric choice (in the sense that both genders are held to choose and

to choose largely for the same things). Whether these preferences of Miller's turn out to be correct, *The Mating Mind* is one of the best examples I know of a piece of work embodying its own thesis. To Miller, scholarship is obviously a sport and the book is aesthetically pleasing, generous in its treatment of other theories, articulate, creative, and witty.

MARION BLUTE, *Sociology, University of Toronto, Mississauga, Canada*

HUMAN BIOLOGY OF PASTORAL POPULATIONS. *Cambridge Studies in Biological and Evolutionary Anthropology, Volume 30.*

*Edited by William R Leonard and Michael H Crawford. Cambridge and New York: Cambridge University Press. \$80.00. xi + 314 p; ill.; index. ISBN: 0-521-78016-0. 2002.*

This fascinating book provides a wide-ranging introduction to the biological characteristics of animal-herding populations around the world. The editors have accomplished the unenviable task of bringing together research on pastoralists from geographically diverse locations in Africa, Asia, Europe, and the Middle East and, in the process, draw researchers from anthropology, demography, genetics, and medicine. The book consists of twelve chapters grouped loosely into three topical sections: demography, genetics, and population structure; ecology and health; and biocultural and evolutionary perspectives. The chapters were originally presented as symposium papers, and perhaps for this reason the volume does not quite live up to its advertising as the first book to systematically examine the biology of pastoralists. Most of the chapters deal with only one aspect of a single pastoral group, making it difficult at times for readers to carry ideas and lessons from one chapter to the next, and muddying the volume's message of respect and concern for the health and biological characteristics of pastoralists throughout the world. Only the excellent chapter on lactose tolerance (by Holden and Mace) attempts to provide a worldwide examination of a single aspect of pastoral biology.

A more ambitious introductory chapter, or perhaps a few thoughtful concluding comments, would have helped the book immensely. Still, the volume's incomplete coverage does not detract from the wealth of information to be found within its covers. Many of the chapters do complement each other. The contributions by Leonard, Crawford, and their research teams, provide a remarkably rich look at the biology of Evenki reindeer herders of Siberia, while a pair of chapters by Little et al. demonstrate in detail the precarious yet resil-

ient ecological foundations of Turkana pastoralism in northwest Kenya. The Turkana chapters can then be compared and contrasted fruitfully with the chapter by Goldstein and Beall on the ecological basis of Tibetan pastoralism and recent development policies initiated by the Chinese government. For patient readers, an abundance of similarly useful comparative information can be teased from these pages. This book should be on the shelf of any scholar, from any discipline, with an interest in the health of pastoral populations worldwide.

CHRISTIAN JENNINGS, *History, University of Texas, Austin, Texas*



### BIOMEDICAL SCIENCES

IMMUNOLOGY AND EVOLUTION OF INFECTIOUS DISEASE.

*By Steven A Frank. Princeton (New Jersey): Princeton University Press. \$75.00 (hardcover); \$24.95 (paper). xi + 348 p; ill.; author and subject indexes. ISBN: 0-691-09594-9 (hc); 0-691-09595-7 (pb). 2002.*

This stimulating book makes an important contribution by bridging the gap between immunology and epidemiology. This is the first volume to comprehensively survey the integration of evolution, epidemiology, ecology, genetics, and immunology of pathogen and host populations. As such, it is a valuable resource for both students and researchers. Frank highlights how the conceptual unification of these different disciplines can improve our understanding of infectious diseases, and better equip us to control their evolution and transmission. The author also stresses the value of methodological unification between phylogenetic analysis, mathematical modeling, molecular techniques, and experimental evolution. He draws on examples from a diverse range of pathogens, including influenza, HIV, foot and mouth virus, hepatitis C viruses, and trypanosomes, highlighting the value of comparative biology. He explains that in all of these pathogens antigenic variation enhances both persistence of infection within individual and transmission between hosts.

In 16 engaging chapters, Frank demonstrates how the antigenic variation of pathogen populations can be viewed from different levels of biological analysis, including molecular, population, and evolutionary levels. He discusses the selection pressures that generate different patterns of antigenic variation and the epidemiological consequences and evolutionary dynamics of these pat-

terns. He reveals how within-host dynamics and population-level processes interact to generate patterns of transmission over both space and time.

Frank surveys the diversity of molecular mechanisms that are employed by different pathogens to produce antigenic variation, including viral hypermutation and trypanosomal switching of gene expression. The book also emphasizes the importance of coevolutionary dynamics between pathogens and their hosts to the epidemiology of disease. The selection that acts on antigenic variation is a composite of evolutionary pressures arising from cross-immunity, immunodominance, and heterogeneity in host immune response (controlled by both major histocompatibility complex and background genes).

The author demonstrates that the melding of immunological and evolutionary theory generates predictions that could not be made by employing either type of theory independently. For example, the use of discordant patterns of immunological and phylogenetic classifications to reveal selection favoring antigenic diversification of pathogen populations is applied to HIV and influenza. The evolutionary divergence of specific codons of antibody-binding sites permits escape from preexisting immunity, thereby enhancing transmission. This research can be used to predict the likelihood of future strains triggering an epidemic, and has tremendous potential for guiding the development of vaccines, including those that target influenza.

In the wake of efficient molecular typing techniques, there is tremendous potential to improve our understanding of the population structure and antigenic diversity of parasites. The author calls for an integration of recent progress in molecular analysis with the conceptual and methodological advances in population and evolutionary biology.

Frank offers a multiplicity of innovative suggestions for future research in each chapter. The breadth and depth of ideas covered in this book will make it of considerable interest to researchers from many biological and medical disciplines, including epidemiologists, evolutionary biologists, immunologists, virologists, and public health practitioners.

ALISON P GALVANI, *Environmental Sciences, Policy & Management, University of California, Berkeley, California*

**THE HUMAN IMMUNODEFICIENCY VIRUS: BIOLOGY, IMMUNOLOGY, AND THERAPY.**

*Edited by Emilio A Emini. Princeton (New Jersey): Princeton University Press. \$75.00. xii + 532 p; ill.; index. ISBN: 0-691-00454-4. 2002.*

The editor has recruited an impressive group of contributors for this book. The goal of the volume (according to the book jacket) was to "provide, in

a single resource, an in-depth overview of the diverse areas that constitute HIV research." Each chapter presents a comprehensive review of the assigned topic, although the overall theme integrates our knowledge of the structure, biology, and genetics of the virus into the discussions of the available therapeutic modalities and of agents designed for novel targets such as the viral integrase, chemokine receptors, and products of *r* regulatory and accessory function genes such as NEF, VIF, and TAT. The volume concludes with chapters that describe the interface between pathogenesis and treatment, proven methods of HIV prevention, an overview of the immunobiology of HIV-1 infection, and a review of projects for development of a vaccine.

For a multiauthored volume there is little redundancy in the 13 chapters, each of which can stand alone as a review of the specific subject. There is significant variation in the basic knowledge readers must bring to individual sections for complete understanding of the presentation. Many of the chapters would not provide a useful introduction to unsophisticated or beginning students.

Overall, Emini and his collaborators have achieved the goal of providing a useful review of the current state of our knowledge of the biology, immunology, and therapy of the Human Immunodeficiency Virus.

JOHN P PHAIR, *Infectious Diseases, Feinberg Medical School, Northwestern University, Chicago, Illinois*

**ANNUAL REVIEW OF BIOMEDICAL ENGINEERING. Volume 4: 2002.**

*Edited by Martin L Yarmush, Kenneth R Diller, and Mehmet Toner. Palo Alto (California): Annual Reviews. \$180.00 (Institutions); \$67.00 (Individuals). xii + 481 p + 19 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 1-4). ISBN: 0-8243-3504-X. 2002.*

**XENOTRANSPLANTATION: BASIC RESEARCH AND CLINICAL APPLICATIONS.**

*Edited by Jeffrey L Platt. Totowa (New Jersey): Humana Press. \$125.00. x + 270 p; ill.; index. ISBN: 0-89603-674-X. 2002.*

This is an outstanding compilation of 12 reviews of original research that discuss methods to bring xenotransplantation closer to clinical reality. The mechanisms for rejection of xenografts, molecular and cell based strategies to overcome the limitations, and an update on the present and future of clinical xenotransplantation are reviewed. The authors are internationally recognized authorities

in immunology, transplantation, and molecular and cellular biology. This book will have broad interest for those in academia as well as industry.

SUZANNE T ILDSTAD, *Institute for Cellular Therapeutics, University of Louisville, Louisville, Kentucky*

#### BIOMEDICAL DIAGNOSTIC SCIENCE AND TECHNOLOGY.

*Edited by Wai Tak Law, Naim Akmal, and Arthur M Usmani. New York: Marcel Dekker. \$165.00. xvii + 425 p; ill.; index. ISBN: 0-8247-0725-7. 2002.*

#### EPIDEMIOLOGICAL STUDIES: A PRACTICAL GUIDE. Second Edition.

*By Alan J Silman and Gary J Macfarlane. Cambridge and New York: Cambridge University Press. \$85.00 (hardcover); \$30.00 (paper). xiv + 241 p; ill.; index. ISBN: 0-521-81097-3 (hc); 0-521-00939-1 (pb). 2002.*

This is not a general epidemiology textbook. It accomplishes exactly what the title suggests. The text clearly states that readers are expected to have a basic understanding of statistics and epidemiology. It explains basic principles such as incidence, prevalence, and risk, which must be understood before attempting an epidemiological study. The explanation of cross-sectional, cohort, and case-control studies is clearly presented. The authors skillfully discuss the differences, advantages, and disadvantages of each. The descriptions of statistical analysis, especially the importance of confidence intervals, are presented with unusual clarity. The topics chosen throughout are relevant, important, and explained well. The chapters that discuss analysis, confounding, bias, and ethical issues are particularly valuable for those who are soliciting funding for epidemiological studies. The authors do not overly burden readers with complex formulae, graphs, and charts, but make the case that the epidemiological concepts must be understood before analyzing data with a computer program. They skillfully use brief examples throughout the text to explain and clarify the subject matter being addressed. This is a major strength of the book.

The authors probably should have emphasized the importance of consulting with statisticians and professional survey services before submitting proposals, and certainly before actually conducting epidemiological studies. This is standard procedure for most researchers and a common mistake made by many who are just beginning to write grants and conduct these studies.

*Epidemiological Studies* accomplishes its stated purpose of providing information to help readers

write better grants and avoid common mistakes when planning and carrying out epidemiological studies. It stimulates thinking about major issues such as study design and cost. It effectively discusses some of the ethical issues that must be considered when designing studies. Students and most experienced researchers will benefit from reading this clearly written book.

NOLAN R HARTWIG, *Veterinary Diagnostic & Production Animal Medicine, Iowa State University, Ames, Iowa*

#### CHEMICAL SENSORS AND BIOSENSORS. *Analytical Techniques in the Sciences (AnTS).*

*By Brian R Eggins. Chichester (UK) and New York: John Wiley & Sons. \$115.00 (hardcover); \$57.95 (paper). xxiii + 273 p; ill.; index (general, chemical and biochemical species). ISBN: 0-471-89913-5 (hc); 0-471-89914-3 (pb). 2002.*

#### NEUROBLASTOMA.

*Edited by Garrett M Brodeur, Tadashi Sawada, Yoshiaki Tsuchida, and P A Voûte. Amsterdam (The Netherlands) and New York: Elsevier. \$170.00. xxvii + 582 p; ill.; index. ISBN: 0-444-50222-X. 2000.*

This book contains 42 chapters that describe the cell biology, molecular biology, and clinical aspects of this tumor. Each chapter has been written by well-established investigators and experienced clinicians. Unfortunately, this book has failed to acknowledge extensive studies that have been published on the role of adenosine 3'5'-cyclic monophosphate (cAMP) in differentiation of neuroblastoma cells. Despite this criticism, the book represents a comprehensive source of information about neuroblastoma, and will be very valuable to basic neurobiologists and clinicians. I am pleased to note that *Neuroblastoma* has been dedicated to Audrey Evans, one of the recognized pioneers in the study of this tumor.

KEDAR N PRASAD, *Radiology and Center for Vitamins & Cancer Research, University of Colorado Health Sciences Center, Denver, Colorado*

#### CALCIUM HUNGER: BEHAVIORAL AND BIOLOGICAL REGULATION.

*By Jay Schulkin. Cambridge and New York: Cambridge University Press. \$80.00 (hardcover); \$29.00 (paper). x + 206 p; ill.; index. ISBN: 0-521-79170-7 (hc); 0-521-79551-6 (pb). 2001.*

The author has written an outstanding book on calcium appetite that answers questions such as: Does it exist? What regulates it? Schulkin succinctly summarizes all of the evidence in a readable style and makes a strong case. For outside animals that

need additional amounts of calcium (e.g., lactating cows), it would seem that the case for an independent calcium appetite is not compelling. Given its importance, particularly to our aging population and the huge projected increase in osteoporosis, there is a great need for more studies, particularly in humans.

The one disappointment about the book is that there was little discussion of calcium absorption. Most of the calcium that mammals eat is not absorbed from the digestive tract. The first mechanism to deal with increased calcium requirements, increased calcium loss in the urine, or a diminished intake is to increase the amount of calcium absorbed from the intestinal tract, rather than stimulate calcium appetite.

One area that is explored in greater depth is the relationship between salt appetite and calcium appetite. Schulkin suggests that, in many instances,

seeking out of salt may in fact be a need to seek out calcium, as many sources of salt have calcium. This seems to be contradictory on evolutionary grounds as salt intake is the most important control of calcium excretion in the urine—a high salt intake increases urinary calcium excretion, which in spite of a variety of compensatory mechanisms, results in a small negative calcium balance. The vital importance of this is that if mammals only eat very small amounts of salt, which in evolutionary terms they do, then the need for calcium is much less. Our current very high salt intake means that we need to consume more calcium. Perhaps it would be better to reduce our salt intake.

Nevertheless, this is a fascinating book for all those interested in mineral metabolism.

GRAHAM MACGREGOR, *Blood Pressure Unit, St. George's Hospital Medical School, London, United Kingdom*

#### DIRECTORY OF PUBLISHERS

*for books reviewed in this issue*

- Academic Press, 525 B Street, Suite 1900, San Diego CA 92101-4495; 619-231-6616; 800-321-5068; [www.apnet.com](http://www.apnet.com).
- American Fisheries Society, 5140 Grosvenor Lane, Suite 110, Bethesda MD 20814-2199; 301-897-8616; 412-741-5700; [www.fisheries.org](http://www.fisheries.org).
- Anchor Books (Random House), 1540 Broadway, New York NY 10036; 212-782-9000; 800-800-3246; [www.randomhouse.com](http://www.randomhouse.com).
- Annual Reviews, 4139 El Camino Way, Palo Alto CA 94303-0139; 650-493-4400; 800-523-8635; [www.annualreviews.org](http://www.annualreviews.org).
- Atlantic Monthly Press, 840 Broadway, New York NY 10003; 212-614-7860; [www.groveatlantic.com](http://www.groveatlantic.com).
- Backhuys Publishers, P O Box 321, 2300 AH Leiden, The Netherlands; +31 71 5170208; [www.euronet.nl/users/backhuys](http://www.euronet.nl/users/backhuys).
- Basic Books, 10 East 53rd Street, New York NY 10022; 212-207-7600; 800-331-3761; [www.basicbooks.com](http://www.basicbooks.com).
- Blackwell Science, Commerce Place, 350 Main Street, Malden MA 02148-5018; 781-388-8250; 800-759-6102; [www.blacksci.co.uk](http://www.blacksci.co.uk).
- Cambridge University Press, 40 West 20th Street, New York NY 10011; 212-924-3900; 800-221-4512; [www.cup.org](http://www.cup.org).
- Cold Spring Harbor Laboratory Press, 1 Bungtown Road, Cold Spring Harbor NY 11724; 631-349-1930; 800-843-4388; [www.cshl.org](http://www.cshl.org).
- Columbia University Press, 562 West 113th Street, New York NY 10025; 212-666-1000; 800-944-8648; [www.columbia.edu/cu/cup](http://www.columbia.edu/cu/cup).
- Comstock Publishing Associates (Cornell University Press), 512 East State Street, P O Box 250, Ithaca NY 14851; 607-277-2338; 800-666-2211; [www.cornellpress.cornell.edu](http://www.cornellpress.cornell.edu).
- CRC Press, 2000 Corporate Boulevard NW, Boca Raton FL 33431; 561-994-0555; 800-272-7737; [www.crcpress.com](http://www.crcpress.com).
- Elsevier Science, P O Box 211, 1000 AE Amsterdam, The Netherlands; +31 20 4853757; [www.elsevier.nl](http://www.elsevier.nl).
- Farrar, Straus and Giroux, 19 Union Square West, New York NY 10003; 212-741-6900; 888-330-8477; [www.fsbassociates.com/fsg](http://www.fsbassociates.com/fsg).
- Fondo de Cultura Económica, Carretera Picacho-Ajusco, 227-1 Col. Bosques del Pedregal, Tlalpan, C.P. 14200, México, D.F.; +52 27 46 72; [www.fce.com.mx](http://www.fce.com.mx).
- Garland Science, 717 Fifth Avenue, 25th Floor, New York NY 10022-8101; 212-751-7447; 800-627-6273; [www.garlandpub.com](http://www.garlandpub.com).
- Harvard University Press, 79 Garden Street, Cam-

- bridge MA 02138; 617-495-2600; 800-448-2242; [www.hup.harvard.edu](http://www.hup.harvard.edu).
- Humana Press, 999 Riverview Drive, Suite 208, Totowa NJ 07512; 973-256-1699; [www.humanapress.com](http://www.humanapress.com).
- Ibis Publishing, 44970 Via Renaissance, Temecula CA 92590; 909-676-1548; [www.ibispub.com](http://www.ibispub.com).
- Indiana University Press, 601 North Morton Street, Bloomington IN 47404-3797; 812-855-8817; 800-842-6796; [www.indiana.edu/~iupress](http://www.indiana.edu/~iupress).
- IOS Press, Nieuwe Hemweg 6B, 1013 BG Amsterdam, The Netherlands; +31 20 688 3355; [www.iospress.nl](http://www.iospress.nl).
- Island Press, 1718 Connecticut Avenue NW, Suite 300, Washington DC 20009; 202-232-7933; 800-828-1302; [www.islandpress.org](http://www.islandpress.org).
- Johns Hopkins University Press, 2715 North Charles Street, Baltimore MD 21218-4363; 410-516-6900; 800-537-5487; [www.jhuupress.jhu.edu](http://www.jhuupress.jhu.edu).
- Karger, P O Box, CH-4009, Basel, Switzerland; +41 61 306 11 11; [www.karger.com](http://www.karger.com).
- Kluwer Academic/Plenum Press, P O Box 17, 3300 AA Dordrecht, The Netherlands; +31 78 6392392; 781-871-6600; [www.wkap.nl](http://www.wkap.nl).
- Lynx Edicions, Montseny 8, E-08193 Bellaterra, Barcelona, Spain; +34 93 594 7710; [www.hbw.com](http://www.hbw.com).
- Marcel Dekker, 270 Madison Avenue, New York NY 10016-0602; 212-696-9000; 800-228-1160; [www.dekker.com](http://www.dekker.com).
- MIT Press, Five Cambridge Center, Cambridge MA 02142-1493; 617-625-8569; 800-356-0343; [www.mitpress.mit.edu](http://www.mitpress.mit.edu).
- New York Academy of Sciences, 2 East 63rd Street, New York NY 10021; 212-838-0320; 800-843-6927; [www.nyas.org](http://www.nyas.org).
- Ohio State University Press, 1070 Carmack Road, Columbus OH 43210-1002; 614-292-6930; [www.ohiostatepress.org](http://www.ohiostatepress.org).
- Oxford University Press, 198 Madison Avenue, New York NY 10016; 212-726-6000; 800-451-7556; [www.oup-usa.org](http://www.oup-usa.org).
- Perseus Books, 1 Jacob Way, Reading MA 01867; 781-944-3700; 800-449-3356; [www.perseusbooks.com](http://www.perseusbooks.com).
- Princeton University Press, 41 William Street, Princeton NJ 08540-5237; 609-883-1759; 800-777-4726; [www.pup.princeton.edu](http://www.pup.princeton.edu).
- Rowman & Littlefield, 4720 Boston Way, Lanham MD 20706; 301-459-3366; 800-462-6420; [www.rowmanlittlefield.com](http://www.rowmanlittlefield.com).
- Rutgers University Press, 100 Joyce Kilmer Avenue, Piscataway NJ 08854-8099; 732-445-7762; 800-446-9323; [www.rutgerspress.rutgers.edu](http://www.rutgerspress.rutgers.edu).
- Simon & Schuster, 1230 Avenue of the Americas, New York NY 10020; 212-698-7000; 800-223-2348; [www.simonsays.com](http://www.simonsays.com).
- Smithsonian Institution Press, 750 Ninth Street NW, Suite 4300, Washington DC 20560-0950; 202-275-2300; 800-782-4612; [www.si.edu/organiza/offices/sipress](http://www.si.edu/organiza/offices/sipress).
- Springer, 175 Fifth Avenue, New York NY 10010; 212-460-1500; 800-777-4643; [www.springer-ny.com](http://www.springer-ny.com).
- Texas A&M University Press, Drawer C, College Station TX 77843-4354; 409-845-1436; 800-826-8911; [www.tamu.edu/upress](http://www.tamu.edu/upress).
- Texere, 71-77 Leadenhall Street, London EC3A 3DE, United Kingdom; +44 20 7204 3644; [www.etexere.com](http://www.etexere.com).
- Timber Press, 133 SW Second Avenue, Suite 450, Portland OR 97204-3527; 503-227-2878; 800-327-5680; [www.timber-press.com](http://www.timber-press.com).
- Trust for Public Land, 116 New Montgomery Street, 4th Floor, San Francisco CA 94105; 415-495-5660; [www.tpl.org](http://www.tpl.org).
- UBC Press, University of British Columbia, 2029 West Mall, Vancouver, British Columbia, V6T 1Z2, Canada; 604-822-5959; 800-663-8583; [www.ubcpres.ubc.ca](http://www.ubcpres.ubc.ca).
- University of California Press, 2120 Berkeley Way, Berkeley CA 94720; 510-642-4247; 800-777-4726; [www.ucpress.berkeley.edu](http://www.ucpress.berkeley.edu).
- University of Chicago Press, 1427 East 60th Street, Chicago IL 60637-2954; 773-702-7700; 800-621-2736; [www.press.uchicago.edu](http://www.press.uchicago.edu).
- University of Michigan Press, P O Box 1104, Ann Arbor MI 42106-1104; 734-764-4388; [www.press.umich.edu](http://www.press.umich.edu).
- University of Texas Press, P O Box 7819, Austin TX 78713-7819; 512-471-7233; 800-252-3206; [www.utexas.edu/utpress](http://www.utexas.edu/utpress).
- University of Washington Press, P O Box 50096, Seattle WA 98145-5096; 206-543-8870; 800-441-4115; [www.washington.edu/uwpress](http://www.washington.edu/uwpress).
- University Press of Florida, 15 NW 15th Street, Gainesville FL 32611-2079; 352-392-1351; 800-226-3822; [www.upf.com](http://www.upf.com).
- W. W. Norton, 500 Fifth Avenue, New York NY 10110; 212-354-5500; 800-233-4830; [www.wwnorton.com](http://www.wwnorton.com).
- Wiley, 605 Third Avenue, New York NY 10158-0012; 212-850-6000; 800-225-5945; [www.wiley.com](http://www.wiley.com).
- Yale University Press, 302 Temple Street, New Haven CT 06511; 203-432-0960; 800-987-7323; [www.yale.edu/yup](http://www.yale.edu/yup).