



Building a Better Race: Gender, Sexuality, and Eugenics from the Turn of the Century to the Baby Boom. *By Wendy Kline*

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Review by: Reviewed by Jonathan A P Lelliott

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HISTORY, PHILOSOPHY & ETHICS

THE ORIGIN OF SPECIES REVISITED: A VICTORIAN WHO ANTICIPATED MODERN DEVELOPMENTS IN DARWIN'S THEORY.

By Donald R Forsdyke. *Montreal and Ithaca (New York): McGill-Queen's University Press.* \$49.95. xi + 275 p; ill.; index. ISBN: 0-7735-2259-X. 2001.

From the dust jacket, I expected this to be an historical treatment into antecedents to Darwin's theory on the origin of species. It is part history—"[i]n places I am drawn to ask questions of a historical nature" (p 3)—but the history takes the form of looking for hints in the 19th century for recent physiological and molecular approaches to the origin of species. Forsdyke believes that he has found such hints in the works of Romanes, Gulick, and Bateson, the latter being well known for his rediscovery of Mendel's paper. Romanes was a staunch supporter of Darwin. Gulick (for most of his life a missionary) is known to some for his discovery of speciation in isolated, but contiguous populations of Hawaiian snails. Less well known is that Gulick anticipated "organic selection" (the Baldwin effect) by 11 years. Forsdyke admits that his approach is unabashed Whig history, which historians are not supposed to do. But Forsdyke is not an historian, he is a biochemist and molecular biologist.

As his mechanism of speciation, Darwin opted for natural selection over the production of variants—most evolutionary biologists would not define variation as "like does not produce like," or inheritance as "like produces like," as Forsdyke does (p 16). Bateson wanted to include reproductive criteria in his definition of a species. Romanes's thesis that reproductive or physiological selection

occurs before selection on the rest of the phenotype is well laid out. Forsdyke concludes that, if his interpretation is correct, Romanes and Bateson were light years ahead of their contemporaries. This assumes that we can equate the modern-day knowledge that aspects of species-specific base composition in viral DNA (in particular, C + G% differences) indicate some physiological basis for selection and, specifically, for speciation of organisms other than viruses, which is a real stretch. Romanes and Bateson were seeking a physiological mechanism. Whether we have found that in C + G% differences in viruses remains to be seen. Other aspects of the phenotype of the gene (patterns of methylation, imprinting) are not considered; whether any aspects of the heritable phenotype of the gene relate to speciation (initiation or adaptation) remains to be proven. What Forsdyke does is remind us that individuals other than Darwin were seeking alternate mechanisms of speciation.

BRIAN K HALL, *Biology, Dalhousie University, Halifax, Nova Scotia, Canada*

DEAR MR DARWIN: LETTERS ON THE EVOLUTION OF LIFE AND HUMAN NATURE.

By Gabriel Dover. *Berkeley (California): University of California Press.* \$27.50. xvi + 268 p; ill.; index. ISBN: 0-520-22790-5. [First published in Great Britain in 1999 by Weidenfeld & Nicolson.] 2000.

In this imaginary correspondence with Charles Darwin the author asserts that many of the ideas of William Hamilton, George Williams, Robert Trivers, and John Maynard Smith are based upon the "illusion" that genes are the ultimate units of selection (p 70), that evolutionary factors addi-

tional to natural selection have been overlooked (such as neutral drift, "exaptation," "adaptation," and "molecular drive"), and that DNA, RNA, and proteins have cooperated and coevolved since the origin of life. The important writings of Richard Dawkins on these subjects are repeatedly caricatured and scornfully dismissed, and Edward O Wilson is called "the father of evolutionary psychology" (p 233). Also, the author finds evidence from his teary experiences in watching football (soccer) matches (p 186) and in listening to music (p 242) that human behavior is not genetically determined and therefore that we have free will. How, he asks, could the behavior of team athletes and their supporting fans be under the control of selfish genes if they are unrelated and from such diverse backgrounds?

The author does not provide the background information needed by his intended audience (general readers) to evaluate this truly astonishing mishmash of confused and ignorant assertions. Anyone wishing to gain a clear understanding of the topics discussed in this book should go to one of the recently published introductory textbooks on sociobiology or evolutionary psychology, or to the original writings of the authors mentioned above. The same course of action is recommended for the author.

WILLIAM F ZIMMERMAN, *Biology, Amherst College, Amherst, Massachusetts*

SHAPING SCIENCE WITH RHETORIC: THE CASES OF DOBZHANSKY, SCHRÖDINGER, AND WILSON.

By Leah Ceccarelli. *Chicago (Illinois): University of Chicago Press.* \$55.00 (hardcover); \$20.00 (paper). xi + 204 p; ill.; index. ISBN: 0-226-09906-7 (hc); 0-226-09907-5 (pb). 2001.

Despite the book's title, this is no disciplinary defense of how rhetoric is responsible for the creation of scientific knowledge. Rather, the author has gone beyond the former generation of rhetoricians of science to demonstrate how "interdisciplinary inspirational monographs" help form new disciplines within science and thus shape future scientific research. Ceccarelli defines these monographs as volumes that address groups of scientists from different fields urging them to enter into new interdisciplinary alliances. Although *Shaping Science* is about interdisciplinarity, it is also an interdisciplinary inspirational textbook, a new addition to the genre. The author nicely weaves together the disciplinary strengths and professional interests of rhetoricians and historians to explore how scientists successfully motivate their colleagues to cross disciplinary boundaries. By incorporating social, professional, and cognitive explanations

into her account, Ceccarelli adds an important contribution to our understanding of how science develops.

The book is separated into four sections. The first three are case studies of scientists attempting to inspire interdisciplinarity through inspirational monographs; the fourth section then offers conclusions concerning the genre, including how it contributes to the rhetoric of science, the history of science, and interdisciplinary studies. Each case study is further separated into two chapters. The first chapter places the volume within its historical context, outlining the social, conceptual, and theoretical debates on the eve of the book's publication. The second chapter then offers a close reading of the text itself combined with an examination of its reception within the scientific community. Through this admixture of the rhetoric of science and the history of science, textual analysis, and reader response, Ceccarelli is able to explain how the successful inspirational monograph was rhetorically designed to unite the social and conceptual divisions among disciplines to form new interdisciplinary fields of research.

The three volumes Ceccarelli examines are Theodosius Dobzhansky's *Genetics and the Origin of Species* (1937. New York: Columbia University Press), Erwin Schrödinger's *What Is Life?: The Physical Aspect of the Living Cell* (1944. Cambridge: Cambridge University Press), and Edward O Wilson's *Consilience: The Unity of Knowledge* (1998. New York: Knopf). Although the first two books helped usher in the modern synthesis and molecular biology, respectively, the third has arguably ended in failure. The most exciting and useful conclusion comes from a comparison of why, rhetorically, these volumes succeeded or failed. Ceccarelli defines two specific rhetorical strategies used to appeal to two different disciplines. The first, conceptual chiasmus, is a rhetorical strategy that encourages each discipline to view the world through the other's intellectual space. The second, polysemous constructions, allows an ambiguous passage to be read and interpreted by each community in more than one way. As Ceccarelli demonstrates, these constructions are expertly represented in the work of Dobzhansky and Schrödinger, and decidedly absent in the work of Wilson.

At the turn of the 20th century, methodological disagreements and ideological commitments separated descriptive naturalists and experimental geneticists. As Ceccarelli argues, a close reading of the text and its reviews reveal that Dobzhansky was sensitive to the different social, political, and professional concerns of both the naturalists and the geneticists. He used mechanistic language to

describe natural selection, while introducing non-reductionist explanations of biological processes. Through this conceptual chiasmus, Dobzhansky was able to make the competing camps conceptualize their fields differently. Moreover, the text was written in such a manner to allow for two different readings. Unlike the rhetoric of conquest found in Wilson's *Consilience*, Dobzhansky used a polysemous construction that safeguarded the naturalist tradition, while simultaneously suggesting the fertile ground that would be opened to the geneticist. He thereby smoothed political tensions to make each group believe that it was in their own best interest to collaborate.

Ceccarelli identifies the same rhetorical strategies in Schrödinger's monograph. Although it offered no new scientific findings and was replete with errors, Schrödinger helped convince both biologists and physicists that collaboration was desirable. By animating the atom and mechanizing the organism, Schrödinger, unlike Wilson, was careful not to place one discipline above the other in his exposition. Like Dobzhansky, Schrödinger also used a polysemous construction. In an ambiguous passage in his introduction, he suggested that living matter would likely involve "other laws of physics." Rather than using her rhetorical analysis to determine what Schrödinger actually meant or to support a certain historical reading, Ceccarelli acknowledges the ambiguity of Schrödinger's "other laws of physics" passage and demonstrates how the different readings of the passage were valid from each discipline's perspective. Here, as elsewhere in *Shaping Science*, Ceccarelli notes how different audiences produce different readings of a volume, as they come to it with different professional and ideological assumptions. Those researchers interested in the public understanding of science will find this especially appealing.

In an attempt to carve out a disciplinary space, pioneering rhetoricians of science focused largely on the major scientists and their exemplary textbooks. Too often science was reduced entirely to persuasive techniques. Although Ceccarelli acknowledges her debt to these earlier researchers, she has moved gracefully beyond. Rather than a battle cry for disciplinary space, Ceccarelli places the "subdiscipline" of the rhetoric of science within an interdisciplinary framework that speaks to rhetoricians of science, those in the large discipline of rhetorical inquiry, historians of science, and larger interdisciplinary research communities. By focusing on interdisciplinary inspirational monographs, the author was able to use the advances made by the earlier generation of scholars and investigate, on equal terms, the book, the historical context, and the broader social and cognitive factors leading to

interdisciplinary research. In the end, science is indeed shaped by both social and cognitive forces. As Ceccarelli defines the genre of the interdisciplinary inspirational monograph, *Shaping Science* is itself an example of the genre. Through her own use of conceptual chiasmus and polysemy, she has taken a large step toward reinvigorating the rhetoric of science, offering innumerable possibilities for those interested not only in science studies, but in interdisciplinary research in general.

MICHAEL S REIDY, *History & Philosophy*, Montana State University, Bozeman, Montana

THE EVOLUTION OF REASON: LOGIC AS A BRANCH OF BIOLOGY. *Cambridge Studies in Philosophy and Biology*.

By William S Cooper. Cambridge and New York: Cambridge University Press. \$52.95. x + 226 p; ill.; index. ISBN: 0-521-79196-0. 2001.

From at least as early as the publication of Charles Darwin's *On the Origin of Species*, scholars have attempted to locate the origin of human behavioral and mental traits within animal groups assumed to be ancestral to humans. In *The Evolution of Reason*, William Cooper takes this reductive process one step further by locating the origin of reason and logic within the process of evolution. As he states his position, there is no need "to account for logic—only a drawing out of the consequences of known principles of natural selection" (p 5) is required.

To support his view, he develops the "Reducibility Thesis," and then provides a lengthy logic-based philosophical defense of a reductive chain connecting evolution theory to mathematics, through sequential steps of life-history strategy theory, decision theory, inductive logic, and deductive logic. Importantly, these steps are not merely artificial conventions since biology's "evolutionary branch is a subsience that, in addition to its ordinary offices, predicts and explains logic" (p 12). In other words, as the book's title strongly implies, reason and logic are products of the evolutionary process. And herein resides a two-part rub.

First, despite the title, there is little discussion of biology or evolution theory. Cooper does refer to predation, shelter, and food resources, but always in a general sense and only in connection with decision theory or life-history strategy. Similarly, evolutionary ideas such as selection, adaptation, and survival make it into the text, but in most cases they, too, lack any specific context, serving instead as generalized statements that enable the author to transcend the biological basis of his argument for the logical aspects of the "Reducibility Thesis." Without clear and convincing examples that illus-

trate how evolutionary processes drawn from biology may lead causally to logic, Cooper is not just asking readers to accept an implication from evolution theory, but he is requiring one to leap with abandon from evolution theory to logic.

Second, Cooper implicitly positions himself within a long tradition of providing a naturalistic basis for logic and reason, as well as philosophy. There is, however, no discussion that indicates what Cooper is offering is something new. How does he avoid the naturalistic fallacy? How does he avoid the social and cultural setting of reason and logic? Are we to assume that only in the western world has reason and logic from animal ancestors found fertile ground in which to take root? Or, does Cooper assume that the long tradition of western logic and reason is essentially identical to nonwestern logical and rational systems? Again, without confronting these issues, especially through the benefit of an extensive body of historical work, his book appears to offer a naïve argument. At the very least, it would seem appropriate to ask for a contextual setting for his "Reducibility Thesis."

But perhaps it is not fair to judge *The Evolution of Reason* from either the perspective of the biologist or the historian. After all, given its content and given the nature of its argument, Cooper may have directed his claims to a philosophical audience. Certainly these readers would find his book more accessible. Nevertheless, such a provocative thesis should aim to reach the larger audience of general readers of biological literature.

KEITH R BENSON, *History, University of California, San Diego, La Jolla, California*

PLATYPUS: THE EXTRAORDINARY STORY OF HOW A CURIOUS CREATURE BAFFLED THE WORLD.

By Ann Moyal. Washington (DC): Smithsonian Institution Press. \$21.95. xiii + 226 p + 8 pl; ill.; index. ISBN: 1-56098-977-7. 2001.

There is perhaps only one animal in the world that since its discovery could have been described as a hoax, a prank, a myth, a novelty, eccentric, unnatural, improbable, anomalous, archaic, highly evolved, complex, and a paradox. This is the platypus, *Ornithorhynchus anatinus*. In her book, Moyal affectionately examines the scientific history of one of nature's most fascinating oddities. The arrival of specimens of the "amphibious mole" in Europe starting in 1799 coincided with the active period of the development of evolutionary theory. Indeed, all the major players in the arguments over evolution in the early 19th century had something to say about the platypus. Darwin had observed and hunted platypus in Australia, while serving on the HMS *Beagle*, and he pondered the animal's tax-

onomic status in letters to colleagues. Richard Owen was the most obsessed with the biology of the platypus. He spent years attempting to obtain specimens to determine the animal's mode of reproduction. Despite accounts by Aborigines that the platypus laid eggs, it took over 80 years before this fact was verified and the platypus attained its particular scientific status as intermediate between reptiles and mammals.

The book is chronologically structured to show how the scientific view of the platypus changed over time, particularly with respect to evolutionary theory. This link between the platypus and its importance in the construction of evolutionary theory at times seems a bit forced, although scientists were impressed by this biological novelty. The book is written for general readers, but it can be appreciated by scholars of biology and the history of science. Little detailed information on the biology of the platypus is presented in the book, and readers interested in such accounts are better referred to other books listed in the bibliography. From an historical perspective, Moyal has done an exceptional job in documenting the impact of the platypus, including a rich collection of black-and-white illustrations, color plates, stories, and poems, which are entwined in the fabric of Australian culture. The book is entertaining for those readers interested in this most enigmatic of mammals.

FRANK E FISH, *Biology, West Chester University, West Chester, Pennsylvania*

THE PERVERSION OF KNOWLEDGE: THE TRUE STORY OF SOVIET SCIENCE.

By Vadim J Birstein. Boulder (Colorado): Westview Press. \$32.50. xx + 492 p; ill.; index. ISBN: 0-8133-3907-3. 2001.

This volume records the corruption of Soviet science by state power. Vadim Birstein, a geneticist trained in biology during the Lysenko era, explains how members of scientific institutions, particularly the prestigious Academy of Sciences, collaborated in the legitimization of inhumane research and in the suppression of colleagues. Birstein emphasizes the Stalinist period, ending with a sober appraisal of post-Soviet scientific leadership. The book is extensively documented from work with available archives and published materials in Russian and English. In particular, the records of the human rights organization, Memorial, and KGB documents that Birstein acquired drew him to Grigory Mairanovsky's career. The notorious biochemist-physician directed Laboratory No. 1 for the NKVD and MGB in the 1930s and 1940s. At that facility, prisoners were administered poisons in controlled experiments that led ultimately to their deaths.

The resulting data were applied in espionage and in biological and chemical weaponry. Although Birstein compares these experiments with similar ones in Nazi Germany, and mentions American radiation and British nerve gas tests on volunteers, it is clear that he regards the Soviet activity as the most repugnant.

Just as devastating was the deadly political merger between Lysenkoism and the security services under the auspices of the Academy of Sciences. The Academy not only accepted the quack professoriate of Trofim Lysenko into its ranks, it also allowed security agents to adopt the institution as a "cover," conferring degrees and membership. In addition, Academy careerists participated in the professional and personal destruction of prominent scientists, such as the plant geneticist Nikolai Vavilov. Even after the fall of Lysenko, his legacy continued to inflict damage on this elite institution.

Birstein chronicles heroes as well as villains, notably academician Dmitrii Pryanishnikov. In 1940, Pryanishnikov openly criticized Lysenko in an effort to save Vavilov, a former pupil. This courageous example is, however, rare among Birstein's innumerable case histories of state crime and professional collusion in those crimes. These stories are both the book's strength and its weakness, mainly because of the author's uncommonly discursive style. His biographical detail nearly overwhelms important observations about modern relationships between science and state. The book, nevertheless, is valuable for contemplative scientists and teachers.

JOAN KLOBE PRATT, *History, University of Northern Colorado, Greeley, Colorado*

THE OZONE LAYER: A PHILOSOPHY OF SCIENCE PERSPECTIVE.

By Maureen Christie. Cambridge and New York: Cambridge University Press. \$65.00 (hardcover); \$23.00 (paper). xii + 215 p; ill.; index. ISBN: 0-521-65072-0 (hc); 0-521-65908-6 (pb). 2000.

Perhaps I just spent too many years frustrated by my lack of athletic ability, but I found myself adapting an old sporting adage usually applied to coaches or referees as I was reading this book. In this case, those that can do science do it, while those that cannot, philosophize about it. Nonetheless, *The Ozone Layer: A Philosophy of Science Perspective*, by Maureen Christie, a lecturer in philosophy of science at the University of Melbourne, is generally well written and does offer valuable insights as it examines how scientific thought and theory developed for a real and very important issue.

The first 70 pages of the book provide an his-

torical perspective on the scientific findings behind the discovery and eventual understanding of the large decreases in stratospheric ozone concentrations that have occurred over the last few decades. Of particular focus is the discovery in 1984 of the large springtime ozone decrease over Antarctica, known as the ozone "hole," which then led to much speculation about possible causes before key atmospheric measurements finally demonstrated that chlorine, and to some extent bromine, from human related activities were largely responsible. Although it misses on some details, this brief synopsis generally does an excellent job of describing the key scientific questions confronting the science community as each piece of evidence was discovered.

The rest of this book uses the history of the scientific discoveries of the ozone hole and associated hypotheses to examine ongoing debates in the philosophy of science. I found this part of the book to be repetitive, as Christie reexamines the science findings about the ozone hole in light of different past philosophical arguments about the scientific process and the relationships among philosophy, history, and science. For example, some philosophers and historians of science see it as essentially failure if a theory does not capture all that is later discovered, whereas I and most other scientists do not see the early versions of theories as failures, but as important steps in understanding and accept revisions to the theory as part of the progress of science. In her discussion, Christie shows that she understands this difference in viewpoint and uses the ozone analyses as a means for modifying the philosophical perspective. Despite the repetitions, I did find much of this discussion interesting, although some of it is clearly aimed at the philosophy of science community.

DONALD J WUEBBLES, *Atmospheric Sciences, University of Illinois, Urbana, Illinois*

AMERICA'S BOTANICO-MEDICAL MOVEMENTS: VOX POPULI.

By Alex Berman and Michael A Flannery. Pharmaceutical Products Press. Binghamton (New York): Haworth Press. \$69.95 (hardcover); \$24.95 (paper). xxiii + 289 p + 29 pl; ill.; index. ISBN: 0-7890-0899-8 (hc); 0-7890-1235-9 (pb). 2001.

The botanico-medical movements in the United States during the 19th century are expertly drawn together in this volume that makes order out of the "increasingly complex" situation that the successors of Thomsonianism created. After 1840, the authors tell us, "[a]ffiliations and names change rapidly; ephemeral botanic medical schools and journals appear and vanish; local and national soci-

eties succeed each other with kaleidoscopic speed; and uneasy alliances spring up between warring botanic factions" (p 69). The vicissitudes of the botanic sects—Thomsonians, Neo-Thomsonians, Eclectics, Physio-Medical physicians, and variations—their fundamental assumptions and empirical approach, their striving for and attainment of professional respectability, their fratricidal quarrels, and their eventual decline, are spelled out in detail.

In a final and most interesting chapter, *Where Have All the Botanics Gone?*, the authors bring the story up to the present. Although vestiges of botanical movements continued well into the 20th century—Naturopathy can be viewed as a continuation of the movement even today and the United States Pharmacopoeia has indicated a renewed interest in plant drugs—the decline in botanical medicine is traced primarily to the blossoming of the biological and medical sciences in the late 19th century. The authors conclude with an up-to-date account of the "current botanicism," that is, the burgeoning of the popularity of "food supplements," and suggest that the challenge now facing the pharmaceutical sciences is to turn herbalism into phytomedicine. There are ten appendixes that include access to documents not readily unearthed such as a catalogue of the plants recommended by Samuel Thomson, and the constitution of the American Physio-Medical Association.

This volume derived from Berman's 1954 dissertation at the University of Wisconsin (Berman died while this book was in press). In it, and in a number of subsequent articles, he pointed out that the history of "regular" medicine was only one side of the coin: there was a pervasive and popular "irregular" medicine during the 19th century in the United States that required consideration. The present volume, however, is a new book, as is readily evident from the thorough use of the literature that has appeared since 1954. The last chapter, on the present-day scene, is presumably the work of the coauthor, Michael A Flannery (the author of a recent biography of John Uri Lloyd).

DAVID L COWEN, *History, Rutgers University, New Brunswick, New Jersey*



GENERAL BIOLOGY

HOMOLOGY AND SYSTEMATICS: CODING CHARACTERS FOR PHYLOGENETIC ANALYSIS. *Based on a symposium held in Oxford, August 1997. The Systematics Association Special Volume Series, Volume 58.*

Edited by Robert W Scotland and R Toby Pennington. London and New York: Taylor & Francis. \$110.00. vii + 217 p; ill.; index. ISBN: 0-7484-0920-3. 2000.

This book is the result of a symposium of the First Biennial International Conference of the Systematics Association. The volume's nine chapters and a little over 200 pages address the issues of character coding and homology in cladistics. Most authors' empirical interests are in plants or insects, and chapters deal with both molecular and morphological data. Few chapters refer to literature beyond the date of the symposium, hence the material is quite dated in some cases.

Brower opens with a discussion of the development of the idea of homology in systematics since pre-Darwinian times, and couches his discussion in terms of de Pinna's primary and secondary homology, as well as separates the development of hypotheses of primary homology into stages.

Viewed together, the following two chapters (Hawkins; Forey and Kitching) represent a sobering message for morphological systematists. Hawkins's survey of the botanical literature for primary homology assessment in morphological data matrices reveals that there is widespread variation in the way that systematists code the same kind of observations. In other words, there are a number of numerical codings used to represent the result of identical primary homology assessments. Hawkins separates coding methods into conventional and nonconventional categories, and many of the nonconventional coding approaches have theoretical disadvantages. There is widespread use of the multistate coding approach to inapplicable character states, although this is not the most satisfactory way to code these observations. Forey and Kitching show that two commonly used methods (one conventional and one nonconventional) produce quite different phylogenetic results. They advocate using a Sankoff matrix for characters that have different states and are both present and absent for the coded set of taxa. This method was not used by any systematists in Hawkins's survey.

Stevens discusses homology and character state definition in morphological and molecular data,

and uses an empirical example to show that overlapping state data are less useful than nonoverlapping data in morphological studies. Wheeler's chapter relies on the notion that alignment and tree length minimization should be conducted simultaneously as the best solution will rely on optimizing both simultaneously in a parsimony analysis. Alignment relies on maximizing similarity between sequences, and parsimony analysis relies on maximizing homology. This method is now implemented in POY. Ruddall shows that incongruence between molecular and morphological data can improve hypotheses of primary homology. Weston discusses in depth the process morphology of Sattler, whose main contribution seems to be that structure is process, or that structures are part of a process of development.

The final two chapters deal with homology in terms of three-item analysis. A statement of taxic homology can be broken down into its constituent parts with three taxon statements. This recoding of the data can produce different results to those of matrices coded in standard form. Although it is a different way to code basic observations, these chapters do not address the issue of whether it is a better way.

There are some editorial lapses. Thiele's important contribution to this debate (1993. *Cladistics* 9(3):275–304) is referred to as (1993) in one chapter and (1994) in another. In summary, it is difficult to recommend this book for purchase. Few of the chapters contain citations to the literature since 1997. Most of the important contributions in the book have been published elsewhere in journal articles. Forey and Kitching's chapter is a notable exception.

DAVID YEATES, *Australian National Insect Collection, CSIRO Entomology, Canberra, Australia*

MATHEMATICAL MODELS IN POPULATION BIOLOGY AND EPIDEMIOLOGY. *Texts in Applied Mathematics, Volume 40.*

By Fred Brauer and Carlos Castillo-Chávez. New York: Springer. \$59.95. xxiii + 416 p; ill.; index. ISBN: 0-387-98902-1. 2001.

The role of mathematics in ecology and epidemiology has had a long history, going back at least as far as the pioneering work of Lotka, Volterra, and Kermack and McKendrick. The current volume focuses on this interface between mathematics and biology. The style and contents are definitely more appealing for the mathematician looking at biological applications of mathematics, than the biologist looking for an introduction to mathematical tools used in population biology or for a discussion of theoretical questions (rather than mathematical

ones). The book is written in the theorem proof style that mathematicians will feel comfortable with. There is very limited discussion of biological examples, and the structure is developed essentially from a mathematical point of view.

The book covers the basic models of population growth in continuous and discrete time, but also presents results with delays. For interacting species models, simple harvesting as well as basic models are discussed. But these models are not well related biologically. The succinct and clear section on mathematical epidemiology is one of the highlights of the book. A brief discussion of structured population models completes the volume. Two notable omissions are any consideration of spatial models, and of any of the modern statistical issues that arise. There are extensive problems throughout the text; these are all essentially mathematical exercises. The very quantitatively oriented and mathematically well-prepared biologist who can understand the mathematics presented here will find that the book does present advanced mathematical ideas quite clearly.

ALAN HASTINGS, *Environmental Science & Policy, University of California, Davis, California*

INSECTS AND GARDENS: IN PURSUIT OF A GARDEN ECOLOGY.

By Eric Grissell; with photographs by Carll Goodpasture. Portland (Oregon): Timber Press. \$29.95. 345 p; ill.; index. ISBN: 0-88192-504-7. 2001.

If you have been dousing your garden with insecticides, Eric Grissell, a gardener and wasp systematist, wants you to stop. He would prefer that you turn off your electric bug killers and get rid of your Japanese beetle traps, too. With regard to the traps, which are baited with pheromones, he writes, "[s]ure, extend an invitation to the poor, homeless blighters and then make certain they never leave" (p 280). This sensible and humane attitude permeates *Insects and Gardens*, the main thesis of which is that a "naturalistic" garden—one in which herbivorous insects are kept in check by predatory and parasitic insects—is easier to tend, healthier for the environment and, most importantly, a more interesting space to inhabit than a garden drenched with poisons.

Of course, one would expect an entomologist to promote insects, and Grissell, clearly an unabashed enthusiast, does his best to convert entomophobes into entomophiles. Having always been fond of insects, I cannot judge whether he is likely to succeed, but I can say that readers will be entertained and informed by Grissell's effort.

Insects and Gardens begins with a review of basic principles such as orders of insects, metamorpho-

sis, reproduction, and feeding types. This information serves as background for understanding the ecology of gardening, especially interactions between insects and plants and interactions of insects with each other. The emphasis throughout is on encouraging the latter while not being overwhelmed by the former. Attitude is crucial, and Grissell argues that insects will neither do "some unimaginable harm to the gardener" nor some "inestimable harm to the garden" (p 283). A diverse garden is crucial, too, because plant diversity promotes insect diversity, and insect diversity is essential for the "matrix of behavioral interactions" (p 224) that keep ecosystems and gardens in balance. Every gardener should absorb and practice this message.

Carll Goodpasture's photographs are the perfect complement to the text, presenting the insect world as we have never seen it: my favorites include a caterpillar emerging from an egg and a beetle poised on a stem as if planning to fly to the moon that hovers in the background.

JANICE E BOWERS, *U.S. Geological Survey, Tucson, Arizona*



FOR TYROS & LAICS

VISUALIZATIONS: THE *NATURE* BOOK OF ART AND SCIENCE.

By *Martin Kemp*. Berkeley (California): University of California Press. \$35.00. xv + 202 p; ill.; index. ISBN: 0-520-22352-7. 2000.

This book is a compilation, for each chapter began life as a popular article in *Nature*. Kemp has no central theme, for the idea seems to be to set in juxtaposition the speculations and some of the facts that an art historian likes to retell. A selection of pictures decorates each short article, every one bearing a contrived and alliterative title. When it is Kepler's cosmos we may smile indulgently, but Goldsworthy's genera makes one frown a little, while Onwin's holistics makes you grimace at an idea carried too far.

Sometimes the disciplinary gap between art and science is not satisfactorily bridged. Thus, Kemp speculates on conversations between Vermeer and Leeuwenhoek, heedless of the latter's famous insularity. A presumed social link between the two men customarily arises from the fact that Leeuwenhoek was executor to the young Vermeer's will, but this is likely because of Leeuwenhoek's position as a

local government official, and does not imply personal familiarity.

Kemp discusses the popular icons that a few scientists manage to become, although the conventional images of Albert Einstein and Charles Darwin should remind one that famous scientists are almost always old and male. Only one woman, Maria Sybilla Merian, caught my eye as having a chapter of her own; of the few women figured, only one of them (Leonardo's Mona Lisa) has her clothes on. There are very few youngsters in this book, although most of the scientists familiar to us as seniors made their great discoveries when young.

As a collection of discourses, this is a fine book for the bedside. It may gather some artistic readers who will find out something about science. But Kemp's book does not break down barriers, for the choice of people and places tends to reinforce many of the most outdated stereotypes. Although he wanders freely through an eclectic selection of images and ideas, he could perhaps have done more to explore new ground.

BRIAN J FORD, *Cambridgeshire, United Kingdom*

THIS INCOMPARABLE LAND: A GUIDE TO AMERICAN NATURE WRITING.

By *Thomas J Lyon*. Minneapolis (Minnesota): Milkweed Editions. \$18.95 (paper). xii + 277 p; no index. ISBN: 1-57131-256-0. 2001.

Anyone interested in nature writing will appreciate this guide. The volume is an ideal resource for anyone planning a course in nature writing or seeking a history or annotated bibliography of essays and nonfiction nature writing.

The guide opens with a delightfully idiosyncratic chronology of events from 1492 to 2000, starting with a quotation associated with Columbus's landing in the Bahamas, and ending with notes on publication events, the world's population, fires in the western U.S., and the death of a key environmental leader in the year 2000. Following the chronology is a taxonomy of nature writing. This taxonomy is based on the extent to which writings include facts about natural history, personal commentary, or philosophical perspective. To illustrate the taxonomy, Lyon presents a table with examples of nature writing in the following categories: field guides; natural history essays; rambles; solitude and back-country living; travel and adventure; farm life; and man's role in nature.

Several chapters (about one-third of the book) set the context and review the history of nature writing (The American Setting; Beginnings; The Age of Thoreau, Muir, and Burroughs; and The Twentieth Century). For those of us unfamiliar

with the field of nature writing, these chapters do an excellent job of providing perspective. The bulk of the book (over half of the pages) is devoted to a two-part annotated bibliography. The first section represents the author's choice of essays about natural history or the experience of nature (ranging from wilderness to farm life). The second section lists philosophical essays, literary criticism, histories, anthologies, and scholarly works.

This is a valuable resource for anyone interested in an overview of the best in American nature writing.

MARTY CONDON, *Biology, Cornell College, Mount Vernon, Iowa*



PALEONTOLOGY

INTRODUCTION TO THE STUDY OF DINOSAURS.

By Anthony J Martin. Malden (Massachusetts): Blackwell Science. \$74.95 (paper). xiv + 426 p; ill.; index. ISBN: 0-632-04436-5. 2001.

Many dinosaur books of late begin with the refrain, "do we need another book on dinosaurs?" Indeed, I have coauthored one that starts this way, as has A J Martin in his book, *Introduction to the Study of Dinosaurs*. Apparently the answer is "yes," especially given the increasing number of undergraduate science courses tailored for nonscience majors. These are often turned into bread-and-butter courses by both geology and biology departments, yielding greater Full-Time Equivalents (FTEs), and hence more awareness and support from the Dean's Office. What could be better—a popular class on exciting animals (they were in the movies, after all), and it will be easy.

So how does Martin's book stack up? First, it amply demonstrates that excitement about the natural world and the science used to understand it can be combined under the guise of dinosaurs and the research that has been conducted on them. For example, much of the volume is organized around questions on how the past (deep time) can be understood through the introduction of the physics of body weight, stratigraphic succession and radiometric dating, nasal cavity size and resonance, the physics of head butting, and the potential for transport in streams as a function of buoyancy. These are excellent ways to focus on numerical approaches to the life and times of dinosaurs. In addition, Martin's handling of the dinosaurs themselves includes discussion of each major group, a treatment of within-clade evolutionary relationships with the features that provide the tree topol-

ogy, as well as various aspects of the paleobiology of the group. Although taking up less than half of the volume, these chapters that focus on the different dinosaurian groups are quite well done.

The volume, however, misses an important opportunity to present how evolutionary relationships among organisms (both extinct and living) can be determined. The use of cladistics is now a mainstay in much of biology, no more so than in the most active areas of dinosaur research, that of the origin of birds. Unfortunately, nowhere in the book is there discussion of how characters are selected in cladistics, the hierarchical nature of homology, and the ways in which tree topologies can be tested. Given the other hands-on approaches presented in Martin's book, it would also have been appropriate to introduce these powerful tools of cladistics.

I was particularly surprised that there is a complete lack of bibliography and appropriate citations of primary research in this book, such that students do not have a direct contact with where the ideas and research originally came from. In their place are references to websites where it might be possible to make cyber-connections to original references. Unfortunately, there is no guarantee that this is true, as I learned when I unsuccessfully tried to relate particular passages in the book with citations on the Web to the original studies. Woe to all of us if this is going to be a continued trend.

Finally, the most disappointing aspect of the Martin book is the lack of decent illustrations. Given that this volume is devoted to very "photogenic" subjects, there are too few figures and those that exist are limited to less than half a page or to the margins, making it very difficult to read the labels.

Introduction to the Study of Dinosaurs succeeds in being a reasonably good textbook for undergraduate science courses for nonscience majors. It has a way to go, however, before it can be considered a major contribution at this level.

DAVID B WEISHAMPEL, *Center for Functional Anatomy & Evolution, School of Medicine, Johns Hopkins University, Baltimore, Maryland*

THE ARMORED DINOSAURS. *Life of the Past.*

By Kenneth Carpenter. Bloomington (Indiana): Indiana University Press. \$75.00. xv + 526 p; ill.; index. ISBN: 0-253-33964-2. 2001.

Few dinosaurs rival the spiky stegosaurs and knobby ankylosaurs for sheer oddness, and their dermal exuberance has fostered some wild paleobiological speculation. The armored dinosaurs, including these two groups and a few basal members of their common group Thyreophora, have received less scientific attention than is their due, and this collec-

tion of papers attempts to correct this imbalance. Here 29 authors present 21 papers on the history of study, jaw function, pathology, development, ichnology, scatology, phylogeny and, predominantly, descriptive morphology of armored dinosaurs, in three taxonomic sections: Thyreophora (two chapters), Stegosauria (five chapters), and Ankylosauria (14 chapters).

This useful compendium of papers will excite informed readers but, unfortunately the Table of Contents and Index are the only tools provided by the editor to assist uninitiated readers in seeing the forest through the trees. There is no preface to the volume or the individual sections other than a charming biographical dedication to ankylosaur pioneer Walter Coombs, and the volume consists solely of highly specialized articles. Two well-written historical chapters on the initial interpretation of thyreophorans discovered in the late 19th century will appeal to general readers, but the only broadly synthetic chapters are a useful summary of ankylosaur footprint occurrences and a somewhat flawed phylogenetic analysis of ankylosaurs. Geographic coverage is broad, but favors non-Asian forms, and there is little on their geological milieu. Illustrations are plentiful, but vary widely in quality, from well-lit stereophotographs of exquisite specimens to dark, out-of-focus photographs of black lumps. Taxonomic treatment is generally at the alpha level, and no systematic revisions of higher groups are presented. The phylogenetic analysis provides some important observations, but its utility is hampered by the designation of only the derived character states, the use of supraspecific terminal taxa, and the independent analysis of four groups of taxa. The latter procedure was inspired by a paper by Vermeij that was heavily criticized for limiting global parsimony (see *Paleobiology* 27(1):179–180).

In summary, this volume will be most useful to those whose interest in dinosaurs knows no bounds, but it is not an ideal reference for nonspecialists.

JAMES M CLARK, *Biological Sciences, George Washington University, Washington DC*

DEEP TIME: PALEO BIOLOGY'S PERSPECTIVE. A special volume commemorating the 25th anniversary of the journal *Paleobiology*.

Edited by Douglas H Erwin and Scott L Wing. Published by The Paleontological Society, Lawrence (Kansas); distributed by the University of Chicago Press, Chicago (Illinois). \$60.00 (hardcover); \$25.00 (paper). vi + 373 p; ill.; no index. ISBN: 0-9677554-2-5 (hc); 0-9677554-3-3 (pb). [Supplement to Volume 26, Number 4 of the journal *Paleobiology*.] 2000.

This is an edited volume of 15 papers that was published to celebrate the 25th anniversary of the journal *Paleobiology*. Its name is derived from the

unique perspective paleontology brings to the study of ecology and evolution. Since the first volume in 1975, the journal has been the leading paleontological publication that deals with theoretical issues. In fact, its original genesis was in the edited volume, *Models in Paleobiology* (T J M Schopf. 1972. San Francisco (CA): Freeman, Cooper), which contains the most frequently cited modern paleontological paper—Punctuated equilibria: an alternative to phyletic gradualism, by Niles Eldredge and Stephen Jay Gould.

Paper topics in *Deep Time* primarily focus on invertebrate paleontology (12 papers), with paleobotany (two papers) and vertebrate paleontology (one paper) figuring less prominently, although some of the chapters do contain overlap across these three broad paleontological disciplines. It would have been nice to have had at least one more paper that dealt specifically with vertebrate evolution and phylogeny from a paleontological perspective.

There are some fine contributions in this volume. Chief among these are the ones on biomolecular paleontology of continental fossils (Briggs et al.) and on directionality in the history of life (Knoll and Bambach). Plotnick and Baumiller also have a fine paper on functional analysis of fossils, and Shubin and Marshall provide an interesting chapter on fossils, genes, and the origin of novelty. In addition, Foote's paper on taxonomic diversity will be an important reference on the topic of quantifying speciation and extinction rates in the fossil record, although surely not the last word on this subject. Finally, the paleobotanical chapters on modeling plant form (Niklas) and plant community changes in response to Quaternary environmental oscillations (Jackson and Overpeck) also appear particularly well chosen: a testimony to Scott Wing's successful tenure as coeditor of *Paleobiology*.

One of my disappointments about this volume reflects those authors whose work was not included. Niles Eldredge and Stephen Jay Gould should definitely have been asked to author a paper because of their stature in the field and also because of the important role their punctuated equilibria hypothesis played in the genesis of the journal *Paleobiology*. Another disappointment is that for those chapters that deal with the invertebrate side of paleontology there is perhaps a preponderance of papers by authors from only one school of thought; if this scope had been broadened it might have been beneficial.

BRUCE S LIEBERMAN, *Geology and Ecology & Evolutionary Biology, University of Kansas, Lawrence, Kansas*



MOLECULAR BIOLOGY

PROTEIN-PROTEIN INTERACTIONS: A MOLECULAR CLONING MANUAL.

Edited by Erica Golemis. Cold Spring Harbor (New York): Cold Spring Harbor Laboratory Press. \$205.00 (hardcover); \$135.00 (paper). ix + 682 p; ill.; index. ISBN: 0-87969-604-4 (hc); 0-87969-628-1 (pb). 2002.

This new volume covers a wide range of techniques currently used in the field of protein-protein interactions. Due to space constraints, the editor has chosen to exclude classic biochemical approaches to study proteins such as Western blotting, subcellular fractionation, chromatography, differential centrifugation, electrophoretic mobility shift assay, enzyme-linked immunoadsorbant assay, and immunofluorescence microscopy.

The chapters in Section 1 illustrate the importance of protein-protein interactions by describing specific techniques that have been applied to particular biological problems. The second section deals with well-established biochemical and genetic approaches used to study protein-protein interactions, including far-Western and Glutathione-S-Transferase (GST)-pull down assays, coimmunoprecipitation, chemical protein cross-linking, basic yeast and bacterial two-hybrid systems, phage display, and a suppressor-hunt screen. Section 3 focuses on biophysical methods: fluorescence resonance energy transfer microscopy, green fluorescent protein proximity imaging, mass spectrometry, atomic force microscopy, surface plasmon resonance, and quartz crystal microbalance. The fourth section is the major component of the book, and groups a wide assortment of techniques. Topics described include protein purification by tandem affinity or by specific peptide-fusions, several variations of the basic two-component protein interaction assays, and an assortment of novel developments such as peptide aptamers, catalytic antibodies, and ribosome display. The final section explores computational approaches used to handle and represent large protein-interaction data sets, and provides useful information regarding currently available databases and visualization tools.

In general, the majority of the chapters provide excellent reviews and relevant background information on the topics covered. In contrast, they vary quite a bit in the amount of experimental detail

provided. For example, many chapters include useful figures or diagrams of the methods and relevant machinery, as well as detailed protocols and troubleshooting suggestions, while others are restricted to generalities or focus on a single example using the given technique. In any case, comprehensive bibliographies are available at the end of each chapter for further reference.

This book will assist investigators in deciding which approaches are most relevant for studying their favorite protein-protein interactions. Undoubtedly, the background overviews, introductory protocols, and bibliographic references will get them started in the right direction.

MARISSA VIGNALI and VICTORIA BROWN-KENNERLY, *Genome Sciences, University of Washington, Seattle, Washington*

ENDOCYTOSIS. *Frontiers in Molecular Biology, Volume 36.*

Edited by Mark Marsh. Oxford and New York: Oxford University Press. \$120.00 (hardcover); \$65.00 (paper). xxi + 283 p + 5 pl; ill.; index. ISBN: 0-19-963852-7 (hc); 0-19-963851-9 (pb). 2001.

MOBILE DNA II.

Edited by Nancy L Craig, Robert Craigie, Martin Gellert, and Alan M Lambowitz. Washington (DC): ASM Press. \$169.95. xviii + 1204 p + 49 pl; ill.; index. ISBN: 1-55581-209-0. 2002.

Since *Mobil DNA* was published in 1989 (Washington (DC): American Society for Microbiology), the field has exploded with new discoveries. Transposable DNAs have been used in gene therapy. Genomewide views of the propagation of mobile DNAs and their impact on genome evolution are now recognized. Several new superfamilies of transposons have been identified. Over 90 experts have contributed to this volume.



CELLULAR BIOLOGY

MECHANICS OF MOTOR PROTEINS AND THE CYTOSKELETON.

By Jonathon Howard. Sunderland (Massachusetts): Sinauer Associates. \$59.95. xvi + 367 p; ill.; index. ISBN: 0-87893-334-4. 2001.

Admittedly, in the counterintuitive nanoworld of cells and macromolecules, much of the physics that biologists and biochemists were taught is plainly irrelevant. Even worse, most of what we actually

need to know lies buried in advanced textbooks visited mainly by engineers. To the beating tail of a spermatozoon or a moving anaphase chromosome—whose world is dominated by viscous, not inertial forces—it may be true that $F = ma$, but it simply does not matter. How then are we to understand the world of proteins? Based on their structural properties, how should we expect them to behave in the cell?

Howard's book addresses these questions for the proteins of the cytoskeleton, which confer upon the cell its structure, shape, and ability to move. The past few years have presented this field with an embarrassment of riches: the elucidation of a vast diversity of cytoskeletal and motor proteins, extending to families and superfamilies of related proteins, along with the determination of the high resolution structure of a number of the major proteins. The morass of molecular detail now tempts us to wade in and hunt for meaning by analyzing DNA and amino acid sequences. This book plots a different way forward. Howard explicates quantitatively the general mechanical properties of the cytoskeleton and its motor proteins, and shows how to use this knowledge both to probe the cytoskeleton productively, and to explain the larger properties of cells.

The book begins with a lengthy section that develops, from the ground up, the physical and mechanical principles that are necessary to understand how macromolecules behave. In addition to viscous forces, a number of other essential concepts are treated, including diffusion, damping, chemical forces, and the mechanical properties of polymers. Although there are patches of tough sledding for those of us whose calculus has grown rusty with disuse, the effort is well worthwhile. For the most part, the author has used a level of mathematical detail appropriate to his goals, while leaving the bloody-minded to delve into the appendixes for the finer points. Following this groundwork, the two remaining parts of the book apply quantitative physical principles to the mechanical properties of the cytoskeleton and the behavior of motor proteins. Both parts build nicely on the introductory material and illuminate the major advances and remaining problems in the field. Perhaps the latter are the more useful. It is easy now, years after the first successful assembly of cytoskeletal filaments in the test tube, to forget that there is still much to be learned about how a pool of tiny protein subunits can polymerize into organized structures spanning the cell. And likewise, decades after the accession of the rotating crossbridge model of motor protein action, we are often guilty of lapsing into cartoon-like explanations of motor proteins that are macroscopically intuitive—and therefore wrong. More rig-

orous approaches are demanded if we are to further expand our understanding of the cytoskeleton and its motor proteins. Howard reminds us just how much more, and how to frame the questions clearly.

This volume would serve as an extremely useful textbook for an advanced course in the biophysics of macromolecules. It may also find use in a variety of upper-level courses in the biochemistry and molecular biology of the cell. But for anyone who labors in the fields of cell motility and the cytoskeleton, this volume is both an immensely worthwhile read and a fine biophysics reference to have on the shelf. Readers need not retain the partial differentials; if you have scribbled adequately in the margins, you will soon be pulling it down and locating the information that you need in order to recognize and then dismiss one piece of "intuitive" nonsense or another.

PETER J. HOLLENBECK, *Biology, Purdue University, West Lafayette, Indiana*

BASIC CELL CULTURE: A PRACTICAL APPROACH. *Second Edition. The Practical Approach Series, Volume 254. Edited by J M Davis. Oxford and New York: Oxford University Press. \$120.00 (hardcover); \$60.00 (paper). xxv + 381 p; ill.; index. ISBN: 0-19-963854-3 (hc); 0-19-963853-5 (pb). 2002.*

EXCITATORY AMINO ACIDS: TEN YEARS LATER. *Based on a meeting held in Manaus, Brazil, 18–22 November 1998. Biomedical and Health Research, Volume 45.*

Edited by L Turshi, D D Schoepp, and E A Cavalheiro. Amsterdam (The Netherlands) and Washington (DC): IOS Press. \$100.00. viii + 346 p; ill.; index. ISBN: 1-58603-072-8. 2001.



GENETICS & EVOLUTION

THE BOOK OF LIFE: AN ILLUSTRATED HISTORY OF THE EVOLUTION OF LIFE ON EARTH.

General Editor: Stephen Jay Gould; Contributing Scientists and Illustrators: Peter Andrews, John Barber, Michael Benton, Marianne Collins, Christine Janis, Ely Kish, Akio Morishima, J John Sepkoski, Jr, Christopher Stringer, and Jean-Paul Tibbles. New York: W. W. Norton. \$45.00 (hardcover); \$29.95 (paper). v + 256 p; ill.; index. ISBN: 0-393-05003-3 (hc); 0-393-32156-8 (pb). 2001.

Why reissue a book on the evolution of life that was published nearly a decade ago? The editor asks this question in the new introductory chapter. His

answer is that the book is terrific and that the story has not changed much in ten years. He is partly right. The book is terrific in lots of ways. The contributors are experts in their fields and great writers: the late Stephen Jay Gould (reconstructing the past), the late Jack Sepkoski (evolution of marine life), Michael Benton (life and time, and all the nonmammalian vertebrates), Christine Janis (mammalian evolution), and Peter Andrews and Christopher Stringer (Primates) produced engaging chapters with lively insights and crisp summaries of groups, ages, and events that are usually difficult to epitomize. The lavish illustrations include first-rate graphics and fulsome paintings of prehistoric life that range from accurate and evocative to wooden and cartoonish. This is the sort of book, such as Richard Cowen's *History of Life* (Third Edition. 2000. Malden (MA): Blackwell Science) that you would want to give to friends curious about what we generally know about the past and how we know it (although Cowen's volume is probably better overall).

But what of Gould's second question? Has the story of life changed much since 1993? Gould mentions some examples, such as Precambrian bilaterian embryos, more evidence about the "Cambrian Explosion," the early history of vertebrates, and the origin of whales, in his new introduction. But maybe that is not the point. He goes on to lament his book's possible shortcomings: it inevitably proceeds chronologically, and it presents groups along the traditional "ladder of life," so that groups introduced earlier in the chronology are more or less forgotten later on. A new final chapter, he adds, might have been a discussion of modern bacteria.

Well, maybe so. But a *scala naturae* approach would have been better avoided by some incorporation of phylogenetic advances. In this book, fishes are things that swim in the water; amphibians are tetrapods that are not reptiles (regardless of whether they are closer to living amphibians or living amniotes), and reptiles are things that are not mammals or birds. So, of course, readers get the sense of a stepwise progression toward humans (the last chapter, no surprise) instead of the branching bush that Gould describes so often in his works.

A strong theme of the book is the continual recurrence to geological and climatic changes that accompany the history of life. Unfortunately, invertebrates are largely omitted after the first chapter, and plants are treated less as organisms than as just part of the scenery, fodder, and substrate for the animals. Is only fine-tuning needed, or will the new millennium bring a new way of describing the history of life? "I do not know the best way for telling this most wonderful and intricate of all stories,"

Gould concludes (p 5), and some readers may reluctantly agree. It is a difficult assignment.

KEVIN PADIAN, *Integrative Biology and Museum of Paleontology, University of California, Berkeley, California*

FROM GENESIS TO GENETICS: THE CASE OF EVOLUTION AND CREATIONISM.

By John A Moore. *Berkeley (California): University of California Press.* \$27.50. xvi + 223 p; ill.; index. ISBN: 0-520-22441-8. 2002.

In the increasingly contentious debates between science and religion, this book is refreshingly dispassionate—a largely historical overview of a broad sweep of subjects related to the evolution and creation controversies. Prefacing the text with the observation that the teaching of evolution serves as a litmus test for the rigor of scientific education, the author then describes several examples in which "two immiscible patterns of thought" (p 4) are in conflict. These differences in world-view include disputes between anthropologists and Native Americans over the Kennewick Man, between human rights advocates and the Taliban about the role of women in society and, yes, between scientists and creationists over the teaching of the theory of evolution. In this context, the author examines early human history and the origins of the Bible, particularly in regard to the two creation stories found in modern versions of Genesis. Subsequently, Darwin, his scientific predecessors and contemporaries, and his theory of evolution are introduced. Following an historical chronology, data and observations that support Darwin's theory are reviewed for the balance of the 19th and 20th centuries, including the theory of genetics, models of speciation, and hypotheses for the origin of life and the origin of human beings. Finally, the history of 20th-century conflicts between scientists and creationists over the teaching of evolution in the United States is outlined.

With such a broad range of topics, some omissions and inconsistencies are inevitable. For example, no mention is made of recent investigations of the postglacial flooding of the Black Sea and the role that this may have played in flood epics, e.g., in Genesis and the Epic of Gilgamesh. Several "icons" of evolution (e.g., the peppered moth and Stanley Miller's experiments) are presented uncritically and without further elaboration and qualification. The evolution of increasing complexity is frequently emphasized, while examples to the contrary (e.g., parasites such as amitochondriate eukaryotes) are not stressed. A strict view of creation according to Genesis is criticized because "[i]t provides no acceptable explanation for the

remarkable biochemical similarities in the cells of microorganisms, plants, and animals, for the universality of the genetic code, for the peculiarities of the geographic distribution of species, for the basic structure of major groups of organisms and the variations shown in the individual species in the group, or for the cycles of life that maintain a rough biological and chemical equilibrium in the environment" (p 52). Nevertheless, later the obvious creationist rejoinder is pointed out in another context: "All vertebrates are constructed on the same general plan, that is, they are variations on the vertebrate theme. This astonishing observation could be explained as the consequence of divine creation: the Creator made all the vertebrates as variations on one basic theme" (p 83).

The discussion of the new creationism—intelligent design (ID) theory—could have been stronger. The author correctly links this theory with William Paley's centuries-old views, but does not emphasize that ID theory focuses on the most recently characterized natural histories—biochemistry and molecular biology. The author then writes: "I.D. creationists believe that some things about organisms are so complex that they are not just unknown but ultimately unknowable and, hence, are the work of an Intelligent Designer" (p 180). This is somewhat misleading. Rather than suggesting that molecular and biochemical mechanisms cannot be characterized, ID theory argues that such "irreducibly complex" mechanisms could not have evolved. There is little in *From Genesis to Genetics* to counter this view. Generally, the broad sweep of this volume and the historical and social context make it well worth reading for both scientists and nonscientists. In this way, *From Genesis to Genetics* will lead to more miscible patterns of thought from all those concerned about science education.

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

REVOLUTIONARY BIOLOGY: THE NEW, GENE-CENTERED VIEW OF LIFE.

By David P Barash. *New Brunswick (New Jersey): Transaction Publishers.* \$29.95. vii + 213 p; index. ISBN: 0-7658-0067-5. 2001.

Any book that purports to answer fundamental questions such as "what is the meaning of life?" and "why are we here?" deserves close attention. For the most part, *Revolutionary Biology* does not disappoint. The book is separated into seven chapters—Revolutionary Biology: The Family Face; Altruism: Theory and Animals; Human Altruism; Reciprocity: Doing unto Others; Parenting, Adoption and Step-Parenting; Conflict between Parents and Offspring; and To Whatever Abyss.

Barash draws on a diverse array of scientific, medical, philosophical, and literature resources to review how genes may influence behavior, ranging from social cohesiveness among bees and ants to human nepotism and extramarital sex. As the author acknowledges, arguments presented with respect to the broad spectrum of human behaviors, although persuasive, rest on tenuous grounds. Human genes whose functions have been conclusively identified are relatively few in number. More troubling are the difficulties encountered with regard to the citation of research studies. In the first chapter, two studies are cited that purported to identify the gene for risk taking, "novelty-seeking" behavior in human beings. The author states that these studies provided the "first example of an identified human gene concerned with a normal behavioral predisposition. . . . Almost certainly, it will not be the last" (p 29). In the chapter's footnotes, however, the author acknowledges that "a different team of researchers was unable to replicate its findings" (p 35), and that the initial results may have been "in error" (p 35). It is reasonable to question why this later study was not acknowledged and discussed within the body of the chapter. Although this appears to be an isolated incident, it creates an atmosphere of skepticism in which readers may feel compelled to review the footnotes of each chapter in order to determine the credibility of the human genetic studies. This criticism aside, the author has provided an entertaining, informative, and provocative resource.

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GENES & SIGNALS.

By Mark Ptashne and Alexander Gann. *Cold Spring Harbor (New York): Cold Spring Harbor Laboratory Press.* \$59.00 (hardcover); \$39.00 (paper). xvi + 192 p; ill.; index. ISBN: 0-87969-631-1 (hc); 0-87969-633-8 (pb). 2002.

This is a delightful book that provides an insightful view of our current understanding of how gene expression is regulated. Beginning with gene expression in prokaryotic systems, the authors present basic principles, using experimental examples from phage lambda and *E. coli*. They then move on to genetic systems with increasing complexity in yeast and higher eukaryotes. What is very nice about this book is that the authors successfully extract experimentally defined principles that regulate gene expression, and build upon these to make readers comfortable with higher levels of complexity. For example, the theme of transcriptional regulation by binding of a multidomain protein to DNA and to a transcriptional activator is built upon throughout the book until one reaches

the complexities defining combinatorial regulation of promoters in higher eukaryotes.

Genes & Signals is comprised of four chapters on prokaryotes, yeast, and higher eukaryotes, with a final chapter directed toward integrating cell signaling with transcriptional control. The book is ambitious in scope, but retains its clarity by incorporating basic principles that are supplemented with well-illustrated figures and more detailed discussions of topics in boxes and footnotes. References for further reading are given at the end of each chapter. This book will be useful for students who are grappling for the first time with gene expression, but perhaps is even more informative for scientists, like myself, who work outside the field of transcriptional regulation, but who can greatly benefit from a clear understanding of the state of the field. Having read this volume, one can jump into the dense thicket of papers describing transcriptional regulators and signaling pathways with a basic understanding of the principles underlying this exciting work. I thoroughly enjoyed reading this book and highly recommend it.

MARY COLLINS, *Musculoskeletal Sciences, Wyeth Research, Cambridge, Massachusetts*

GENES AND MECHANISMS IN VERTEBRATE SEX DETERMINATION. *EXS*, Volume 91.

Edited by G Scherer and M Schmid. Basel and Boston: Birkhäuser Verlag. DM 196. xii + 205 p; ill.; index. ISBN: 3-7643-6168-9. 2001.

During the past 30 years, a major scientific effort was expended in elucidating the molecular mechanism underlying the mammalian sex chromosome mechanism. This has resulted in the discovery of a number of genes with important functions in the process of male sex determination. Somewhat paradoxically, in the same period, evidence accumulated that many reptiles lack sex chromosomes, and that sexual development in these species depends on environmental variables, of which temperature of incubation seems to be the most important. In the wake of these findings, there is now increasing interest in comparisons between the sex-determining mechanism of mammals and those of other vertebrates. The changing scientific picture is reflected in the composition of this book.

The reptilian contribution, by Pieau et al., is confined to temperature-dependent sex determination, but the sex chromosomes of snakes are briefly described in the chapter on Amphibia by Schmid and Steinlein. Evidence from Amphibia suggests that changes in repetitive DNA may precede the evolution of morphologically distinct sex chromosomes. The chapter on fish, by Baroiller and Guiguen, concentrates on endocrine and environmental sex differentiation. The introductory chapter,

on paralogues of sex-determining genes, is by the late Susumu Ohno, to whose memory the book is dedicated.

In his important review of *Sry*, the Y-chromosomal gene that triggers male development in mammals, and the related *Sox9* gene, which is also required for male development, Koopman discusses their relationship with about a dozen other genes and concludes that the description of sex determination as a pathway is hopelessly inadequate and that we are dealing with a complex network (p 47). By virtue of its presence in one sex only, *Sry* is confined to mammals, but *Sox9* and other genes involved in the sex-determining process are also found in other vertebrates. *Sry* is present in marsupials but not apparently in monotremes. The contribution by Pask and Graves provides a fascinating picture, based on findings in these two mammalian subclasses, of the evolution of the mammalian X- and Y-chromosomes from an original autosomal pair.

Avian sex chromosomes, ZZ in males and ZW in females, are derived from a different autosome pair. As pointed out by Clinton and Haines, avian gonads are more plastic than those of (eutherian) mammals, their development being also influenced by steroid hormones and laterality. Oestrogens play an important role in the differentiation of the ovary also in turtles, crocodilians, and lizards, whose sex is determined by the temperature of incubation during a critical period of development, referred to as the "temperature-sensitive period" (TSP); but it can be seen from the diagram on page 122 that even before TSP, the gonadal protein contents of *Emys orbicularis*, the European freshwater turtle, is higher at male- than at female-producing temperatures. Baroiller and Guiguen have alluded to the relationship between water temperature and growth rates in fish (pp 178 and 192).

Although some of the genes involved in mammalian sex determination have also been found in other vertebrates, their function remains unknown. It may be worth reversing the quest and explaining mammalian sex determination by concentrating on the effects of temperature on the dynamics of growth in poikilothermic vertebrates, who are the antecedents of mammals and birds.

URSULA MITTWOCH, *Biology, University College London, London, United Kingdom*

THE COOPERATIVE GENE: HOW MENDEL'S DEMON EXPLAINS THE EVOLUTION OF COMPLEX BEINGS.

By Mark Ridley. New York: The Free Press. \$26.00. xii + 324 p; ill.; index. ISBN: 0-7432-0161-2. 2001.

The theme of this book is that sexual reproduction and Mendelian inheritance are a necessary condition for the evolution of complex, multicellular

organisms. The book is aimed at people who are not trained as biologists, and adopts the breathless style that is currently fashionable for popular works. Ridley has chosen a major theme that will be of broad interest. Given the fact that much of what he says is based on population genetic models, he relies skillfully on ingenious, but sometimes convoluted, verbal analogies to convey his major points.

The argument boils down to the following: First, life originated early in evolution, but multicellular life came very late. Ridley claims that this means that the evolution of life is probable, but complex life is improbable. This logic seems shaky, as probabilities cannot be inferred from single trials. Second, complex organisms need large genomes, which imply high deleterious mutation rates and hence high genetic loads, which threaten them with extinction. Sexual reproduction overcomes this problem, since synergistic epistasis can greatly reduce the mutational load. Third, sex allows selfish genetic elements to subvert Mendelian ratios, and undermine individual fitness. The reshuffling of genes by genetic recombination allows these to be suppressed. Hence, Mendelian inheritance with relatively free recombination is necessary both for the evolution of complex life and for its continuing survival. Various other issues, such as the evolution of two sexes and genetic imprinting, are discussed along the way.

I am not convinced by all of this. Ridley tends to overlook alternatives to the possibilities he discusses; for example, could selection for reduced mutation rates be effective in reducing any problem from mutational load for the survival of asexual complex organisms? He never mentions Muller's ratchet, which is a strong candidate for causing the mutation-driven extinction of asexual higher organisms. In addition, there is a consistent tendency to present speculative ideas as established facts (e.g., the organelle conflict model of the origin of anisogamy). The professional will be disappointed by the lack of a balanced treatment of many key issues. I suspect that laics may be baffled by the complexity of many of the issues discussed.

BRIAN CHARLESWORTH, *Institute for Cell, Animal & Population Biology, University of Edinburgh, Edinburgh, United Kingdom*

GENETIC PREHISTORY IN SELECTIVE BREEDING: A PRELUDE TO MENDEL.

By Roger J Wood and Vítězslav Orel. *Oxford and New York: Oxford University Press.* \$85.00. xvii + 323 p; ill.; index. ISBN: 0-19-850584-1. 2001.

This is a really useful and interesting book, well worth ordering for a college library, although I think it is more specialized than most general read-

ers would desire for personal purchase. The problem set by the authors, one of whom (Orel) is the former head of the Mendelianum in Brno, is whether Gregor Mendel and the work that led him to his laws of heredity came from nowhere, or whether there was a long and rich tradition into which he was tapping and the culmination of which he represented. The authors argue that there was such a tradition, that in fact much was known about breeding before Mendel (especially in the realm of sheep improvement) and with care and a lot of documentation they set about making their case.

From early breeding in Spain we move to England, to the British Midlands in particular, and more attention is paid to the innovative animal breeder, the 18th-century farmer, Robert Bakewell of Leicestershire. From there we proceed with Merino sheep to the continent, and eventually move across toward the east of Germany and the Austrian Empire (which is where Mendel's monastery was located). We then start to see how breeding transfers from the practical farmers to the more theoretically inclined scientists, as people start to wonder how exactly features are transmitted from one generation to the next. Finally, we move right up to the time and place of Mendel himself, and although it is stressed that people then knew much about breeding and could make good predictions, the actual laws governing transmission were still hidden from sight.

In other words, Mendel did belong to a rich tradition, but the glory of discovery was properly his alone. It is good to have such a thorough and sensible treatment of an area of practical biology that was clearly of importance to the development of the genetics which we hold and know today.

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FAUNAL AND FLORAL MIGRATIONS AND EVOLUTION IN SE ASIA-AUSTRALASIA.

By Ian Metcalfe, Jeremy M B Smith, Mike Morwood, and Iain Davidson. *Rotterdam (The Netherlands): A. A. Balkema.* \$130.00. 416 p; ill.; no index. ISBN: 90-5809-349-2. 2000.

The islands of eastern Indonesia hold a special fascination for biogeographers and evolutionary biologists. It was here in the 1850s that Alfred Russel Wallace identified the remarkable disjunction between faunas of the Asiatic and Australian regions. Wallace also recognized that to understand patterns of species distribution it requires knowledge of a region's geological history. Our understanding of geological processes has advanced significantly since Wallace traveled the Malay Archipelago, and this volume presents a use-

ful overview of the current state of knowledge about evolutionary processes and biogeography in Southeast Asia and Australasia.

The book is a compilation of 31 papers separated into six sections. The first section contains two excellent papers that describe tectonic evolution and changing configurations of land and sea in the region, and these provide a useful geological framework for most other chapters. Section 2 (five papers) discusses Palaeozoic and Mesozoic biogeography, presenting case studies from a broad range of taxa ranging from plants to dinosaurs. The six papers in Section 3 examine the history and biogeographic significance of Wallace's Line. A particularly interesting paper by Heinsohn summarizes data on animal translocations and invasions across Wallace's Line and throughout the region. This process has important implications for vertebrate zoogeography because humans have transported a remarkable diversity of animals among the islands, and many have established new populations well outside their natural ranges. The final three sections contain discussions of biogeography and evolution of plants (five papers), non-primate animals (seven papers), and primates (six papers). These contributions are of varying quality and scope, and the depth of coverage is markedly inconsistent. Many papers present new data or analyses, while others are largely speculative and based primarily on reviews of previously published information. Given the diversity of subject matter and approaches, it is unfortunate that there is no attempt to present an integrated summary in each section or at the end of the book. The printing quality and layout of this volume are also disappointing given the price, and the text has far too many typographical errors.

Despite these concerns, this book is full of little gems of information and will be a useful resource for anyone with an interest in biogeography and evolution in the Wallacea and surrounding regions.

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PROTECTING BIODIVERSITY: NATIONAL LAWS REGULATING ACCESS TO GENETIC RESOURCES IN THE AMERICAS.

Edited by Susan Perkoff Bass and Manuel Ruiz Muller; Foreword by Mohamed L Ashry. Ottawa (Canada): International Development Research Centre. \$25.00 (paper). xiv + 105 p; no index. ISBN: 0-88936-900-3. 2000.

With recent advances in genetic technology, the potential use of natural genetic resources for utilitarian purposes is staggering. These applications must be balanced against the need to conserve bio-

diversity in situ to the furthest extent possible. The current book begins by outlining these issues, and encourages "pure" scientists to become more involved with the debates, which are already well represented by corporate (financial) interests. The primary goal of this short volume is, however, to present the first coordinated effort (to my knowledge) to summarize legislation governing access to genetic resources in the Americas. Chapter 2 provides a brief history of related legislation in seven countries: Argentina, Canada, Colombia, Costa Rica, Paraguay, Peru, and United States. Chapter 3, the meatiest part of the book, contains four extensive tables that highlight similarities and differences among these seven countries, focusing on such issues as who maintains control of indigenous lands (Table 1) to regulations governing technology transfer (Table 3). Chapter 4, Options for the Future, contains some useful suggestions regarding coordination of efforts to develop comprehensive legal systems for controlling access to genetic resources, but it is five years old, summarizing a meeting held in 1997.

If scientists do wish to become more informed or even get involved in the legislation process surrounding the utilization of genetic resources in the developed and underdeveloped Americas, this volume gives them a place to start. It could also be an extremely useful resource to those who wish to gain access to genetic materials from one or multiple countries. For example, scientists considering embarking on a research program that would entail collecting material from several countries could benefit by first determining the logistical feasibility of their proposed research. Given the political instability of several Latin American countries, including two featured in this volume (Colombia and Argentina), I am concerned that the legislation discussed could be changing rapidly enough that the book is already out of date.

ANDREW STORFER, *Biological Sciences, Washington State University, Pullman, Washington*

BIOINFORMATICS: THE MACHINE LEARNING APPROACH. Second Edition. Adaptive Computation and Machine Learning.

By Pierre Baldi and Søren Brunak. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$49.95. xxiii + 452 p; ill.; index. ISBN: 0-262-02506-X. 2001.

The first edition of this book has greatly influenced the current generation of bioinformatics trainees. It is widely recognized as a classic "computer science oriented" treatment of the subject and was one of the first attempts at a comprehensive theoretical treatment of bioinformatics when initially published in 1998. The second edition contains

several important additions: a timely section on the human genome sequence and a review of protein function and alternative splicing (Chapter 1); a discussion of applications of neural networks (Chapter 6); a section on gene-finding algorithms (Chapter 9); and a new chapter on algorithms for analyzing DNA microarray and gene expression data (Chapter 12). The book assumes that readers will have some understanding of classical probability theory and mathematical statistics (at the level of a second year undergraduate course); more advanced measure theoretic probability concepts are avoided. The book should therefore be of interest to mathematically oriented biologists and computer scientists, as well as applied statisticians. The statistical orientation is predominantly Bayesian, but out of practical necessity rather than dogmatism. There are several relatively self-contained chapters on fundamental statistical topics such as Bayesian Inference (Chapter 2); Probabilistic Modeling and Inference (Chapter 3); and Machine Learning Algorithms (Chapter 4). In particular, Chapter 4 provides a useful introduction to several numerical methods for calculating probabilities and estimating parameters, including the Expectation-Maximization (EM) algorithm and Markov Chain Monte Carlo (MCMC) algorithms. Such methods now play a fundamental role in virtually all areas of genetic analysis ranging from physical mapping to genetic anthropology.

Bioinformatics aims to be a self-contained work and therefore includes separate appendixes that deal with advanced statistical concepts such as: decision theory, sufficient statistics, and exponential families of probability distributions (Appendix A); information theory and statistical entropy measures (Appendix B); probabilistic graphical models (Appendix C); and technical aspects of Hidden Markov Models (Appendix D). This volume is best viewed as a textbook, favoring brevity over comprehensiveness. It fails to provide key references in several areas (most obvious in the chapter on phylogenetic methods) but the authors' bare-bones approach to references does make the book easier to read and provides a coherent (although somewhat biased) picture of developments in this field.

One weakness is that the volume often tends to be quite superficial in its treatment of the details of the models and algorithms. For example, Chapter 10 deals with the entire subject of phylogenetic inference in a mere ten pages. The description of DNA substitution models is constrained only to the most general form (a "Q matrix" with unspecified parameters) and the simplest example of a Q matrix (essentially a Jukes-Cantor model, but with an unspecified stationary nucleotide frequency distribution). Factors that have been observed to

be of specific importance in analyses of actual sequences (such as transition-transversion bias) are not mentioned. Examples of particular substitution models that have been widely used in the published literature would be helpful. The authors also gloss over the extensive literature on branching process priors for the speciation process (dating back to at least the 1960s) with the comment "[l]ittle work has been done so far to define prior distributions on the space of phylogenetic trees, in terms of both the branching process and the branching lengths" (p 273). No further references are provided. Such statements will be of little use to readers and are potentially misleading. The discussion of algorithms for searching the tree space to find a maximum likelihood (ML) tree is similarly superficial, being limited to a single paragraph with little technical content; there is no discussion of the Bayesian MCMC approaches for tree searching that have been in use since 1997.

Overall, this book is essential reading for anyone coming from outside the field that is interested in making original theoretical contributions to bioinformatics. It will also be a useful resource for those involved in data analysis who would like to gain a deeper understanding of the principles underlying current methods. The book is too short on details, and scant on citations of the primary literature, to be useful as a reference work, but arguably makes up for these weaknesses with its didactical strengths. The second edition includes sufficient new material that is probably worth a look, even for those who have read the first edition.

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MACGLADE 4: ANALYSIS OF PHYLOGENY AND CHARACTER EVOLUTION. *Version 4.0.*

By David R Maddison and Wayne P Maddison. Sunderland (Massachusetts): Sinauer Associates. \$125.00 (CD-ROM). ISBN: 0-87893-470-7. [Requirements—MAC: MacOS System 7.5 or later, 4MB hard drive space, 4MB RAM.] 2000.

ADAPTATIONISM AND OPTIMALITY. *Cambridge Studies in Philosophy and Biology.*

Edited by Steven Hecht Orzack and Elliott Sober. Cambridge and New York: Cambridge University Press. \$75.00 (hardcover); \$28.00 (paper). xv + 404 p; ill.; index. ISBN: 0-521-59166-X (hc); 0-521-59836-2 (pb). 2001.

Adaptationism is the claim that natural selection is the only important cause of nonmolecular trait evolution. Along with adaptation, optimality also has enjoyed a controversial history. Both concepts

are based on the primacy of natural selection as the main designer of phenotypes. Orzack and Sober bring together a diverse group of biologists, modelers, and philosophers to comment on the current status of adaptationism and optimality, with the biologist "in the trenches" in mind. Their introduction is one of the more thoughtful contributions, outlining the essential developments and contentious areas.

The first three chapters address the use of historical approaches to testing adaptations. This area has received much attention in the past 20 years, and there is still controversy regarding the usefulness of comparative methods. Topics discussed include the development of new likelihood approaches to testing adaptations with phylogenies (Baum and Donoghue), the logical status of phylogenetic inertia as a null hypothesis (Orzack and Sober), and why historical approaches must often fail (Reeve and Sherman). In two of the more empirically minded chapters, Herre et al. review fig wasp sex ratio evolution as an exemplary test case of the optimization approach, and Halama and Reznick review evidence for adaptive intrapopulation variation in nature, including polymorphisms and adaptive phenotypic plasticity. I found the discussion of case studies a nice change of pace from the more philosophical dissections contained in the volume.

Two thought-provoking chapters are included near the end of the book. Amundson delves into why developmental biology has been traditionally estranged from adaptationism. Godfrey-Smith presents an illuminating discussion of three kinds of adaptationism and suggests that most critics target "explanatory adaptationism" (akin to a Panglossian approach) and not more benign forms used to guide research.

Although the editors intended for this volume to be useful to empiricists, the nature of the debate perhaps makes this book most relevant to more philosophically inclined specialists interested in these areas. Perhaps the reasons why adaptationism and optimality generate so much heat owes much to the presumption that natural selection is the main force guiding evolutionary change. If this is so, then *Adaptationism and Optimality* will shed a little light on these issues.

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THE EVOLUTION OF ADAPTIVE SYSTEMS.

By James P Brock. *San Diego (California): Academic Press.* \$99.95. xiii + 642 p; ill.; index. ISBN: 0-12-134740-0. 2000.

ENVIRONMENTAL STRESSORS AND GENE RESPONSES. *Cell and Molecular Responses to Stress, Volume 1.*

Edited by K B Storey and J M Storey. *Amsterdam (The Netherlands) and New York: Elsevier Science.* \$207.00. xix + 303 p; ill.; index. ISBN: 0-444-50488-5. 2000.

This volume consists of 20 chapters contributed by individual research groups that summarize organismal responses to stress, primarily at the level of genes and proteins, but with additional emphasis placed on the importance of studying stress responses in an ecological or evolutionary perspective. Individual chapters deal with the stresses of oxygen limitation, extremes of temperature, high pressure, ischemia, hyper- and hypo-osmolarity, desiccation, acidity, insect diapause, and metal toxicity. The majority of chapters focus on stress from the physiological and molecular perspective, although a few discuss the importance of placing stress in an ecological or evolutionary perspective. Individual chapters are extremely comprehensive and well written and will serve as a valuable reference for particular topics, while the entire collection will be an appropriate textbook for a survey course on molecular and organismal responses to environmental stress.

The breadth of topics covered in this volume is, however, both a strength and a weakness. Those interested in the finery of gene regulation during hypoxia may have little enthusiasm for the link between stress and the geographical distribution of organisms. Equally, those focused on the role of trade-offs in evolutionary adaptation to stress conditions are unlikely to be intimately concerned about how osmotic stress affects DNA activity and the cell cycle.

The authors discuss both their own research and relevant research of others, and some will be easily accessible to nonspecialists, while other research is more technical and detail driven. In conclusion, this is certainly an instructive volume and with new advancing technologies quickly changing the investigation of stress responses at the genetic and molecular level, it is a timely summary of information to date on gene responses to a wide spectrum of stresses.

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REGULATION OF GENE EXPRESSION. *Essays in Biochemistry, Volume 37.*

Edited by K E Chapman and S J Higgins. *London: Portland Press.* £19.00 (paper). xvi + 131 p; ill.; subject index. ISBN: 1-85578-138-7. 2001.

Mechanisms that regulate gene expression never fail to excite the imagination. This is ever more so in the present "post genomic" era of biological

endeavor where the genetic codes of model organisms that exemplify the major biological groups are known. The benefits of these treasures are many fold, although in other respects this wealth of sequence information also serves to emphasize our limitations. Controlling gene expression is an interesting case in point, where sequence information alone cannot define tissue specific patterns of gene expression, even though the mechanistic possibilities are clear.

With this in mind, *Regulation of Gene Expression* begins with three excellent reviews that encapsulate the role of transcription factors in gene regulation and describe how RNA polymerase is engaged to drive gene expression. Three additional chapters expand this theme to discuss in detail how gene expression is activated in response to specific cellular cues. Clearly, many examples could be chosen to expound this process. Here the choices fall to: the complex signaling pathways that connect growth, differentiation, and stress-induced stimuli to the requisite pathways of gene expression; how gene expression is controlled throughout the cell cycle; and the controls that regulate cell fate and specifically those factors that control the decision to proliferate, differentiate, senesce, or die by apoptosis. These excellent chapters each make for compelling reading.

To expand the central theme, two chapters discuss how epigenetic factors influence expression. Here we learn how gene expression can be controlled by chromatin status and how patterns of gene expression can be influenced and stabilized by DNA methylation. Finally, a single chapter considers the potential for regulation downstream of transcription by focusing on a variety of fascinating mechanisms that influence the regulation of mRNA translation.

The overall quality of the essays in this volume is outstanding, as befits the international status of the authors. Each produces a compelling story of a topic that is central to the issue at hand. To be critical, many other features that influence gene expression are neglected. For a balanced view, it is important to recognize how features such as the stability and cellular location of mRNA affect expression and how processing of primary transcripts during splicing might dramatically influence cellular diversity in higher eukaryotes. Additionally, chromosome architecture and global nuclear structure can be key elements in controlling gene expression; even a cursory look at the experience of cell cloning emphasizes this.

Surely it will be necessary to embrace each of these features to develop a global view of gene expression that might allow us to be confident about the abilities of technologies such as single cell cloning and gene therapy. Such caveats aside, I would thoroughly recommend this volume as a

stimulating introduction to this fascinating realm of cell biology.

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REPRODUCTION & DEVELOPMENT

THE EVOLUTION OF DEVELOPMENTAL PATHWAYS.

By Adam S Wilkins. *Sunderland (Massachusetts): Sinauer Associates.* \$54.95. xvii + 603 p; ill.; index. ISBN: 0-87893-916-4. 2002.

Since the mid-1990s, several new books have been published celebrating a reawakening of interest in understanding the evolution of developmental mechanisms, or "Evo-Devo" as the field is affectionately known by its participants. The author of the current volume has produced perhaps the most accessible, up-to-date introduction to this exciting, integrative field. As Wilkins points out in the Introduction, "[t]he central aim of evolutionary developmental biology is [no less than] to delineate the precise mechanisms, processes, and events that have been responsible for generating the astonishing diversity of animal and plant forms that characterize our planet" (p 3). He goes on to provide a beautifully succinct historical account of the early 20th-century divorce between the newly-born fields of genetics and experimental embryology that led to most practitioners in each field ignoring the contributions of the other, and to leave evolutionary questions behind almost completely.

The book is separated into three parts. In the first, Wilkins provides the background for the foundation of this new field: the importance of fossils, comparative molecular studies, and our relatively recent realization that all of the important developmental genes are conserved across all animal phyla. In Part II, he uses several classic case studies to demonstrate how integrating the information from all of these areas has enhanced our understanding of morphological evolution: sex determination, segmental patterning in insects, and the nematode vulva and the tetrapod limb. Finally, he reviews the conundrums that may finally be resolved by the new field: the genetic sources of developmental evolution, costs and constraints, speciation, and the evolution of multicellularity, the Bilateria and triploblasts.

As an introductory overview of the field, this is probably one of the best textbooks currently available, and would be suitable for any advanced undergraduate or graduate Evo-Devo course. I certainly intend to use it as the textbook for my gradu-

ate seminar series on the topic. If I have any criticism it would be that I wish the publishers had found a way to invest in color figures. Perhaps following the undoubted success of this volume they will be able to do so in the second edition.

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DICTIONARY OF DEVELOPMENTAL BIOLOGY AND EMBRYOLOGY.

By Frank J Dye. New York: Wiley-Liss. \$79.95. ix + 165 p; no index. ISBN: 0-471-44357-3. 2002.

PRINCIPLES OF DEVELOPMENT. *Second Edition.*

By Lewis Wolpert, Rosa Beddington, Thomas Jessell, Peter Lawrence, Elliot Meyerowitz, and Jim Smith. Oxford and New York: Oxford University Press. \$89.95. xxv + 542 p; ill.; index. ISBN: 0-19-924939-3 (hc); 0-19-879291-3 (pb). 2002.

The second edition of this textbook includes recent advances in the molecular and cellular biology of development with new sections on the heart, the vascular system, and teeth. A new companion website (www.oup.com/wolpert) provides additional support for both student and instructor, with illustrations, review questions, and course/lecture outlines for each chapter.

VADE MECUM: AN INTERACTIVE GUIDE TO DEVELOPMENTAL BIOLOGY.

By Mary S Tyler and Ronald N Kozlowski. Sunderland (Massachusetts): Sinauer Associates. \$29.95 (CD-ROM). ISBN: 0-87893-842-7. 2000. [Requirements—Windows: Windows 95/98/NT or greater, Pentium II, 200MHz or higher microprocessor (Pentium III recommended), 20MB RAM, 8x CD-ROM drive, Windows compatible sound card, SVGA monitor with 16-bit color (24-bit recommended); MAC: system 8.5 or greater, 7600/132 processor (G3 recommended), 20MB RAM, 8x CD-ROM drive.]



MICROBIOLOGY

BIODIVERSITY OF MICROBIAL LIFE: FOUNDATION OF EARTH'S BIOSPHERE. *Ecology and Applied Microbiology.*

Edited by James T Staley and Anna-Louise Reysenbach. New York: Wiley-Liss. \$89.95. xxxiii + 552 p; ill.; index. ISBN: 0-471-25433-9. 2002.

This book presents recent insights, revealed by the genetic sequence analyses of microorganisms, which have shaken the foundation of traditional concepts about the biodiversity of life on Earth. Noted scientists contribute many of the 16 chapters. Each author draws upon personal research experiences

to present new concepts and pose intriguing questions emerging from studies of microbial diversity. To fully appreciate the impact of the information presented, Carl Woese provides an enlightening perspective on the dismal scientific climate that pervaded microbial evolution and ecology prior to the application of genetic sequence analysis to microbial phylogeny and the detection of microbes in natural habitats. As a result of these advances, stimulating concepts centered on the diversity and evolution of microbial life can now be addressed in a scientifically valid context. Topics presented include: the prokaryote-dominated three domain tree of life and the influence of niche adaptation, geographic isolation, and interspecies communication on bacterial evolution (Section I); evolution of energy generating metabolic pathways, organotrophy lithotrophy, photosynthesis, and evidence for the one that may have evolved first (Section II); genetic diversity of microbes in surface soils, open ocean environments, miles below the Earth's surface, marine environments, geothermally heated and subfreezing sea ice habitats, and the degree to which this diversity reflects physiologically or functionally distinct microbial populations (Sections III and V); and bacterial origins of chloroplasts and mitochondria, and coevolution of complex symbiotic associations among microbes in plants, insects, and humans (Section IV).

The task of memorizing bacterial taxa or biochemical pathways in the absence of an evolutionary framework leaves much to be desired. If you or your students would be more enthusiastic if this were done in association with evolutionary concepts such as how life on Earth originated, the possibility of life on other worlds, or how so many different life forms came to call your body "home," then you will enjoy learning more about the latest research into the biodiversity of microbial life. This book is an excellent place to start.

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DICTIONARY OF MICROBIOLOGY AND MOLECULAR BIOLOGY. *Third Edition.*

By Paul Singleton and Diana Sainsbury. Chichester (United Kingdom) and New York: John Wiley & Sons. \$150.00. xi + 895 p; ill.; no index. ISBN: 0-471-94150-6 (hc); 0-471-49064-4 (pb). 2001.

HUMAN POLYOMAVIRUSES: MOLECULAR AND CLINICAL PERSPECTIVES.

Edited by Kamel Khalili and Gerald L Stoner. New York: Wiley-Liss. \$155.00. xv + 688 p + 8 pl; ill.; index. ISBN: 0-471-39009-7. 2001.

I admit it. When I first received this book, a collection of 22 chapters covering the history, molecular biology, and pathogenesis of human polyomavi-

ruses, I was apprehensive. My apprehension was unfounded, however. This book is not simply a collection of arcane facts, but rather a synthesis of our knowledge regarding this important group of viruses. I found this work to be informative, useful, and pleasant to read. The initial chapters describe the discovery of JC virus and BK virus from the perspectives of four of the principal investigators. This offers a fascinating glimpse into the world of animal virology in the 1950s and 1960s, and the different professional paths taken by these individuals and how they converged with the discovery of the JC and BK viruses, two members of the Polyomaviridae that are human pathogens. Most of the remaining chapters focus on the molecular virology of BKV and JCV, and on how these viruses are thought to contribute to disease. Three chapters are devoted to the immunology and epidemiology of the closely related simian virus 40, and its possible association with human cancer.

This book is full of facts, yet the editors have succeeded in presenting a coherent view of these subjects relatively free of redundancy. Although only true Polyomaviridae geeks will read this book from cover to cover, the material is presented in a user-friendly style that will ensure its use as a reference source for investigators studying infectious disease, neurology, and cancer as well as virology. As such I expect this work will become an essential component of research libraries and virology laboratories. In assembling this collection the editors and authors have accomplished an important and useful service for the scientific community.

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ANNUAL REVIEW OF MICROBIOLOGY. Volume 55: 2001.

Edited by L. Nicholas Ornston, Albert Balows, and Susan Gottesman. Palo Alto (California): Annual Reviews. \$65.00. xii + 817 p + 12 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 51-55). ISBN: 0-8243-1155-8. 2001.



PLANT SCIENCES

THE PLANT CELL CYCLE AND ITS INTERFACES. *Sheffield Biological Sciences.*

Edited by Dennis Francis. Sheffield (United Kingdom): Sheffield Academic Press; Boca Raton (Florida): CRC Press. £69.00. xiv + 220 p; ill.; index. ISBN: 0-8493-0504-7. 2001.

This is a very timely and up-to-date review of an exciting field that is currently expanding rapidly. This book focuses on the biological questions that

make plants particularly good systems to study cell division in relation to growth control. Most adaptive responses in plants to their dynamic environment involve changes in developmental fate and growth patterns and, ultimately, affect cell proliferation. Therefore, many different external and internal signals are expected to, directly or indirectly, interface with the cell division machinery in plants.

An introductory chapter provides an overview of the logic and the key players of the eukaryotic cell cycle. As most of our understanding of the eukaryotic cell cycle in the last three decades stems from work conducted in yeast and animal models, much of this chapter highlights recent progress in those fields. Subsequent chapters emphasize how developmental, metabolic, environmental, and particularly phytohormonal cues interface with the control of proliferation and cytokinesis in plants. The phytohormones cytokinin and gibberellin are discussed in great detail. It is a little surprising that a chapter specifically dealing with the plant growth regulator auxin and its interfaces with the cell cycle machinery is not included, although references to the role of auxin in controlling proliferation are made in several chapters. Individual chapters come in different styles: from more empirical reviews to ones that develop detailed models. Some chapters largely rely on data obtained from nonplant systems (for example, discussions of sugar sensing and cell cycle control). These chapters should be particularly attractive to investigators entering the field as they delineate challenging areas for future studies.

In general, the volume is easily accessible. Great effort was made to keep the references up to date. This book comes at an interesting time for the field. Although most paradigms for plant cell division control are still inferred from work done in other systems, this is rapidly changing. This volume provides a useful blend of reviews of the accomplishments in plant cell cycle research and, simultaneously, highlights the challenges that lie ahead. It will be very useful for both new and established investigators.

PETER DOERNER, *Institute for Cell & Molecular Biology, University of Edinburgh, Edinburgh, United Kingdom*

NITROGEN ASSIMILATION BY PLANTS: PHYSIOLOGICAL, BIOCHEMICAL AND MOLECULAR ASPECTS.

Edited by Jean-François Morot-Gaudry. Enfield (New Hampshire): Science Publishers. \$118.00. xxi + 466 p; ill.; index. ISBN: 1-57808-139-4. [Translation of: Assimilation de l'azote chez les plantes: aspects physiologique, biochimique et moléculaire, INRA, Paris, 1997.] 2001.

This book updates a 1997 French volume, and includes 25 chapters authored by one British and 47 French scientists. There is some variance in

international scope among chapters, but most are comprehensive and all are nicely crafted in language, supporting evidence, and illustration. The use of primary experimental evidence in the context of each topic is a strength throughout.

Separated into five parts, the book begins with the assimilation of nitrate and ammonia by plants. The first chapter is a quick overview of the nitrogen cycle and root anatomy. In contrast, the concluding chapter in Part I provides an anchor with its whole plant context. Symbiotic assimilation of nitrogen is a theme that stands alone. It contains notable advances made during the past decade such as the molecular communication between microorganisms and plants.

I believe the strongest part of the book discusses synthesis and transport of amino acids and carbon/nitrogen relationships. It is worth having the book for this theme alone. The distribution of nitrogen during plant growth and development continues along an increasing complexity of end-state metabolic product. The chapter on protein synthesis in grains and seeds is a good, current review of an important economic and nutrition topic. The ^{15}N methodology chapter both traces the development of isotope research tools available in the past, possible measurements currently available, and those that are likely in the future. The final theme, nitrogen ecophysiology and agronomy, is weak, although there are several excellent chapters. The chapter, Nitrogen: Crop Production and Environment, differs in its approach from the others by focusing more on enumerating topics that need solution. Although the other four themes are more mature, there is more plant mineral ecophysiology than was presented. Biometeorological influences on plant nitrogen, a whole plant evolutionary context, and the plasticity of competing root systems are examples of missing ecophysiological topics.

This book deserves a place in university libraries where plant physiology students can use it to supplement plant mineral nutrition information. The referencing of topics to a whole plant context, in contrast to a singular molecular correlation vision or global trend scale, will make this volume particularly useful for researchers formulating questions. It will also be of use to a range of applied biologists and managers from agronomy through restoration resting on environmental resource stewardship. Written in a lively style, it conveys the excitement of scientific discovery.

ROY M PETERSON, JR, *Environmental Services, California Department of Water Resources, Sacramento, California*

PROTEIN-PROTEIN INTERACTIONS IN PLANT BIOLOGY. *Annual Plant Reviews, Volume 7.*

Edited by Michael T McManus, William A Laing, and Andrew C Allan. Sheffield (United Kingdom): Sheffield Academic Press; Boca Raton (Florida): CRC Press. \$139.95. xv + 325 p; ill.; index. ISBN: 1-84127-299-9 (Sheffield Academic Press); 0-8493-9790-1 (CRC Press). 2002.

RICE GENETICS IV. *Based on a symposium held in Los Baños, Philippines, 22–27 October 2000.*

Edited by G S Khush, D S Brar, and B Hardy. Enfield (New Hampshire): Science Publishers; Los Baños (Philippines): International Rice Research Institute. \$88.00 (paper). xi + 488 p; ill.; no index. ISBN: 1-57808-167-X. 2001.

With the recent genome sequencing of the two major subspecies of rice (*Oryza sativa* ssp. *indica* and *japonica*) and the close genetic relationship of rice with other cereal crops, interest in rice as a model plant system has never been greater. This volume represents a collection of 31 plenary lectures from the Fourth International Rice Genetics Symposium that are organized into five sections: Overview; Molecular markers, genetic diversity, and evolution; Structural and functional genomics; Gene isolation and function; and Transformation. The overview papers provide a concise history of rice genetics and its application to breeding as well as a description of the recently terminated Rockefeller Foundation International Program on Rice Biotechnology, widely recognized for facilitating groundbreaking work in rice biotechnology and training of rice scientists from underdeveloped Asian countries. Papers in the second section provide insight into the genetic origins and relationships of rice, and review the case for using rice as the model cereal genome.

The remaining sections focus on molecular genetics and genomics research and the application of biotechnology to rice improvement, focusing exclusively on production issues. The status of simple sequence repeat markers and miniature inverted repeat transposable elements is discussed, and the use of markers in breeding and dissecting quantitative traits is described. The genomics section contains descriptions of sequencing methods and strategies as well as the development of tools for functional analysis with emphasis on generation and analysis of mutant phenotypes using deletion and insertional mutagenesis. A very brief overview of rice bioinformatics resources is presented. The gene isolation section focuses on the characterization of biotic and abiotic stress tolerance genes and includes work on programmed cell death and engineering apomictic rice. The last sec-

tion covers transgene expression and engineering virus resistance, drought tolerance, and increased photosynthetic efficiency in rice.

Newcomers to the field of rice genetics and genomics will find this to be a useful guide to the wide array of resources currently available and in development. Researchers interested in cutting edge work in structural and functional analysis of the rice genome will also benefit from this fairly complete representation of the field.

THOMAS H TAI, *Agronomy & Range Science, University of California, Davis, California*

LEGUME (FABACEAE) FRUITS AND SEEDS.

By Joseph H Kirkbride, Jr, Charles R Gunn, Anna L Weitzman, and Michael J Dallwitz. Boone (North Carolina): Parkway Publishers. \$75.00 (CD-ROM). ISBN: 1-887905-25-1. 2000. [Requirements—Windows 95, 98, or NT. For good image quality, a display card with at least 32,768 colors at 800x600 or 1024x768 resolution and a refresh rate of at least 70Hz is recommended.]

ECOLOGICAL MANAGEMENT OF AGRICULTURAL WEEDS.

Written and Edited by Matt Liebman, Charles L Mohler, and Charles P Staver. Cambridge and New York: Cambridge University Press. \$120.00. xi + 532 p; ill.; taxonomic and subject indexes. ISBN: 0-521-56068-3. 2001.

Initially, I was somewhat suspicious about this book. A lot has been written on the role of ecology in weed management. Nevertheless, when members of the Weed Science Society of America were recently asked what the contribution of weed ecology really is, the most frequent answer was “moderate” (1997. *Weed Science* 45:344). This book exceeded all my expectations. It is worthy reading for ecologists, weed scientists, farm advisers, and progressive farmers.

Eight out of 11 chapters were written only by one of the authors. Being a plant ecologist, I was first very much impressed by the chapters by Charles Mohler of Cornell University. His contributions represent applied ecology at its best (e.g., Weed life history: identifying vulnerabilities; Enhancing the competitive ability of crops; and Weed evolution and community structure). I later realized that the other two authors—Matt Liebman and Charles Staver—complemented Mohler very nicely by their somewhat more practical and geographically more diverse chapters on the role of crop diversification and livestock grazing for weed management and farmer-extensionist-scientist interactions. There are no superficial chapters in this

book. The authors clearly argue that ecological weed management can greatly reduce the use of herbicides.

If ecological weed management is effective, why do farmers rely so heavily on herbicides? In their final chapter, the authors provide an answer: the apparent ease and low risk of chemical management; the aggressive marketing of chemical solutions, coupled with a lack of widely available information on alternatives; the externalization of environmental and human health cost of agricultural technologies; the increasing prevalence of large-scale industrial farms; and government policies fostering intensive agricultural practices. I believe that this book can make some difference.

As the title implies, management of “environmental weeds” (harmful invaders in natural areas) is not covered. Such extension would substantially increase the number of potential readers. The only serious problem I have with this book is the price. Unless it is reprinted as a paperback, only a very few individuals will buy it. At a much lower price, I would adopt it as a textbook for my class in weed biology.

MARCEL REJMÁNEK, *Evolution & Ecology, University of California, Davis, California*

FLORA EUROPAEA ON CD-ROM.

Cambridge and New York: Cambridge University Press. \$555.00 (CD-ROM). ISBN: 0-521-77811-5. 2001. [Requirements—Win 9X operating system, 80486 processor or greater, 4MB RAM, Windows compatible CD-ROM drive and Microsoft CD-ROM extensions (MSCDEX) version 2.0 or higher, VGA monitor set to 800x600 pixels resolution.]

ARABIDOPSIS: A LABORATORY MANUAL.

By Detlef Weigel and Jane Glazebrook. Cold Spring Harbor (New York): Cold Spring Harbor Laboratory Press. \$180.00 (hardcover); \$115.00 (concealed wire). xii + 354 p; ill.; index. ISBN: 0-87969-572-2 (hc); 0-87969-573-0 (concealed wire). 2002.

Arabidopsis thaliana is perhaps the most important plant species in modern plant biology. This relatively small flowering plant, a member of the mustard (Brassicaceae) family, serves as the dominant model plant in modern plant science, which includes physiological, molecular, and developmental research. In this book, the editors have taken a practical approach and described almost all aspects of using *Arabidopsis* in plant research.

Composed of eight chapters, this volume starts with the most basic, yet important, description of how to grow and maintain *Arabidopsis* plants both

in soil and in culture. Four chapters are dedicated to the study of *Arabidopsis* mutants. Considering the importance of mutants in *Arabidopsis* research, the content of these chapters, which describe ways to produce mutants, methods for genetic and phenotypic analysis, and protocols for identification and isolation of the mutated genes, will provide valuable information for every plant biologist considering the use of mutants for their research. Additional chapters describe the production of transgenic *Arabidopsis* as well as study of gene expression and gene function. The chapters are contributed by various scientists from the *Arabidopsis* research community and begin with the general required background, followed by simple, step-by-step laboratory protocols. For example, in Chapter 5 (How to Transform *Arabidopsis*), a general introduction on the *Agrobacterium* biology and its vector is followed by the successive protocols needed for the production of transgenic *Arabidopsis*. These protocols include transformation of *Agrobacterium*; transformation of ex vitro *Arabidopsis*; selection of transgenic *Arabidopsis*; and in vitro root transformation. Such a practical writing style makes the book easy to use and a perfect, one of its kind, laboratory manual.

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

PLANT SYSTEMATICS: A HALF-CENTURY OF PROGRESS (1950–2000) AND FUTURE CHALLENGES.

Edited by Tod F. Stuessy, Elvira Hörandl, and Veronika Mayer. Vienna (Austria): International Association for Plant Taxonomy. \$30.00 (paper). iv + 333 p; ill.; no index. 2001.

This book originated from the Golden Jubilee Series of reviews published in five numbers of *Taxon* during the last two years. They describe progress in plant systematics throughout the past fifty years and examine present potentials and future challenges.



ANIMAL SCIENCES

THE BIRDS OF NORTHERN MELANESIA: SPECIATION, ECOLOGY, & BIOGEOGRAPHY.

By Ernst Mayr and Jared M. Diamond; color plates by H. Douglas Pratt. Oxford and New York: Oxford University Press. \$55.00. xxiv + 492 p + 9 pl; ill.; subject and species indexes. ISBN: 0-19-514170-9. 2001.

Starting in the 1930s, Ernst Mayr developed a series of definitive works on the birds of the Pacific using the American Museum's newly assembled Whitney

collections. Some 58 scientific papers were to emerge. These findings revolutionized our knowledge of geographic speciation and evolution. The many lineages show striking geographic variation, island size and isolation effects, dispersal phenomena, species turnover, the founder effect, and other basic processes. Ernst Mayr's two authoritative books, *Systematics and the Origin of Species From the Viewpoint of a Zoologist* (1942. New York: Columbia University Press) and *Animal Species and Evolution* (1963. Cambridge (MA): Harvard University Press), extensively draw on this material. Jared Diamond, with some 40 papers to this credit on the birds of New Guinea and the islands is, in turn, the leading expert on the evolutionary ecology of Pacific birds.

Chapters are devoted to the geology and geological history of Northern Melanesia (Solomon Islands, New Hebrides, Bismarck Archipelago, but not New Guinea). Other chapters which include Northern Melanesia and sometimes New Guinea discuss habitats and vegetation, human history and their impact (endemic and European) on island biotas, ornithological exploration, extinction, taxonomic composition of the avifauna, determinants of island species number, level of endemism, habitat preference, and species abundance. Overwater dispersal, distributional ecology, origins, colonization and faunal dominance, geographic variation, speciation, establishment of geographic isolates, taxon cycles, as well as barriers between and within the Bismarcks and Solomons are considered.

There is an abundance of illustrations, range maps of lineages, and a discussion of how they vary through the islands. The volume includes a superb series of nine plates (with 12 to 14 forms per plate) by Douglas Pratt that, for the first time, depict many of the forms in color. They both enliven the book and illustrate characteristics and variation patterns in the lineages being discussed.

This definitive volume will inspire a new set of studies based on genetics and DNA, before too many of the unique island forms disappear. It will remain the ultimate work on island speciation.

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

PRACTICAL EXERCISES IN PARASITOLOGY.

Edited by David W. Halton, Jerzy M. Behnke, and Ian Marshall. Cambridge and New York: Cambridge University Press. \$49.95. xviii + 461 p; ill.; index. ISBN: 0-521-79104-9. 2001.

Not since MacInnis and Voge's volume, *Experiments and Techniques in Parasitology* (1970. San Francisco (CA): W.H. Freeman and Company), has a comprehensive laboratory manual been available. Excellent volumes limited to cell and molecular

parasitology have been published recently, but they exclude fascinating exercises that introduce undergraduates to the diversity of parasitic forms in situ and to the remarkable spectrum of adaptations for host finding, entry, and parasitic life.

The book consists of seven sections, most with five to seven chapters, and each presents a laboratory exercise. Section 1, Observational Exercises on Parasites, consists of two subsections: Local wild and domestic hosts as sources of parasites; and Laboratory maintained species. The authors are almost exclusively from the United Kingdom and, consequently, the host-parasite systems taken from the wild will be unavailable in many other areas. Related assemblages should be available elsewhere, permitting comparable laboratory work to be done. Except for the very squeamish, little excites the interest of biology students as much as finding living parasites in situ personally.

Section 2, Ecology, includes descriptive and experimental studies of parasite population and community ecology. Contemporary ecological theory is explored using helminth parasites. The following three sections, Physiology and Biochemistry, Pathology and Immunology, and Chemotherapy, are largely experimental; they introduce techniques used in the working parasitology laboratory. Again, there is a concentration on helminths not found in other recent laboratory manuals. Section 6, Molecular Parasitology, also presents a series of technical exercises ranging from DNA purification to construction of a genomic library. It also includes examples of applied diagnostic parasitology involving the use of PCR to detect and differentiate between species of parasitic amoebae. In the final section, Behaviour, several studies of parasite host-finding behavior and of parasite-induced changes in host behavior, topics that invariably fascinate students, are presented. Three appendixes list reagents and suppliers in the U.K. and U.S.

These exercises have been tested and used in the teaching laboratories of diverse undergraduate departments. They are sure to excite intellectually curious students. The book is a must for teachers of parasitology, and students exposed to these laboratory exercises are sure to benefit greatly.

GERHARD A SCHAD, *Pathobiology, University of Pennsylvania, Philadelphia, Pennsylvania*

ANIMAL EYES. *Oxford Animal Biology Series.*

By Michael F Land and Dan-Eric Nilsson. Oxford and New York: Oxford University Press. \$85.00 (hardcover); \$45.00 (paper). xii + 221 p + 4 pl; ill.; index. ISBN: 0-19-857564-5 (hc); 0-19-850968-5 (pb). 2002.

This charming and excellent book might be subtitled Optics and Ocular Morphology, for it is primarily concerned with image formation of eyes

across the animal kingdom. An exception is the final chapter on eye movements, which reviews vertebrate and invertebrate strategies of image fixation. Land and Nilsson are acknowledged authorities on invertebrate optics, and their collaboration in this book is a very successful one. In it they have brought together descriptions of many eyes that are scattered far and wide in reviews and journals, and have provided a kind of manual for their analysis. Their handling of the mathematical aspects of optics is elegant and remarkably penetrating. Armed with this little book, careful readers would be prepared to describe and analyze the optical morphology of any newly discovered eye, had only the authors left any to be discovered.

The book is suitable by itself for an undergraduate or graduate seminar, and in combination with other volumes could serve as the optical textbook in a course on the visual system. The novelty and skilled treatment of the subject matter make it a unique and valuable work. It should be in the library of every college, university, and school of optometry.

HOWARD C HOWLAND, *Neurobiology & Behavior, Cornell University, Ithaca, New York*

PENNAK'S FRESHWATER INVERTEBRATES OF THE UNITED STATES: PORIFERA TO CRUSTACEA. *Fourth Edition.*

By Douglas Grant Smith. New York: John Wiley & Sons. \$120.00. x + 638 p + 16 pl; ill.; index. ISBN: 0-471-35837-1. 2001.

Since the publication of the first edition in 1953, Robert Pennak's *Freshwater Invertebrates of the United States* has been a leading resource on the identification and general biology of freshwater invertebrates. Revised by Pennak himself in 1978 and 1989, this book has now been revised by Douglas Smith for a fourth edition.

The introductory chapter, which provides thought-provoking and very broad coverage of freshwater environments and biota, has completely new or extensively revised sections on astatic ponds, phreatic and psammolittoral waters, exotic species (including a very nice table showing the history of some freshwater introductions), and collecting ethics. Aside from these sections, however, the rest of the introduction is virtually untouched since the 1989 edition, which itself was reprinted largely verbatim from a 1985 article by Pennak. In addition to an absence of recent references, the introduction's text is occasionally misleading because of the lack of revision (most conspicuously, diversity esti-

mates from the late 1970s are still referred to as "ten years" old).

Individual chapters are dedicated to Porifera, Cnidaria, Platyhelminthes, Nemertea, Gastrotricha, Rotifera, Nematoda, Nematomorpha, Tardigrada, Entoprocta, Ectoprocta, Annelida, Mollusca, Arachnida, Phyllopodous Branchiopoda, Cladoceran Branchiopoda, Copepoda, Branchiura, Ostracoda, Minor Malacostraca, Isopoda, Amphipoda, and Decapoda. The chapter on protists has been omitted from this edition, a change that is understandable, but regrettable nonetheless. Given the abundance and diversity of protists, and their potential to be mistaken for small invertebrate animals by novice students, many will want to supplement the new edition of Pennak with references on freshwater protists as well as aquatic insects (which were already excluded from the third edition).

Each taxonomic chapter covers general aspects of the group's biology (e.g., anatomy, physiology, ecology, and reproduction) and typically concludes with short sections on collection and preparation techniques and taxonomy of the group, followed by a key. Smith has updated the reference lists and made considerable revisions to many of the keys to update and improve them, making this volume worth acquiring, even for those who already have the previous edition. In contrast to previous editions, however, none of the keys lead the user to species; keys are mostly to genus (or occasionally only to family or order). Most of the marvelous anatomical line drawings from past editions still adorn the chapters. Smith has added a number of new line drawings and photos, including some beautiful scanning electromicrographs (SEMs) and 16 color plates.

In the past half century, Pennak's manual has deservedly become a classic and indispensable guide to freshwater invertebrates for students, teachers, and researchers. Smith's efforts in producing this new edition ensure that this excellent reference will remain relevant and in circulation for a new generation of freshwater invertebrate enthusiasts.

ALEXANDRA E BELY, *Molecular & Cell Biology, University of California, Berkeley, California*

AN UPDATED CLASSIFICATION OF THE RECENT CRUSTACEA. *Science Series, Volume 39.*

By Joel W Martin and George E Davis. *Los Angeles (California): Natural History Museum of Los Angeles County.* \$20.00 (paper). ix + 124 p; no index. ISSN: 1-891276-27-1. 2001.

BUTTERFLIES OF BRITISH COLUMBIA: INCLUDING WESTERN ALBERTA, SOUTHERN YUKON, THE ALASKA PANHANDLE, WASHINGTON, NORTHERN OREGON, NORTHERN IDAHO, NORTHWESTERN MONTANA.

By Crispin S Guppy and Jon H Shepard. Published by UBC Press, Vancouver (Canada), in collaboration with the Royal British Columbia Museum, Victoria (Canada). \$95.00. 414 p; ill.; index. ISBN: 0-7748-0809-8. 2001.

The authors' stated aim is to provide both naturalists and professional biologists with an overview of the butterfly fauna of British Columbia. They have produced a hardback, coffee-table sized book that is definitely not for carrying on a field trip. The photographs, mostly of museum specimens, are clearly intended as aids to identification. There are useful, detailed distribution maps and discussion of nomenclature, both scientific and vernacular. The authors have split some species into two and applied their own grammatical corrections to Latin names. As a result, the names used here occasionally differ from those in competing books.

There is substantial material on the general biology of butterflies. The section on conservation is informative and discussion of potential effects of pesticides is up to date. Much of the discussion includes references that are outdated. There is almost nothing on the general contributions that butterfly biology now makes to ecology, developmental biology, conservation biology, and evolution. The spirited defense of butterfly collecting is bound to be controversial. The authors express faith that collecting has a negligible effect on the survival of butterfly populations, citing a published conclusion that it would take several collectors working every day for three days to extirpate a population of 250 individuals. The potential impact of collecting does not, however, depend just on how hard it is to collect all the butterflies in a population, but also on the impact of removing a small percentage of the butterflies each year for many years. As Susan Harrison and others have argued, the answer to this question is not obvious.

Because of its opinionated approaches to butterfly collecting, biology, and taxonomy, this informative book will be controversial. Set beside its competitors, it is not clearly essential either as a guide to western butterfly identification or to general butterfly biology. There is, however, currently no up-to-date treatment of butterfly biology. Scott's excellent book, *The Butterflies of North America: A Natural History and Field Guide* (1986. Stanford (CA): Stanford University Press), has been repeatedly reprinted and the Royal Entomological Society Symposium dates to 1984. The best modern butterfly book that I know is Asher et al.'s *The Millennium Atlas of Butterflies in Britain and Ireland*

(2001. Oxford: Oxford University Press). The U.K. has fewer species and many more butterfly biologists than British Columbia, so it is not surprising that there is more detail known about each species.

MICHAEL C SINGER, *Integrative Biology, University of Texas, Austin, Texas*

THE BEES OF THE WORLD.

By Charles D Michener. *Baltimore (Maryland): Johns Hopkins University Press.* \$135.00. xv + 913 p + 16 pl; ill.; indexes of terms and taxa. ISBN: 0-8018-6133-0. 2000.

Bees fulfill critical keystone mutualist roles as pollinators of most of the world's quarter million flowering plants (angiosperms). Additionally, they have ecological roles as energy/nutrient cyclers and agents of bioturbation. Almost 20,000 species have been described worldwide, but until now, no systematic treatment has been available to generic and subgeneric levels. Proper identification of bees is necessary not just for museum systematists but for many other end users, including botanists, floral biologists, entomologists, conservation biologists, students, restoration ecologists, land managers, and policymakers. All of these groups have the need to identify bee specimens collected for various purposes at diverse sites around the world. Until now, this knowledge has been disparate, and not synthesized in one modern volume. Traditionally, specimens are sent to a museum researcher and the identification client must wait up to a year to get results. This is largely because there are very few entomologists specializing in the identification of native bees. With the publication of *The Bees of the World* by the undisputed "king bee" world authority, Charles D Michener of the University of Kansas, more individuals will be able to sort out their own identifications using the precise and richly illustrated taxonomic keys in this magnificent volume. It is a magnum opus worthy of the title, the culmination of over 50 years of tireless efforts on bee taxonomy and ecology by the world's foremost practitioner.

The Bees of the World is separated into 119 sections. These subsections are devoted to individual topics or bee taxa, but are not long enough to be considered regular chapters. Given the diverse nature of the world's bee fauna, this was perhaps the only way to deal with the staggering amount of information in an easily retrievable fashion. The first 28 sections are designed to bring neophytes and accomplished melittologists to the same level, and to describe the morphologic and taxonomic terminology that is used by the author. In these early sections of the book, Michener treats the concept of bees (as apart from wasps) their ecological importance, floral

relationships, and free-living or parasitic lifestyles. The next sections cover their body forms as well as detailed descriptions and illustrations of gross and fine morphology and internal anatomy. Structures distinguishing bees from other aculeate Hymenoptera are especially well developed. Sections on bees and Sphecoid wasps as a clade, the origin of bees from wasps, and bees as a holophyletic group are given, along with a history of the categories of bee taxa, historically how they have been classified by other specialists, and their current classification using modern cladistic analysis methods.

A section on bee phylogeny and the proto-bee, along with discussions of fossil bees, is included. Michener's thoughts and analyses of modern higher bee classification are fully presented and referenced with almost 2,500 bibliographic citations. This magnificent tome is the bee bible and will remain the most used reference in this field for many decades to come. Chapters on general biology, ecology, floral biology, and parasitic bees are presented early on. One added feature is the magnificent color photographs contributed to the project by the dean of North American insect photographers, E S Ross. They add much interest to the volume, for entomologists and biologists not formally trained in the study of bees.

Michener treats topics on global bee diversity (for example, why many more bees inhabit xeric deserts and savannahs of the world), species richness, and abundance. Many regions have certain lineages that are far more abundant than others. The family Colletidae in Australia is a prime example. Bee biogeography, dispersal, and evolutionary history are also treated in general, and more specifically as each genus and subgenus is treated throughout the book. There are discussions of family group names (Michener recognizes 7 bee families, 22 subfamilies, 56 tribes, and 423 genera worldwide). Approximately 17,000 species comprise these groupings. This is his most thorough classification and modern treatment since his prescient 1944 treatise (*Bulletin of the American Museum of Natural History* 82:151–326).

The taxonomic treatments are incredibly precise, detailed, and accurate. The keys to the subgenera and other taxa especially good. Throughout these taxonomic treatments, there are explanatory photographs and detailed line drawings to guide users through difficult couplets and morphological choices.

The only small drawback to this volume is its price, which will keep many of its intended users, especially students and faculty in Mexico and other countries, from obtaining it. High prices imposed by publishers for limited run, but significant scholarly works, are major impediments to wide dissemination.

ination and, ultimately, the reason for scientific publishing in the first place. Melittologists, conservation biologists, botanists, and hymenopterists can hope that enough university libraries will purchase copies to make it somewhat more accessible to its intended readership. I, for one, would enjoy seeing an electronic edition of the book available in a CD-ROM format in the future. That would make it available to many more bee workers, especially in countries other than the United States.

STEPHEN L. BUCHMANN, *Ecology & Evolutionary Biology, University of Arizona and The Bee Works, Tucson, Arizona*

TIGER BEETLES: THE EVOLUTION, ECOLOGY, AND DIVERSITY OF THE CICINDELIDS. *Cornell Series in Arthropod Biology.*

By David L. Pearson and Alfried P. Vogler. Comstock Publishing Associates. Ithaca (New York): Cornell University Press. \$39.95. xv + 333 p + 29 pl; ill.; taxonomic and subject indexes. ISBN: 0-8014-3882-9. 2001.

This book is coauthored by David Pearson, a researcher who has worked for more than 25 years on the biogeography, community structure, and diversity of tiger beetles, and by Alfried Vogler, a molecular biologist who has conducted extensive phylogenetic and evolutionary analyses on tiger beetles. Those who are unfamiliar with tiger beetles may ask several questions: Why was such a specialized book written about a group of insects that, in terms of species diversity among insects, is a depauperate group comprised of about 2,300 species? Which book on tiger beetles should be perused (Pearson and Vogler's book joins four other books on tiger beetles published in the last five years)? What readers will find is a fascinating synthesis of one of the most-studied groups of beetles explained in well-written prose with careful editing (performed by John Alcock).

Readers will be treated to a discourse on why tiger beetles present a model group to investigate a wide range of questions in a number of biological disciplines, including cladistics, behavior, ecology, physiology, and genetics. Using the backdrop of tiger beetles, Pearson and Vogler present a well-referenced (over 430 citations) summary of research discussing important biological questions, including species definitions and genetics, biogeography, the roles of biotic and abiotic factors in the ecology of a group of closely related organisms, and conservation. The text is written in language that both seasoned biologists and amateurs will appreciate and is illustrated with a multitude of figures and photographs. The book includes two appendixes: the first presents useful guidelines for

observing and collecting tiger beetles, and the second provides a very short summary of the natural history of the tiger beetle genera of the world. The second appendix is probably too brief to be of great value to tiger beetle enthusiasts, but it does provide illustrations of the variation in tiger beetle morphology and anecdotal comments about members of most genera.

The authors conclude their book with the following statement: "We hope that the insight from these types of studies on tiger beetles will provide ideas for investigating many other taxa and help lead to better understanding of the evolution of diversity" (p. 247). They have succeeded in writing a book that is not only essential to those who study tiger beetles, but which also provides a window into what studies of other organisms should seek to accomplish.

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ANNUAL REVIEW OF ENTOMOLOGY. Volume 47: 2002.

Edited by May R. Berenbaum, Ring T. Cardé, and Gene E. Robinson. Palo Alto (California): Annual Reviews. \$67.00. xi + 1005 p + 6 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 38-47). ISBN: 0-8243-0147-1. 2002.

THE PHYSIOLOGICAL ECOLOGY OF VERTEBRATES: A VIEW FROM ENERGETICS.

By Brian Keith McNab; Foreword by James H. Brown. Comstock Publishing Associates. Ithaca (New York): Cornell University Press. \$75.00. xxvii + 576 p; ill.; taxonomic and subject indexes. ISBN: 0-8014-3913-2. 2002.

Not long ago while chatting with a biochemist/molecular biologist colleague, I stated what to me is a truism: that no two factors have greater significance in the biology of higher organisms than temperature and body size. Incredulous, he asked how I could so easily dismiss the fact that over 60% of the genome is devoted to cell machinery that is common to most eukaryote life-forms. The divergence between our two viewpoints defines one of the fundamental differences between cell biologists and whole-organism, evolutionary ecologists. Neither perspective is wrong. Cell and molecular biologists are interested in the strong, relatively invariant signal common to most life-forms (remember the Krebs cycle?), while evolutionary physiological ecologists are interested in how environment superimposes what I like to think of as "harmonics" on this fundamental signal by shaping and fine-tuning organisms through the process of

adaptation. This book is about these “harmonics,” which to evolutionary biologists and physiological ecologists represent the rich diversity of life-forms, functions, and physiological strategies found on our planet.

Because energy can be viewed as the common currency of life and because temperature and body size have such a strong nonlinear effect on energy requirements and expenditures of both homeotherms and heterotherms, McNab has (wisely, I would say) chosen to present the field of physiological ecology from an energetic perspective. *The Physiological Ecology of Vertebrates* is comprised of 14 chapters grouped into five parts. In the first part (Foundations), McNab identifies physiological ecology as focusing on “the malleable features of physiology that . . . contribute to the increased reproduction of a species” (p 3), immediately establishing an evolutionary perspective. He then presents the physical processes that determine the flow of energy (heat) and material between organisms and the environment. Part II (Thermal Exchange with the Environment) is comprised of three chapters that deal with scaling of metabolism and temperature regulation by ectotherms and endotherms. The third part (Material Exchange with the Environment) also contains three chapters that discuss the physiological challenges posed by osmotic, water, salt, and gas exchange in aquatic and terrestrial environments and the evolutionary transition between the two. The four chapters that comprise Part IV (Ecological Energetics) deal with the cost of locomotion, the components of energy budgets, how these budgets are balanced over daily and seasonal time frames, and nutrient and energy extraction from the perspective of digestive function. The final part (Consequences) consists of two chapters in which McNab discusses his view of how physiological and energetic constraints not only shape the population ecology and life-history strategies of vertebrates, but also set distribution limits for many species.

McNab is known as a prolific researcher of metabolic patterns of vertebrates, an ardent proponent of ecological and phylogenetic causation underlying variation in these patterns, and the creator of “McNabian space” graphics. Readers will find abundant examples of all three traits. The author should, however, be applauded for having produced a book that covers a vast territory, coherently integrates an immense current literature (approximately 3000 references), offers controversial and thought-provoking speculation on the evolutionary pathways leading to and functional significance of observed patterns, and supports ideas and arguments with a large number of empirical, case study examples. I have no doubt that McNab

will “take flack” for many of his ideas, but I am also confident that this book will be a landmark, forming and guiding the thinking of many developing physiological ecologists. Although many textbooks include sections on physiological ecology, in my opinion this is the first volume truly dedicated to this rapidly expanding field. I do not hesitate to recommend *The Physiological Ecology of Vertebrates: A View from Energetics* as interesting reading and a solid foundation for upper-level undergraduate or graduate courses in physiology ecology.

DON THOMAS, *Biology, University of Sherbrooke, Sherbrooke, Quebec, Canada*

AMPHIBIANS AND REPTILES OF PENNSYLVANIA AND THE NORTHEAST. *Comstock Books in Herpetology.*

By Arthur C Hulse, C J McCoy, and Ellen Censky; illustrated by Linda Witt Fries. Comstock Publishing Associates. Ithaca (New York): Cornell University Press. \$39.95. xi + 419 p + 133 pl; ill.; index. ISBN: 0-8014-3768-7. 2001.

This is a comprehensive natural history of the herpetofauna of the northeastern United States with an emphasis on Pennsylvania. Building on C J McCoy's publication, *Amphibians and Reptiles in Pennsylvania: Checklist, Bibliography, and Atlas of Distribution* (1982. Pittsburgh (PA): Carnegie Museum of Natural History), this book synthesizes a wealth of new information on the regional herpetofauna from the literature and the authors' field surveys over the past two decades.

This book is separated into three main parts: a concise introduction and substantial, information-rich sections on Amphibia and Reptilia organized by family and species. The introduction begins with brief reviews of the physiography and vegetation of the region as well as amphibian and reptile collection and observation methods. An illustrated dichotomous key to the salamanders, frogs and toads, turtles, lizards, and snakes of the region, with both larval and adult keys for amphibians, concludes the introduction. The identification keys are largely free of technical jargon, but a comprehensive glossary provides definitions of terms that may be unfamiliar to some readers. Over 130 color plates of amphibians and reptiles supplement the line drawings of external identification characters used in the keys.

The bulk of the book is devoted to individual species accounts that provide detailed information on physical characteristics (size, sexual dimorphism, color), confusing species (i.e., species of similar appearance that may complicate identification), habitat and habits (seasonal activity, hibernation, food, foraging behavior), reproduction (breeding behavior, developmental time, size of

eggs and juveniles), and distribution (described verbally for both range and region and illustrated by regional maps). A remarks section adds useful data on rarity, conservation status, hybridization, vocalization, and other subjects. The species accounts are well referenced with a balance of classic and recent literature.

This informative, affordable book will be of use to a wide audience, including educators, researchers, students, land managers, and others interested in the natural history of amphibians and reptiles of Pennsylvania and the northeastern United States. I highly recommend this volume as a supplement to existing regional amphibian and reptile field guides and as an important natural history resource. It has already become an integral part of my field library.

CHARLES E WILLIAMS, *Biology, Clarion University of Pennsylvania, Clarion, Pennsylvania*

AMPHIBIANS OF CENTRAL AND SOUTHERN AFRICA.
Comstock Books in Herpetology.

By Alan Channing. *Comstock Publishing Associates. Ithaca (New York): Cornell University Press.* \$49.95. xi + 470 p + 24 pl; ill.; systematic and alphabetical indexes. ISBN: 0-8014-3865-9. 2001.

AMERICAN AQUARIUM FISHES. *The W. L. Moody, Jr. Natural History Series, Volume 28.*

By Robert J Goldstein; with Rodney W Harper and Richard Edwards; photographs by William F Roston, Richard Bryant, Fred C Rohde, Garold Sneegas, and Robert J Goldstein. *College Station (Texas): Texas A&M University Press.* \$99.95. xiii + 428 p + 118 pl; ill.; index. ISBN: 0-89096-880-2. 2000.

This attractive volume includes 18 chapters, the first six of which cover introduction, distribution of fishes, collecting and transporting fishes, collecting regulations, use of plants in aquaria (by Richard Edwards), and foods and feeding. These chapters are informative and clearly useful to anyone interested in aquarium fish keeping or breeding. The remaining 12 chapters are devoted to species accounts (with information on taxonomy, identification, distribution, habitat, and life history) of mostly North American freshwater fishes that vary from one sentence (e.g., sicklefin chub) to over a page in length (e.g., bluehead shiner). The text is enhanced by 261 black-and-white photographs and pen-and-ink illustrations of fishes, aquatic plants, and collecting activities. Serious hobbyists will be intrigued by the 119 color photographs of some of North America's most spectacular minnows, sunfishes, darters, and other small, aquarium-sized fishes in nuptial coloration.

Goldstein's synthesis includes an account for nearly every described (and some undescribed)

species in the United States and Canada. The major geographic deviations are accounts of four species of Cyprinodontidae and one cyprinid that occur primarily in Mexico, middle America or Venezuela, and accounts for a European mudminnow and two Mexican blindcats that are restricted to subterranean environments. Chapter 18 ends with numerous accounts of coastal blennies (Blenniidae), gobies (Gobiidae), and sleepers (Eleotridae) that mostly require full strength seawater or some amount of saline solution for aquarium study and keeping. Much of the information presented in the final 12 chapters is superficial and lacks reference to the primary literature from which it was taken. Why provide so much space on characters for identification when few species are actually identifiable from the information presented? Why write an entire chapter on collecting regulations and protected species and then in the species accounts provide information (sometimes specific) on where and how to collect at least 32 federally protected species? Why are cavefishes and large sturgeons included? Errors of omission and commission are numerous, including photographs in which the fish is misidentified and accounts in which the biological information is misleading, incomplete, or incorrect. Some well-known species (e.g., northern pike, muskellunge) that attain large size, but can be kept in aquaria as young and juveniles, lack an account even when other species (e.g., sturgeons and gars) that reach large size are included. Embarrassingly, lead photographer William N Roston has his name and photograph credits listed as William F Roston throughout the entire book. We do not consider this work to be a technical reference, but it does inform potential aquarists of the opportunities to study, photograph, breed, and rear a number of North America's most attractive fishes. The color photographs alone may be worth the price of the book.

BROOKS M BURR and S REID ADAMS, *Zoology, Southern Illinois University, Carbondale, Illinois*

THE CUBAN TREEFROG IN FLORIDA: LIFE HISTORY OF A SUCCESSFUL COLONIZING SPECIES.

By Walter E Meshaka, Jr. *Gainesville (Florida): University Press of Florida.* \$69.95. xxiii + 191 p; ill.; index. ISBN: 0-8130-2109-X. 2001.

King and Krakauer (1966. *Quarterly Journal of the Florida Academy of Sciences* 29:144-154) first summarized the exotic herpetofauna of southern Florida, and since then this topic has received considerable attention. Over the last four decades, approximately 40 species of introduced amphibians and reptiles have been reported in the wild from Florida as having established (i.e., breeding for multiple generations) and widespread popula-

tions; established, but localized populations; presently extirpated populations; or nonestablished, but localized, isolated incidences. The Cuban treefrog (*Osteopilus septentrionalis*), the focus of this book, certainly falls within the first category as an established and widespread species.

The book is organized into 14 chapters, which provides readers with many useful details that are sure to be cited in future publications. The evolutionary origin, probable means of introduction in Florida, and range expansion of the Cuban treefrog throughout the peninsula is given (Chapter 2) since first being reported by Barbour (1931. *Copeia* 1931(3):140). Natural history data including habitat, diet, predation, behavior, as well as aspects of the entire life cycle are examined with large sample sizes. Reproductive cycles (Chapter 5) and seasonal activity (Chapter 7) for both genders is effectively summarized. What really makes this book interesting is that the author provides the numerous reasons why the Cuban treefrog, as opposed to other species, has become such a successful colonizer in Florida (Chapters 12 and 13). Although not limited to only characteristics of the Cuban treefrog, the author also provides interesting details about the Everglades ecosystem and history of Everglades National Park and adjacent areas (Chapter 3).

Although Meshaka states that his specimens have been deposited in systematic collections, it would be nice to include an appendix of specimens examined so others can use these specimens in future studies. There is no credible evidence for listing *Python molurus* as part of the Everglades National Park (ENP) herpetofauna (Table 3.2). These isolated occurrences undoubtedly represent released animals, and there are no "populations" of this species within ENP nor elsewhere in Florida. There are numerous typographical errors scattered throughout the book. Despite these few criticisms, this volume accomplished multiple achievements. Because the audience for which this book is written includes both laics and professional herpetologists, it provides basic knowledge of the Cuban treefrog. It also should serve as a template for how future in-depth ecological studies should be conducted.

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TURTLES, TORTOISES AND TERRAPINS: SURVIVORS IN ARMOR.

By Ronald Orenstein. *Buffalo (New York): Firefly Books.* \$45.00. xii + 308 p; ill.; index. ISBN: 1-55209-605-X. 2001.

Although the author is an ornithologist, his book is a beautiful rendition on the turtle world, very instructive, and a delight to read. Herpetologists,

zoologists, and educated laics might learn a lot from reading it.

The opening chapter generalizes about the problems that turtles face and how they have coped. Next is a chapter on the attempts to determine turtle ancestry, a rather detailed and complex chapter to grasp. The following chapters discuss the side-necked or pleurodire turtles and the cryptodires or hidden-necked turtles. The brief descriptions contain comments about their distributions, habits, and miscellany remarks about their lives and their roles in a man dominated world. The remaining chapters include discussions of the physiological aspects of turtle life, longevity, habitats, feeding, and reproductive biology. A chapter on sea turtles, their migrations, and habits follows and, finally, chapters on perils on land and perils in the sea. These latter chapters can provoke great sympathy for turtles, besieged as they are by nature and man.

Typographical errors are more than usual. The author admits *Chelonia* is an outdated name, but uses it in a couple of tables. Orenstein fails to comment on why baby red-eared turtles are not sold in U.S. pet shops, that the intromittent organs are hemipenes, that softshelled turtles have a five-lobed hemipenis, and for sea turtles and giant tortoises mention of weights reached. He is contradictory in calling Cenozoic a period in one place and an era elsewhere. The numerous color illustrations are excellent, but he does not refer in text to the photograph that illustrates a statement.

The praise in my opening paragraph stands and I highly recommend this book for enjoyable and instructive reading.

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THE SNAKES OF TRINIDAD AND TOBAGO. *The W. L. Moody, Jr., Natural History Series, Number 31.*

By Hans E. A. Boos. *College Station (Texas): Texas A&M University Press.* \$47.95. xvi + 270 p + 48 pl; ill.; index. ISBN: 1-58544-116-3. 2001.

Even though quite a few herpetologists and naturalists have visited and written about Trinidad, few have dealt with the snakes of Tobago. Thus, readers will welcome a book about the snakes of both islands by Hans Boos who for thirty years has studied and cared for the amphibians and reptiles of these two continental Caribbean islands.

The book is well organized and contains practically all that is known about the snakes of this tiny, but intriguing, twin-island nation. After briefly reviewing the climate, topography, and geology of the two islands, the author comments on snake habitats and the herpetological history.

It begins from early travelers and offers delightfully exaggerated stories and fantastic tales about snakes from 1665 on. The modern work spans from 1926 to present and reviews the herpetologists who have studied and reported on the islands' snakes. The chapter, Taxonomy and Species Accounts, describes the 47 species and subspecies of snakes found on the islands (44 on Trinidad and 21 on Tobago). Only one of them, the false coral snake, *Oxyrhopus ocellatus*, is endemic to Tobago. The species and subspecies descriptions include localities, range, local name, natural history, and notes on systematics. A line drawing illustrates the head scales of each of the seven families represented on the islands. The venomous species, Elapids and Viperids, are treated in more detail including folklore, superstitions, and accidents. Interesting stories deal with the more visible species—anacondas, bushmasters, coral snakes, pit vipers, and boa constrictors. Most of the species are illustrated either in black and white or in color. The chapter, Snakebite, provides a wealth of information about venom, accidents, antidotes, and popular treatments, as well as medicinal plants used in snakebite treatment. Popular remedies include the curious Belgian Black Stone, a popular but apparently ineffective snakebite remedy. The book has a glossary and full bibliography about the snakes of Trinidad and Tobago.

For students and nonherpetology snake lovers it could be useful to have the names of head scales shown on the outlines for all the families. Most of the color plates are good to excellent quality that enable one to identify the species, but some of them are a little too small. A key for identification of the species would certainly enhance the value of the book. A few spelling errors were apparent.

The book is appealing and well illustrated, and the information is thorough and well documented. Descriptions and history are carefully presented and the systematics offer the most updated information available. Herpetologists as well as nature lovers will find this volume useful and entertaining.

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A FIELD GUIDE TO THE REPTILES OF EAST AFRICA: KENYA, TANZANIA, UGANDA, RWANDA AND BURUNDI.

By Stephen Spawls, Kim Howell, Robert Drewes, and James Ashe; Consultants: Alex Duff-MacKay and Harold Hinkel. San Diego (California): Academic Press. \$49.95. 543 p; ill.; scientific and common name indexes. ISBN: 0-12-656470-1. 2002.

The first 32 pages of this book include useful introductory information about aspects of reptile keeping, photography, conservation, identification, and classification. The species accounts are separated

into five sections corresponding, in order, to turtles, lizards, worm lizards (amphisbaenians), crocodiles, and snakes. After the species accounts there are two sets of color figures on Reptile Biology (19 figures) and Reptile Habitats (18 figures). The book concludes with seven appendixes: Notes on Snakebite; Local Names; Gazetteer; Glossary; References; Scientific Index; and Common Name Index.

The authors state that they "prepared this book to meet a major need in East Africa . . . [it being] the first book to list and describe all the East African reptiles and map their distributions, as known at present" (p 8). They consider East Africa to include only Tanzania, Kenya, Uganda, Rwanda, and Burundi. Therefore, the coverage is more accurately described as central East Africa, or Equatorial East Africa.

The introductory sections are useful and include the right amount of detail for a field guide. I was disappointed only in the section on zoogeography. The authors identify zoogeographic regions and list some characteristic reptile species for each one. They also provide a brief account of historical changes in geology and climates in the region, along with comments on the likely influences of these changes on reptilian distribution. Missing is a coherent account of centers of high species diversity and endemism, and the biogeographic relationships among centers of endemism. Perhaps, however, this is asking too much of a field guide. I was also disappointed that a simple table listing the number of species in each taxon and the total faunal diversity was not included. The appendixes are well conceived and contribute greatly to the usefulness and value of the book. The section on snakebites is particularly important.

The species accounts include simple and easy-to-understand binomial keys to families, genera, and species, along with drawings that illustrate some of the characteristics used for identification. There are brief accounts of the orders, families, and genera. The species accounts include sections on identification, habitat and distribution, and natural history. Both the scientific and common names are given, but the original author and year that the species was described are not given. Similarly, there are no references to the most recent authorities for the systematics of the groups, and sources of information on distribution, ecology, and natural history are lacking. A small distribution map is provided for each species showing its distribution in East Africa, but not the entire range of the species. Notes are given, however, concerning the occurrence of each species outside the delimited area. Most species are illustrated with small, but generally excellent, color photographs.

Information presented in the species accounts is

interesting and pertinent, and in some cases is the only information available on the natural history of some of the more poorly known species. There are some factual errors and odd omissions scattered throughout the volume. For example, the authors indicate that the gecko genus *Urocytyledon* is a monophyletic African group with the single species restricted to Tanzania. The genus, however, is neither monophyletic nor restricted to Africa. There are three African species of *Urocytyledon* and a fourth one in the Seychelles Islands. If the genus has been reduced to monophyly through recent taxonomic revision of which I am unaware, then the single species would have to be Seychellean, because the Seychelles form, *U. inexpectata*, is the type species of the genus. Similarly, the authors are wrong in stating that the gecko genus *Ebenavia* is monophyletic. A second species of this genus was described in 1998.

These scattered errors are largely unimportant and will not be noticed by most users of this book. The volume is well produced, largely free of typographical and spelling errors, printed on high quality paper, and strongly bound in signatures. Because it is hard cover, it will be a bit unwieldy for use in the field. But this outstanding book is not just for naturalists who plan to travel in equatorial East Africa. It is a must for every amateur and professional student of herpetology.

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HUMMINGBIRDS OF NORTH AMERICA: THE PHOTOGRAPHIC GUIDE.

By Steve N G Howell. *San Diego (California): Academic Press.* \$29.95 (paper). ix + 219 p; ill.; index. ISBN: 0-12-356955-9. 2002.

There are several field and behavioral guides to North American hummingbirds available, but the current volume is the only one to comprehensively document field identifications of Nearctic hummingbirds photographically. This alone makes the book exceptional, but it has many other good qualities, particularly an extensive 34-page introduction and detailed accounts of all 24 North American species.

The introduction is so comprehensive it is like a distillation of a textbook, and yet it is also highly readable throughout. The introduction describes hummingbird essentials such as phylogeny, functional anatomy, feeding and energetics, and breeding, and then goes on to explain the basics and nuances of field identification, including consideration of factors such as variation, hybrids, and viewing environment. Most avian field guides

include a page on the topography of a bird—this volume provides four, with photographs and detailed labels. There is also an extensive section on hummingbird topography, which includes discussions of the bill, head, wings, and tail. The introductory section provides details on molt, voice, wing noise, habitat, and behavior.

After a three-page section explaining how to use the guide, the rest of the book contains short paragraphs on each genus, and several pages on each species. The genus accounts are redundant with similar paragraphs in the introduction, but the species accounts are comprehensively done and very useful. The author provides identification summaries, followed by information on taxonomy, size and distribution, and range. Howell supplies a detailed description of identification characteristics, including discussions of similar species, voice, behavior, molt, and hybrids. Each species account includes several photographs, which illustrate basic identification markers as well as advanced considerations such as variation between sexes, ages, and molt conditions. The book is exceptional in providing such a valuable identification tool, combined with a readable and informative discussion of hummingbird biology. It is a guide that many will find informative and enjoyable.

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SUNBIRDS: A GUIDE TO THE SUNBIRDS, FLOWERPECKERS, SPIDERHUNTERS, AND SUGARBIRDS OF THE WORLD.

By Robert A Cheke and Clive F Mann; illustrated by Richard Allen. *New Haven (Connecticut): Yale University Press.* \$50.00. 384 p; ill.; index. ISBN: 0-300-08940-6. 2001.

During the last decade, books dealing with a particular group (often a family) of birds have become popular with publishers. Such volumes are very useful to the few scientists engaged in comparative studies, to collectors of bird books, and to those interested in a particular family of birds. The present book, covering the sunbirds and their allies, has to be judged by the standard set by a considerable number of other volumes that have been published during the last decade, mainly due to the efforts of Oxford University Press, publisher of the series, *Bird Families of the World*; and Yale University Press, publisher of the series, *A Guide to the (family name) of the World*. Potential readers of such books expect to get a short introduction to the characteristics and biology of the family being dealt with, followed by a species-by-species description of various aspects of their biology, together with pictures. The introduction to this book, how-

ever, is too short and cursory, occupying only 16 out of 384 pages. It is a pity that the authors did not use some of the detailed information they present in the species accounts in order to create a more adequate introductory chapter. On the other hand, the species section is very satisfactory and provides a comprehensive and updated description of what is known on sunbirds, and the drawings are accurate and attractive.

There are several shortcomings: the font size in this volume (as well as in other books in this series) is uncomfortably small, and even smaller in the reference section. All species are numbered, but their order in the plates is sometimes confusing, often because they are not sorted by running number. For example, Plate 18 includes species 60, 137, 78, and 79. References are provided at the end of the description of each species, but are sometimes also quoted in the text, and it is difficult to know why certain works are cited in the text and others not. Some of the maps of Africa are distorted, apparently in order to fit them into one of the two columns of the page.

I recommend this volume for ornithologists looking for information on species of sunbirds, and hope that the next edition will include a more comprehensive introduction.

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HANDBOOK OF AUSTRALIAN, NEW ZEALAND & ANTARCTIC BIRDS. *Volume 5: Tyrant-flycatchers to Chats.*

Senior Editors: P J Higgins, J M Peter, and W K Steele; Assistant Editors: G D Price and C M Myers; edited by K Y Al-Dabbagh et al.; colour illustrations by P Marsack, P Slater, K Franklin, M J Bamford, F Knight, and D J Onley. Oxford and New York: Oxford University Press. \$250.00. 1269 p + 44 pl; ill.; indexes to scientific and English names. ISBN: 0-19-553258-9. 2001.

The fifth volume in the comprehensive Australasian bird handbook series covers 118 species, including the Acanthisittidae (New Zealand wrens), pittas, lyrebirds, scrub-birds, Australasian treecreepers, the malurid wrens (22 species), and honeyeaters and Australian chats (76 species). Individual species mostly receive ten to 18 pages of information. With the use of a small font, just about everything that is known about each species is included. Detailed treatment is given to field identification, habitat and occurrence, distribution, seasonal movements (and banding results), food, social organization and behavior, voice and calls, breeding, plumage, molts, and geographic variation. A reference list is included at the end.

As with previous volumes, the color plates are superb, with each species depicted by sex and age forms, and also including major geographic forms and, occasionally, flight features. Large range maps are provided.

This volume deserves a place on the shelf of any ornithologist interested in the Australasian avifauna. One will not take the set into the field: each volume weighs several pounds. The work is a tribute to the Royal Australasian Ornithologists' Union (now known as Birds Australia) and Oxford University Press.

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

THE FLIGHT OF THE EMU: A HUNDRED YEARS OF AUSTRALIAN ORNITHOLOGY, 1901–2001.

By Libby Robin. Melbourne (Australia): Melbourne University Press. \$69.95. xi + 492 p + 24 pl; ill.; index. ISBN: 0-522-84987-3. 2001.

This handsome, clearly and entertainingly written, and profusely illustrated volume traces the history of the Royal Australasian Ornithologists' Union (now known as Birds Australia). Topics discussed include a century of ornithology in Australia; the national ornithological union; collectors, collections, and discovery; Gregory Mathews and the 1926 Checklist; the education, protection, and collecting controversy; the reunification of conservation and ornithology; a national bird-banding scheme; CSIRO, museums, and universities in the post-war era; the 1974 (Canberra) International Ornithological Congress; field guides, atlases, and observatories; conservation in the age of biodiversity; and later developments at the end of the century. There is an extensive list of "who's who in Australian ornithology," with all the more important ornithologists receiving a paragraph; a list of past presidents and secretaries; documentation of congresses and field camps; a list of Australian bird journals; and an honor roll of member wartime veterans.

The book is remarkable for its comprehensiveness. There are 24 full-page color plates, some meaningfully reproduced from early issues of the journal *Emu*, and others of species of special interest or conservation importance. They are supported by 400 black-and-white photographs that illustrate just about every phase of bird study, activities, and personnel through the 100 years of history. The book, with its emphasis on history and personalities, will be received with interest by ornithologists everywhere.

What criticisms do I have of the work? These are difficult to muster. As an academic insistent on emphasizing the contributions of ornithology to science, I would have preferred a discussion of this

subject. Due to its space limitations, this is beyond the volume's objectives.

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THE OSTRICH: BIOLOGY, PRODUCTION AND HEALTH.

Edited by D C Deeming. Wallingford (United Kingdom) and New York: CABI Publishing. \$110.00. x + 358 p; ill.; index. ISBN: 0-85199-350-8. 1999.

The editor of this volume succeeds not only in condensing expert knowledge on ostrich biology, production, and health, but also highlights gaps in current scientific understanding of the ostrich, with suggestions for further research in the field. Challenges facing the marketing of ostrich products include the need to expand meat markets, as well as to explore new markets for hides, which must be counterbalanced by the maintenance of top quality products and maximum profitability.

In general, ratites correspond well anatomically to other birds, but differences in the respiratory system are worth investigating. Physiology, osmoregulation, thermoregulation, respiration, metabolism, and the endocrine system of the ostrich are considered. Of particular interest is the aspect of neoteny related to thyroid function, and its importance in the evolution of ostriches and other ratites. The behavior of ostriches, in both natural and farming habitats, is described, with emphasis on the relevance of more appropriate husbandry techniques. This would enhance individual bird performance, a valuable tool for farmers. Further study is needed into digestion and nutrition, which are very relevant and of cardinal importance for the successful farming of ostriches. Feeding guidelines, for genetically improved ostriches with greater growth capacity, need to be established. There is still a great lack of understanding concerning reproduction in ostriches, with many facets still to be studied. Sexual behavior, endocrinology, manipulation of reproductive function, and reproductive anomalies, in both male and female ostriches, are identified as areas where urgent study is needed.

A detailed discussion on commercial incubation of ostrich eggs and the requirements of the embryo during different phases is presented. Rearing environments also enjoy some coverage, as do slaughter, marketing, advertising, and development of different products. The worldwide expansion of the ostrich industry over the past two decades is reflected in the intensification of management of all aspects of the industry. In spite of this, ostrich farming is still in its infancy compared to the poultry industry, stressing the need for more research and development. This book manages to

deliver successfully what the title promises, and is a must-read for anyone involved with this big bird.

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NORTH AMERICAN TREE SQUIRRELS.

By Michael A Steele and John L Koprowski. Washington (DC): Smithsonian Institution Press. \$24.95. xiii + 201 p; ill.; index. ISBN: 1-56098-986-6. 2001.

The authors wrote this book to share the process of scientific discovery and the wonderful world of the highly evolved tree squirrel with seasoned biologists, amateur naturalists, and casual readers. They succeeded. The book begins with the question, Why Squirrels?, and follows with body plan, habitat, diet, patch use, cache, seeds and squirrels, reproduction, social behavior, and population ecology. They cover the literature on the genus *Sciurus* well, and do so in a friendly way.

The book is well written for diverse audiences. There are distracting anomalies of metric conversion—English units are reported to two decimal places (e.g., 24.85 ounces), precision that is not significant. Jargon is mixed with mostly clear language. Tactile is used where touch would do, sympatric instead of occurring together. Even when the writing is muddled with jargon, however, the meaning is clear. Some circular arguments appear—explaining the adaptive value of the same pelage color with contrasting environmental conditions. There are good discussions of anatomic adaptations for arboreal travel and seed consumption. And some silly writing that concludes that the function of vestigial premolars is unknown. Some explanations are lacking, for example, that the tree squirrels have long vibrissae because of their structurally and spatially complex arboreal environment (where vision would be paramount; one would expect vibrissae would be more important in dark burrows). Many explanations are compelling.

Thus, the book proffers educators and students with multiple opportunities to teach and learn—how to write and edit technical subjects, to critically examine the logic of arguments, to do science—with a vehicle that is an interesting story that is clearly, but imperfectly, told. Moreover, the authors repeatedly present compelling stories of scientific discovery, of addressing large questions through continued refinement, and movement from field observations to laboratory experimentation. These stories are nicely told and good reading for beginning biologists or natural historians. Or just for fun.

ANDREW B CAREY, *Pacific Northwest Research Station, USDA Forest Service, Olympia, Washington*

DESERT PUMA: EVOLUTIONARY ECOLOGY AND CONSERVATION OF AN ENDURING CARNIVORE.

By Kenneth A Logan and Linda L Sweanor; Foreword by Maurice G Hornocker. Washington (DC): Island Press. \$70.00 (hardcover); \$45.00 (paper). xxxi + 463 p + 12 pl; ill.; index. ISBN: 1-55963-866-4 (hc); 1-55963-867-2 (pb). 2001.

This new book presents the results of the longest and most complete puma study that I am aware of. I found it highly informative and easy to read, with a less technical but thorough review of the authors' own data and that of others. In my opinion, it is a "must read" for anyone interested in mountain lions, and particularly those who are new to mountain lion research or management. Besides the authors' own data, readers will find an excellent literature review of systematics and evolutionary origin, capture techniques, population demographics and social structure, diet, and conservation. Unlike journals, where space is understandably limited and methods and complete explanations of results are often very brief, readers will be able to understand how and why Logan and Sweanor collected their data, and how they came to their conclusions. I found the summary and statistics sections at the end of each chapter helpful, and it reduced the cumbersome role of reading through lines of *P* values with associated statistics. In some cases, I wondered if statistics were necessary; why use population estimators when you know about the whole population? The data are that complete in some instances.

Although many of the authors' conclusions will spark new debates, one cannot disagree with the thoroughness of their data, and the rigorous design used to experimentally manipulate large carnivore numbers. I also appreciated their frankness with possible differences resulting from studying a more isolated puma population and the need for further study on more contiguous puma populations. The conservation section is thought provoking, and I believe the zone management scheme has merit and may even be affordable in today's financially strapped management agency world.

From my own standpoint, as a field biologist who has studied pumas, I see a personal angle here as well. This is also a story of a husband-wife team, with the help of many field assistants, who put their personal life on hold by spending more than 250 days a year in the field to collect data for over ten years, and actually do experiments on the most allusive beast I have ever tried to learn about. This book is a product of determination, endurance of heat, cold, insects, rattlesnakes, numerous muscle aches, dehydration, airsickness from circling collared pumas in the heat induced updraft, learning to like the taste of dust, along with the red eyes,

carpal tunnel syndrome, and late, late nights that come from any large writing endeavor. In my opinion, the result is a good one, and I appreciate that they were able to put it together. In the scientific world where we strive for "replicates," it is doubtful that many groups will reproduce such a thorough look at a population of pumas over the long term as Logan and Sweanor did.

STAN CUNNINGHAM, *Arizona Game & Fish Department, Phoenix, Arizona*

CARNIVORE CONSERVATION. *Conservation Biology, Volume 5.*

Edited by John L Gittleman, Stephan M Funk, David W Macdonald, and Robert K Wayne. Published by Cambridge University Press, Cambridge and New York, in association with The Zoological Society of London. \$130.00 (hardcover); \$49.95 (paper). xiv + 675 p; ill.; index. ISBN: 0-521-66232-X (hc); 0-521-66537-X (pb). 2001.

This comprehensive book addresses the key issues and obstacles facing the world's carnivores in the 21st century. Perhaps more than any other taxon, carnivores elicit the full range of human emotions: from fear—based partly on age-old myth and superstition and partly on the fact that carnivores do kill to survive—to awe and respect for the skill, cunning, and strength embodied by predators. Large carnivores in particular often inhabit extensive territories and come in direct conflict or competition with humans. As a result, carnivores confront a daunting array of policy, management, and biological challenges.

From genetics to invasive species to the difficulties of predator restoration, *Carnivore Conservation* adeptly brings experts from diverse disciplines together in a single volume to examine these topics. Part 1 identifies the past and current problems in carnivore conservation, Part 2 discusses possible approaches and solutions, and Part 3 outlines prospects for future research and conservation initiatives. This volume will be a useful tool to biologists working in the field of carnivore conservation, as well as to informed laics concerned about this issue.

NINA FASCIONE, *Defenders of Wildlife, Washington, DC*

DISPERSAL. *Based on a conference held in Roscoff, France, 23 April–1 May 1999.*

Edited by Jean Clobert, Etienne Danchin, André A Dhondt, and James D Nichols. Oxford and New York: Oxford University Press. \$95.00 (hardcover); \$45.00 (paper). xxi + 452 p; ill.; index. ISBN: 0-19-850660-0 (hc); 0-19-850659-7 (pb). 2001.

Dispersal is a phenomenon of central importance in ecology and evolution. Yet many of its fundamental aspects remain poorly understood or barely

investigated. This excellent, broad-ranging volume is a collection of 26 short reviews derived from a Centre National de la Recherche (CNRS)-National Science Foundation (NSF) sponsored workshop held in 1999. As stated by the editors, this book is mainly comprised of "reviews and more theoretical approaches, with a limited number of empirical examples" (p xx) on dispersal.

In general, contributions are of high quality and summarize advances during the past decade, current state-of-the-art, and future directions of dispersal studies. Contributions are also, by and large, integrative and critical, typically comparing and contrasting different experimental or theoretical approaches. The book is separated into five parts, roughly dealing with genetic and demographic measures of dispersal; influences of habitat and inter- and intraspecific (e.g., kin) interactions on dispersal; proximate physiological and genetic causes on dispersal and habitat selection; ecological and genetic consequences of dispersal on populations, metapopulations, and communities; and synthesis, future directions, and importance of dispersal studies in conservation biology. Central topics in dispersal, such as the use of indirect versus direct methods of estimation, are well covered in several sections, with alternate methods being critically evaluated and newer approaches discussed. An important aspect of this volume is the inclusion of newer, less-studied topics such as influence of landscape context on dispersal, habitat selection by dispersers, and effects of dispersal on metapopulation dynamics. Finally, the inclusion of several in-depth reviews of experimental models such as fire ants, pikas, and naked mole rats (my personal favorite) add balance to a volume weighted more toward theoretical aspects.

I highly recommend this book. It will be particularly useful for researchers who want to get succinct updates on recent advances, state-of-the-art, and future directions of dispersal studies. This volume would also be ideal as a focus for a graduate course on dispersal.

ANTHONY J ZERA, *Biological Sciences, University of Nebraska, Lincoln, Nebraska*

THE PHILOSOPHY AND PRACTICE OF WILDLIFE MANAGEMENT. *Third Edition.*

By Frederick F Gilbert and Donald G Dodds. *Malabar (Florida): Krieger Publishing.* \$34.50. xiii + 355 p; ill.; index. ISBN: 1-57524-051-3. 2001.

Wildlife management has matured from a profession where biologists were largely concerned with maintaining robust populations of popular game species into a discipline that is a major contributor toward current efforts to preserve the biological

diversity of this planet. Practitioners are expected to be familiar with a number of subject areas (e.g., animal biology, ecology, physiology, and systematics). Any textbook that introduces the major principles of wildlife management should expect readers to have a fundamental knowledge of these subjects as this book does. Twelve chapters span topics such as the historic development of wildlife conservation, the values of wildlife to humans, managing population of wild animals and their habitats, and involvement with environmental impact assessments. Chapter 3 (Native American Access to Wildlife) and Chapter 5 (Parasites, Disease, and Wildlife) are good additions since the first edition of this volume. The authors have extensive experience with natural resource agencies in Canada and the United States, which may explain the nearly exclusive North American focus. Unlike other recent books on the subject, the authors have not blurred the distinctions between wildlife management and the more recently developed discipline of conservation biology. This was especially apparent in chapters that dealt with habitat management and individual species management. Issues relevant to contemporary landscapes and modified habitats (e.g., fragmentation and corridors) are barely introduced, as well as the tools (satellite imagery and geographic information systems) used to address them. Some of the conventional approaches to game management are not covered well either. Although the concept of maximum sustained yield (MSY) is introduced, I did not find any description of density-dependent recruit. This is essential for understanding management plans that include a MSY approach.

To their credit, the authors provide substantial insight into the "philosophy" of wildlife management. Although not presented as comprehensive cases studies, a number of examples are given that illustrate the role of public involvement in affecting wildlife management and legislation. Too frequently information presented by biologists is overshadowed by concerns for political fallout and this is worth emphasizing.

Clearly this book is a revision; however, I was surprised to find most references in chapter-specific bibliographies to be prior to 1990. Illustrations are not used effectively, attractive drawings and black-and-white photographs of individual animals are presented without captions or references in the text. Figures and boxed examples would have aided in presenting more complex topics. Although students should be cautioned against a recipe approach to wildlife management, "how to" examples provide an effective format to cover the complexities of a successful management plan. In summary, the authors have done a good job in pro-

viding readers with a pragmatic review of the approaches taken to manage an important natural resource. Students and professional wildlife biologists will benefit from reading this book.

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A DIFFERENT NATURE: THE PARADOXICAL WORLD OF ZOOS AND THEIR UNCERTAIN FUTURE.

By David Hancocks. Berkeley (California): University of California Press. \$35.00. xxii + 280 p; ill.; index. ISBN: 0-520-21879-5. 2001.

I think that it is quite safe to say that zoos (and aquariums) have seen their greatest advancements in exotic animal management, medicine, exhibitory behavior, breeding, and enrichment in the past 30 to 40 years. This has all occurred at a time when more and more species are becoming increasingly rare. There is a greater need to better manage zoo collections and, at the same time, to prevent some species from going extinct, mainly by educating visitors to the plight of these species and the shrinking wild places that these animals inhabit.

It was these thoughts about how zoos have advanced that caused me to be more than mildly annoyed or at least frustrated by *A Different Nature*. Hancocks, a gifted architect, has been one of the most innovative zoo exhibit designers in the past 40 years. At the very least, he has been a part of the teams that have designed and built exhibits that have set the standard for others to follow. This creativity and willingness to take risks was and still is quite admirable. It has been quite fortunate for zoos and their inhabitants that some of these creative people—through their exhibits, publications, and presentations—were getting the word out (if for no other reason than to possibly draw business) about what they were building at the time when very few zoo directors and curators were talking about their latest efforts.

The first hundred pages of *A Different Nature* present the history of zoos from the first animal keepers up through the 20th century. This section of the book is easy reading, with little that is in any way thought provoking or controversial. For anyone with an interest in zoo history, there are a number of books that have been written that go into more detail than is provided here.

It is the remainder of the book that may be described as enlightening, but occasionally controversial. At times, the knowing zoo professional will be in full agreement with Hancocks, while at other times unhappy or frustrated by his thoughts. It is then that readers will look for and pick out the book's small faults or inaccuracies because there is

little else to do. I found myself doing this. I dislike correcting the author, but the Bronx Zoo's "Congo Gorilla Forest" cost many millions of dollars more than what he reported. The Singapore Zoo did not abandon its gorilla exhibit because the gorillas contracted an epidemic and fatal tropical parasite. What the Singapore Zoo did was to convert this exhibit (with very little effort) to a successful exhibit for chimpanzees.

One has to wonder if the author really does like zoos and zoo exhibitions. Hancocks, either through modesty on his part or for other reasons, neglects to mention his role in the dramatic changes that have occurred in zoos in the last 30 years. He has high praise for some zoos and zoo exhibits scattered throughout the book. He also identifies some zoos and exhibits that were not as well planned as they might have been. Occasionally these zoos are ridiculed, rather pompously, by the author for what they have done. Unfortunately, there is no mention of their lack of the creative human resources as well as the monetary resources that are not always available to zoos.

Disturbing is the author's seemingly unquestioning support of groups that appear to be antizoo. Shame on anyone within or outside of the zoo community that in anyway supports bad zoos. I am quite convinced that if groups (such as Zoo Check) were only attempting to close bad zoos, then they would have many allies within the zoo world. I do not believe that this is case for Zoo Check or the other organizations mentioned by the author.

Hancocks's great interest in what he describes as "the electronic zoo" is another issue that causes one to wonder where his sentiments really lie, despite the fact that he has had a long career as a zoo director. Nearly eight pages are devoted to plans for the use of films, videos, HDTV, and other equipment that seems mostly related to the magnification and observation of tiny invertebrates and plant life; the "usual zoo animals" are not included. Is this an exhibition that families will visit more than once? I think not, but I have no intention of being completely against the idea because I know that there is technology in the "electronic zoo" that we can take advantage of as we plan for the future.

I would like to encourage Hancocks to write the kind of book that I know he can write. He has so much to offer, especially to the zoos that he has tended to criticize in *A Different Nature*. In my long career, I have found that North American zoos are willing to cooperate and help each other when asked, and the author could be a great resource to the zoo community. Hancocks has the experience and the creativity to write, in a very positive fashion, a book that can be helpful to those zoos that he tends to fault. One of these days, all zoos must real-

ize that it is not just lots of money that will make an exhibit good for the animals and the zoo's visitors. It also takes the creativity and risktaking of people like David Hancocks. Until that book is written, read *A Different Nature* and take from it all the good that it has to offer.

JAMES G DOHERTY, *Mammals, Bronx Zoo, Wildlife Conservation Society, Bronx, New York*

ERRATUM

In the review of *Sperm Competition and Its Evolutionary Consequences in the Insects*, by Leigh W Simmons [reviewed by John Alcock, *The Quarterly Review of Biology*, 77(2): 209–210], the correct citation in paragraph 1, sentence 1 should be (*Biological Reviews*, 45: 525–567).



AQUATIC SCIENCES

CREATURES OF THE DEEP: IN SEARCH OF THE SEA'S "MONSTERS" AND THE WORLD THEY LIVE IN.

By Erich Hoyt. *Buffalo (New York): Firefly Books.* \$40.00. 160 p; ill.; index. ISBN: 1-55209-340-9. 2001.

This book is a photographic and narrative visit to the remote deep-sea frontier, which represents the largest and least studied biological habitat on Earth. The photographs of a variety of bizarre and beautiful marine organisms are spectacular, and the accompanying text is interesting and informative. With a few exceptions, the factual content is generally quite good; generalizations and simplifications were probably a necessary compromise to achieve the concise text. There is a strong emphasis on photogenic, toothy megafauna, which is a bit misleading for this environment, but there are brief sections on the less charismatic lower trophic levels. The historical information is really enjoyable and gives a feel for exploration and discovery.

The organization of the first part of the book, which presents chapters on sequentially deeper habitats, generally works quite well. A minor drawback is that like much of the book, a few subjects are presented in some detail through interesting and sometimes personal experience, but at the expense of presenting any sort of synthesis. Part 2 brings together some of the key elements of the food web, but the heavy weighting on a few big predators (yes, lots of sharks) seems rather arbitrary and throws the discussion out of balance. The

third part, which is largely about hydrothermal vent environments, is interesting and visually striking, but this is really the only bottom environment that gets any detailed treatment. Seamounts, seeps, and sediments (my personal favorite) get little, if any, attention.

Deep-sea biologists will find the book incomplete and not as rigorous as they might like, but may want to buy it for the great photographs. For everyone else, the images and easy narrative style make it a very attractive coffee-table book that will intrigue those who peruse it.

PAUL SNELGROVE, *Biology, Memorial University of Newfoundland, St. John's, Newfoundland, Canada*

COPEPODS: AETIDEIDAE OF THE WORLD OCEAN. *World Biodiversity Database CD-ROM Series. Version 1.0.*

By E L Markhaseva. *New York: Springer-Verlag.* \$129.95 (CD-ROM). ISBN: 3-540-14622-9. 2000. [Requirements—Windows: Windows 95/98, Pentium processor, 16MB RAM, 4x CD-ROM drive, 16-bit color monitor; MAC: system 7.x or 8.x, Macintosh computer with 680x0 or PowerPC processor, 16MB RAM, 4x CD-ROM drive, 16-bit color monitor.]

ORGANISM-SEDIMENT INTERACTIONS. *Based on a symposium held in Columbia, South Carolina, October 1998. The Belle W. Baruch Library in Marine Science, Number 21.*

Edited by Josephine Y Aller, Sarah A Woodin, and Robert C Aller. *Published for the Belle W. Baruch Institute for Marine Biology and Coastal Research by the University of South Carolina Press, Columbia (South Carolina).* \$60.00. xxiii + 403 p; ill.; index. ISBN: 1-57003-431-1. 2001.

This volume contains 23 papers that are a result of a symposium in honor of Donald Rhoads, whose conceptual work throughout his career continues to frame and define our understanding of how the benthos and the sedimentary regime interact. The interrelated themes represented in the volume relate the effect of physical disturbance and species interactions on species succession, community structure, and feeding ecology of the benthos and their effect on sedimentological and biogeochemical processes. The papers are reviews of major areas of benthic research over the last few decades: biogenic modification of physical properties of sediments, response of benthos to sedimentary disturbance and biological/paleoecological indicators of these processes, biogeochemical processes affected by bioturbation, and food resources and utilization by benthos.

The first section on technological advances in the study of benthos highlights the signal contribution that Rhoads has made to the ability in studying in an interdisciplinary way the interaction of benthos with the sedimentary regime. The paper (by Rhoads et al.) on the importance of technology in benthic research and monitoring explores the history of moving from the traditional grab sample approach in describing benthos to a variety of technologies that allow for rapid collection of information not only on community structure but also on biogeochemical processes. In so doing the authors underscore the fact that the best technological advances stem from first articulating those first order questions about the interactions of organisms. The section on Response of Benthos to Sedimentary Disturbances provides a strong multiple scale overview of benthic-sediment interactions in the dynamic water-sediment interface. Papers by Alongi and Aller et al. offer excellent descriptions of the interplay of organic input and organismal activity affecting diagenesis. The papers on sedimentary food resources and digestive strategies are forward looking in tackling the ecology of the chemistry of digestion, as well as the paper by Levinton et al. that brings the discussion of organismal feeding into the context of population effects on ecosystem processes. The review volume serves as a real resource in readings for those teaching advanced students in benthic ecology because there is no textbook available that covers with the needed depth the main themes of benthic research encompassed in this volume. This book also provides sufficient discussion to make it worthwhile in providing to nonbenthic researchers an appreciation for the role organisms play in sediment geochemical processes.

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ENVIRONMENTAL SCIENCES

THE SILVER LINING: THE BENEFITS OF NATURAL DISASTERS.

By Seth R Reice. Princeton (New Jersey): Princeton University Press. \$24.95. xiii + 218 p; ill.; index. ISBN: 0-691-05902-0. 2001.

The idea that natural disturbance is a recurrent organizing principle in plant communities has become commonplace within the discipline of ecology. Our present communities—this contem-

porary biodiversity—are thus the “silver lining” alluded to in the title. The author attempts to present this view for a mass audience. With a book such as this, one has to ask three things: First, does the author get the science right? Second, has this not yet been done before? Third, is the prose engaging? I think this book fails on all three counts. Indeed, it is awful.

Although Reice mentions a large number of disturbance types in passing, it is flood and fire that he covers in detail. What he has to say about fire is, by and large, simply wrong. A major problem is his reflexive assumption that fire suppression has been effective during the preceding decades. It is scandalous that Canada and the United States combined spend about a billion dollars per year on suppression and yet there is no concrete evidence to show that it amounts to more than a make-work program for undergraduates and a bloated fire-fighting bureaucracy. Indeed, Reice, when faced with the contrary evidence of fires such as the 1988 Yellowstone burn that could only be extinguished by a Noachian precipitation, happily adopts the same argument as the fire fighting lobby, arguing that their extraordinary success in the past has led to such a buildup of fuel that now a fire is simply unstoppable. In short, recent huge fires such as the 2001 Chisholm fire in Alberta are analogous to the Missouri/Mississippi flood of 1993, a product of our hubris. Nowhere in the primary literature is there serious support for or against the argument although it is quite common in the secondary literature.

Reice then loses readers entirely in the section on species' adaptations to fire. It is a mass of speculations regarding selection for or against flammability in the past. But those unlucky communities dependent on their flammability—such as pine forests or chaparral—are doomed to disappear, Reice tells us, given our misguided suppression efforts. But what happened to the hubris argument? I do not know.

My second criticism of this book is that this “new paradigm . . . emerging” (p 15) is hardly new at all. Even in popular works, authors such as Daniel Botkin (or Stephen Jay Gould in a different context) have been emphasizing catastrophe and nonequilibrium views for some time now. Further, in an informal way, citizens with a natural history bent have been hearing this message for at least 20 years around campfires in national parks. I first heard the argument that Smokey the Bear is a “false friend” (p 19) at Yosemite National Park around 1979 from an undergraduate in a park uniform. And, of course, the message was repeated endlessly to mass audiences by Yellowstone personnel in response to criticism of the let-burn policy.

My final complaint is that the wooden prose sometimes aspires to the maudlin: "we learned the name of this nocturnal scourge: Hurricane Fran" (p 24); "[t]hose fearsome fires, floods, and storms are essential" (p 212). And the attempts to connect with an audience using popular culture are clumsy. For example, Reice tells us that "Walt Disney . . . [got] it right in *Bambi*" (p 18), meaning there was indeed a crown fire. Actually, Disney was trying to support the Smokey the Bear argument. The fire (near the end of the movie, and of trivial importance to the plot) was started by human hunters who had left their campfire unattended. Reice says that the movie shows a situation where "notions of competition and predation are gone" (p 18). In this movie the omnivores and herbivores are all pals. The only predators were the humans with rifles.

In summary, it is not clear that the author is well versed in either the primary literature or popular culture. This book is a disaster lacking any silver lining.

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FIRE: A BRIEF HISTORY.

By Stephen J Pyne; Foreword by William Cronon. *Seattle (Washington): University of Washington Press.* \$18.95 (paper). xvii + 204 p; ill.; index. ISBN: 0-295-98144-X. 2001.

In his current description and analysis of the historic interrelationships between man and fire, the author first summarizes the presence and influences of fire before humans were on the scene. He follows this with the expanded and increased impacts of fire on Earth's ecosystems after man's arrival, focusing on man's gaining the power to create, maintain, and deploy fire at his will and command. Fire, in the hands of humans, when added to the continuing potent occurrences of natural fire ignitions, led to new levels of ecosystem complexity. Several times in his book, Pyne points out that although fire could survive without man, man could not survive without fire, and provides convincing evidence to support his point of view.

Prehistoric fire, called "First Fire" by Pyne, routinely and randomly burned organic fuels, releasing stored solar energy and gaseous byproducts. Plants and animals evolved adaptive strategies to survive in such an environment. First Fire, for millions of years, formed natural fire cycles or fire regimes relating to the presence or absence of fire over time. Fire cycles or regimes refer to and encompass the frequency, intensity, and severity of fire events. These regimes vary within and between different global ecosystems. Fires operating during

more recent times, but now fostered and prescribed by aboriginal man, are labeled "Second Fire." Man possessing and using fire altered the natural fire regimes on a global scale; the timing and geographic extent of burning changed dramatically.

Second Fire, controlled by humans (either deploying it or suppressing it) created major departures from First Fire regimes; Pyne provides many examples. Development of agriculture, encompassing the selection and cultivation of cereal and vegetable crops, as well as generating pasture for grazing livestock, meant humans asserting control over natural fire, or making every effort to do so. Sometimes fire was a desirable and useful agricultural tool; at other times it was purposely kept off the land. Humans altered fire regimes wherever agricultural activities were pursued; the amounts and arrangements of natural fuels were changed in the process. These changes are still occurring today, and is one of the best reasons for reading *Fire: A Brief History*.

Third Fire, or industrial fire, the last described by Pyne, encompasses fire occurring in confined places that we moderns rarely think about, including mined, drilled, or pumped fossil fuels, coal, oil, and gas, used within engines or in energizing our homes. First Fire, uncontrolled wild fires ignited by lightning, are only slightly different from the precisely controlled Third Fire events, such as when we turn the ignition keys in our automobiles and expect the engine to "fire up." Third Fire is generally kept hidden from our direct sight, but remains a major part of our lives, in areas such as global politics and economies. Pyne does an excellent job in making these connections.

Humans have expanded their numbers, filling much of the Earth, but First, Second, and Third Fires have remained important influences. Pyne calls upon his abundant knowledge of historic and modern fire to fashion a narrative that will easily hold the attention of readers. As long as green plants continue to photosynthesize, creating burnable biomass, fire is certain to find it and consume it. New problems have arisen. More and more people in Europe and North America are exiting from crowded cities, building their homes in isolated semiwild areas, the so-called forest-urban interface. Many such homes are or have become surrounded by accumulations of flammable plant growth, fuels ready to be discovered by fire. Interface home owners soon discover they have been drawn into complexities and conflicts among their homes, the fuels, and inevitable fire. Pyne's book is a must read for anyone flirting with potential wildland fire on their interface homesites. It will provide a reality check.

William Cronon provides an insightful foreword, *Small Book, Big Story*. It is here that readers are alerted to Pyne's intention of providing a "narration" in a "slender volume," of how our hominid ancestors discovered the trick of capturing fire and carried it forth, changing the face of all continents as they went. In his current effort, Pyne has managed to draw the critical substances from his numerous past fire-history publications. Cronon's remarks provide encouragement to return to Pyne's earlier volumes in the *Cycle of Fire* series for in-depth details. Having read several, I can support this recommendation.

The author provides an excellent bibliography of key fire references to fire history as well as a listing of recommended further readings. Because of the wide-ranging number of bases his book touches upon, *Fire: A Brief History* is recommended not only to scientists and resource managers who are routinely associated with fire in their professional work, but to geographers, anthropologists, natural historians, and to anyone interested in the history of mankind and how fire shaped that history.

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THE HISTORICAL ECOLOGY HANDBOOK: A RESTORATIONIST'S GUIDE TO REFERENCE ECOSYSTEMS.

Edited by Dave Egan and Evelyn A Howell; Foreword by Curt Meine. Washington (DC): Island Press. \$55.00 (hardcover); \$30.00 (paper). xix + 457 p; ill.; index. ISBN: 1-55963-745-5 (hc); 1-55963-746-3 (pb). 2001.

This is an excellent overview for restoration biologists interested in the best estimates for reference composition for sites to be restored. This compilation provides general directions to obtain the historical information that gives the past composition of plants and animals at a site. The book begins with a theoretical framework of ways to use and think about reference conditions for a restoration. The introduction is followed by a collection of six chapters on different approaches to cultural evidence and seven chapters on sources of biological evidence. The book concludes with four chapters that provide a brief overview of projects that utilized a diversity of historical evidence to develop reference conditions. I found this to be a well-edited collection of chapters that indicate cultural and biological sources of information along with general advantages and drawbacks of each. Examples within most chapters are from a diverse array of habitats common in North America.

In the Introduction, Egan and Howell develop themes that readers should keep in mind when

they read through the rest of the book. I was particularly impressed with the presence of an overview chapter that, rather than indicating a view of what was coming in the following chapters, instead provided a framework for how restorationists should think about the systems they intend to restore, how dynamic they are and, consequently, the value and limitations of historical data. They begin with a discussion of what "historical ecology" seems to be in the minds of researchers who practice it, and follow that with a discussion of why restoration biologists should be interested in historical information, including an outline procedure for site restoration in which historical information is most important in the initial stages of developing ecosystem models of what the site should become. This is followed by a discussion of the temporal scales that should be considered in developing reference conditions for ecosystem research.

In the section on cultural sources of information, O'Brien begins by introducing archeological techniques. I enjoyed the history of how archeologists have evolved from perceiving the environment as driving human history to how paleohumans also interacted with and modified their environment. The awareness of the historical influence of humans in North America is not always clear when talking with restoration ecologists, but O'Brien makes a strong case for their role in shaping past ecosystems and how archaeology can provide insight. Subsequent chapters discuss ethnobiology (Anderson), written sources (Edmonds), oral history (Fogerty), historic photographs (Reithmaier), and early land survey information (Whitney and DeCant). Some chapters illustrate research issues (archeology and ethnobiology), while others are descriptions of technique (oral history and historic photographs). As an example, Edmonds's chapter on the diverse sources of written information was interesting in that the information may be present, but is also difficult to interpret. The cultural biases of early Europeans as well as their use of problematic common names for plants and animals are illustrated as some of the constraints of these sources.

The next section develops a series of approaches using biological sources of information. Forest stand history using observational data (Marks and Gardescu) begins this series of chapters, followed by others on dendrochronology (Kipfmüller and Swetnam), palynology (Davis), and packrat middens (Rhode). In the chapter on palynology, not only does Davis review classic paleoecological work on postglacial changes in vegetation that used palynological data, but he also illustrates several other studies, including those in habitats and locations in which researchers might not expect historic pol-

len data to be important. Additional chapters in this section discuss developing historic animal assemblages (Morrison), using geomorphical information (Trimble), and using phytoliths (Fredlund) for reconstructing ecosystems.

Two things are effective about the sections on cultural and biological evidence. One is the diversity of source types and the examples of their application. The other is that these techniques cover a diversity of temporal scales, from quite historical (e.g., archeological or palynological) to quite recent (e.g., photographic or forest stand observational). This approach pulls information together for biologists interested in restoration and provides a range of techniques that may be effectively scaled for the objectives of a particular project. For example, the last section describes the use of multiple sources in four case studies: the pre-European vegetation of Nantucket Island in New England (Dunwiddie), the recent changes in Indiana Dunes forests (Cole), the archeologically reconstructed vegetation near the Grand Canyon (Alcoze and Hurteau), and the historical distributions and morphologies of wetlands in the San Francisco Bay (Grossinger). Although none of the chapters in this section are comprehensive in reconstructing any historic ecosystem, each shows how evidence from a variety of sources can be used to support or contradict interpretations of historic sources.

Egan and Howell, the editors of the book, indicate at the end of the introductory chapter that their intention was to provide "a series of 'primers' about the various techniques and source materials that can be used to identify historic reference conditions for restoration projects" (p 15). I feel they have accomplished this task effectively. This is an important source for biologists interested in any aspect of restoration ecology.

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EXPLORING AGRODIVERSITY. *Issues, Cases, and Methods in Biodiversity Conservation.*

By Harold Brookfield. New York: Columbia University Press. \$75.00 (hardcover); \$35.00 (paper). xxi + 348 p; ill.; index. ISBN: 0-231-10232-1 (hc); 0-231-10233-X (pb). 2001.

Contemporary debates on the management of biodiversity and biotechnology are only rarely situated in the context of agricultural diversity as it has evolved in history and was until very recently practiced by a majority of the world's small-scale farmers. Laying claim to having himself coined the term (p xii), Harold Brookfield in this ambitious book

recounts his exploration of an exciting and expanding new interdisciplinary science. The author describes agrodiversity as the ways in which farmers use the natural diversity of the environment for production through their choice of crops and management of land, water, and biota (p 42).

Readers wishing to use Brookfield as their guide in their own urgent exploration of this emerging terrain will find him both expert and companionable. The best guides have long memories, and this book begins where its author began—in the highlands of New Guinea in 1958. In Part I, diversity is presented by example, taking on board Peruvian, Sudanese, and Malaysian cases before analyzing the conceptual framework of the new science and linking it into the history of agriculture and the diversity and dynamics of soils, which are the foundations of ecological diversity. Part II focuses on the often maligned practice of shifting cultivation, using a series of case studies to show how several fast-disappearing systems in tropical countries made skilful use of natural diversity, rationally exploiting "parsimonious soils" (e.g., the *citemene* and *fundikila* systems of the Bemba), managing fallows, coping with degraded land, erosion on slopes, and flood hazards. Brookfield is critical of the use of the "ethnographic present" in anthropological literature, so Part III addresses pathways of transformation, from the agricultural to the green revolutions. Stressing the importance of incremental rather than revolutionary change, and of farmers' own innovations and investments, these chapters provide a prelude to the important discussion of contemporary issues in Part IV (The Future of Agrodiversity). A "gene revolution" (p xvii) is now succeeding the green, and brief reviews of current issues (up through 1999) include genetic erosion and conservation, alternative agriculture in the North, the story of the "terminator gene," tissue culture and asexual reproduction in crop breeding, biosafety, and ethics.

In thus contextualizing current debates, Brookfield draws attention to the common ground that modern alternative agriculture movements in the North share, not only with their own past, but also with diverse agriculture in developing countries, as well as the ways in which the latter are drawn into struggles with the seed and biotechnology corporations. Such unifying themes will surely draw a line under many decades of scholarship that have tended to isolate the practice of agriculture in North and South, driven by an overemphasis on biological and technical differences. In fact, the book ends on a surprisingly upbeat note: the diversity of small-scale agriculture is its own best defence against the homogeneity and input-dependency of

"modernist" agriculture, and this finding neatly dovetails with theory developed by Holling and others on diversity engendering resilience in managed ecosystems. Without effective organization, small farmers are vulnerable (pp 278–279), notwithstanding their continuing numerical superiority.

This is a book of major importance not least because of the facility with which its author (whose earlier writings have been influential) weaves a seamless interdisciplinary tapestry around urgent issues that are too easily debated out of social and historical context (such as biodiversity loss and population-induced degradation). Readers among the biological sciences will find it an admirable guide to wide-ranging work and an extensive literature. It is also an intensely personal exploration, having the homely feel of a series of lectures rather than a textbook. Anecdotes and occasional eccentricities punctuate an argument that never loses its momentum. Boxes and helpful cross-referencing will assist readers.

Can agrobiodiversity survive in a "globalizing" world? Although the economic and demographic forces that drove historical land use change, biodiversity change, and agricultural evolution find mention in many of the case studies used in the book, there is not a systematic discussion of their impact on agrobiodiversity, nor of the terms under which diversity will be negotiated with global markets in the future. Agriculture has always existed mainly to produce food, and the demand for food has always depended to a large extent on population, once at local and now increasingly at global levels. Northern "alternative agriculture" (p 253) pursues a minority market. Small farmers in the South face a productivity constraint, always cited by proponents of gene transfer technology. We can eat diversity (and it is good for us), but can there be enough for everyone?

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ECOLOGICAL INTEGRITY: INTEGRATING ENVIRONMENT, CONSERVATION, AND HEALTH.

Edited by David Pimentel, Laura Westra, and Reed F Noss. Washington (DC): Island Press. \$70.00 (hardcover); \$35.00 (paper). xiii + 428 p; ill.; index. ISBN: 1-55963-807-9 (hc); 1-55963-808-7 (pb). 2000.

This book provides a synthesis of the findings of the Global Integrity Project that brought together scientists to examine the problems of threatened and unequal human well-being, degradation of the ecosphere, and unsustainable economics.

DESIGNING FIELD STUDIES FOR BIODIVERSITY CONSERVATION.

By Peter Feinsinger. Washington (DC): Island Press. \$27.50 (paper). xx + 212 p; ill.; index. ISBN: 1-55963-878-8. 2001.

Designed as a practical guide to the use of scientific methods in conservation biology and ecology, particularly in Latin America, this helpful and engaging book is aimed at a broad audience, including not only professional ecologists and conservation biologists, but also secondary school educators and laics. As such, it assumes little prior knowledge of scientific inquiry, and is written in a crystal clear style, largely free of jargon and technical language.

The book begins with a description of the hypothetico-deductive scientific method, which is quickly demystified with an example of a farmer using common sense methods to decide which crops to plant in a new field. Complex scientific concepts are skillfully explained with examples throughout the book.

The next several chapters discuss the process of framing answerable questions (Chapter 3), designing an experiment to successfully answer a research question and deal with variation and confounding factors (Chapter 4), and using statistics to understand the results (Chapter 5). I found this latter chapter to be one of the highlights of the book; I have seldom encountered a clearer explanation of statistical tests and their interpretation. This chapter includes excellent explanations of descriptive statistics, Type I and Type II errors, statistical power, and a sophisticated yet very lucid explanation of interpreting statistical significance. I found myself constantly referring to these chapters as I prepared college-level introductory courses in ecology and statistics.

Later chapters focus on topics of more particular relevance for conservation ecology, including incorporating a thorough knowledge of natural history into studies (Chapter 6), the benefits of a landscape perspective and edge effects (Chapter 7), the usefulness of indicator species (Chapter 8), and species diversity indices (Chapter 9). The book concludes with a step-by-step guide to involving local communities in conservation efforts (Chapter 10).

In each chapter, Feinsinger goes beyond merely presenting techniques, but rather provides an up-to-date, sophisticated, critical evaluation of each, rare in a book aimed at such a general audience. All of the chapters are very readable, and are backed with extensive notes and references.

My only complaint is that the book's focus on Latin American examples and conservation biology could give the erroneous impression that only Latin American conservation professionals would benefit from reading this book. On the contrary, I

enthusiastically recommend it to anyone beginning their studies in field biology and to their teachers.

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SPREADSHEET EXERCISES IN ECOLOGY AND EVOLUTION.

By *Therese M Donovan and Charles W Welden. Sunderland (Massachusetts): Sinauer Associates. \$24.95 (paper). xi + 556 p; ill.; no index. ISBN: 0-87893-156-2. 2002.*

SPREADSHEET EXERCISES IN CONSERVATION BIOLOGY AND LANDSCAPE ECOLOGY.

By *Therese M Donovan and Charles W Welden. Sunderland (Massachusetts): Sinauer Associates. \$24.95 (paper). xi + 464 p; ill.; no index. ISBN: 0-87893-159-7. 2002.*

These books use prewritten spreadsheet programs to build biological models. The authors intend to introduce biologists to the creation and use of models that can aid in learning basic and advanced concepts in ecology, evolution, conservation biology, landscape ecology, and statistics.

HANDBOOK OF THE CONVENTION ON BIOLOGICAL DIVERSITY.

By *the Secretariat of the Convention on Biological Diversity. London and Sterling (Virginia): Earthscan. £60.00 (hardcover); £24.95 (paper). xxix + 690 p; ill.; indexes of key terms and articles, decisions, and recommendations. ISBN: 1-85383-748-2 (hc); 1-85383-737-7 (pb). 2001.*

This handbook is a guide to decisions adopted by the Conference of the Parties (COP) to the Convention on Biological Diversity and presents ongoing activities relating to particular articles and thematic areas of the convention. It has been constructed to allow frequent updates for new decisions of the COP.

BIOGEOGRAPHY OF THE WEST INDIES: PATTERNS AND PERSPECTIVES. *Second Edition.*

Edited by *Charles A Woods and Florence E Sergile. Boca Raton (Florida): CRC Press. \$139.95. xxvi + 582 p; ill.; index. ISBN: 0-8493-2001-1. 2001.*

Although labeled a "second edition," this is more than a revision of the edited volume, *Biogeography of the West Indies: Past, Present, and Future* (C A Woods. 1989. Gainesville (FL): Sandhill Crane Press). Some chapters (on butterflies, the mongoose, and manatees) reappear in modified form, but most contributions are new. Woods states in the

introduction that the focus of this book is narrower as a consequence of an emphasis on "patterns."

The volume contains 27 chapters by 45 contributors. Two overviews (one historical) and a chapter on climate change are followed by a treatise on functional adaptations to island life and a series of contributions arranged taxonomically: plants (one chapter), terrestrial arthropods (five chapters), amphibians and reptiles (one chapter), parrots (one chapter), and mammals (nine chapters). A discussion of vertebrate fossils from Jamaica is inserted inexplicably between those on parrots and mammals. A potpourri of contributions on historical biogeography in Cuba, Native American use of animals, an historical survey of human influences, and two articles emphasizing conservation conclude the book. The length of individual contributions ranges from five to 76 pages.

The historical overview serves to place subsequent contributions into perspective—but leaves readers wishing for more. Subsequently, the stated theme of patterns prevails, particularly those pertaining to the origin of the terrestrial biota and extinctions. The former emerges in the second overview, which identifies three competing hypotheses that seek to explain origins: overwater dispersal, vicariance, and a land bridge. Subsequent chapters on plants, beetles, amphibians and reptiles, and one on bats support dispersal, whereas those on ticks, butterflies, and a rhinocerotoid mammal present data most compatible with vicariance, and that on sloths concludes that the distribution of mammals (except insectivores) is best explained by a land bridge. Interestingly, data on insectivores and Cuban insects are inconclusive.

The chapter on climate change has broad, if not explicitly stated, applications to at least some extinction patterns. The paper addressing physiological adaptations to island life condenses an inordinate amount of information into a few pages. Particularly interesting are conclusions that no obvious adaptive patterns apply to West Indian vertebrates and that Amerindians, in contrast to climate change, were responsible for many extinctions. The latter contention is supported by subsequent chapters on parrots, hutias, and Amerindian impact on Caribbean faunas. Surprisingly, although present day efforts to conserve biodiversity are acknowledged implicitly or mentioned peripherally in several chapters, they are addressed explicitly only in the last paper on the status of conservation efforts in Haiti.

The success of any volume of collected works can best be measured in how effectively it addresses its stated purpose or in terms of its utility to the target audience. Most chapters clearly identify the pres-

ence or absence of at least one relevant pattern. Several of the shortest chapters do little more—and without sufficient discussion placing patterns into a broader context, their value is severely diminished. Utility is compromised by an excessive emphasis on mammals and particularly by the inexplicable omission of at least one chapter synthesizing the information presented in the many narrowly focused papers. Nevertheless, this book does extend the discussion of West Indian biogeography and, as such, serves an important role—especially if used in combination with the first edition.

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VIRTUAL RIVERS: LESSONS FROM THE MOUNTAIN RIVERS OF THE COLORADO FRONT RANGE.

By Ellen E Wohl. *New Haven (Connecticut): Yale University Press.* \$35.00. xiii + 210 p; ill.; index. ISBN: 0-300-08484-6. 2001.

There are few rivers left that have not felt the hand of man—even in what appears to be the wilds of the Colorado Rocky Mountains. In this book, Ellen Wohl has attempted to show how the actions of man have permanently changed the character of many of Colorado's mountain streams, in a form readable for both scientists and laics. To fulfill this goal, she has written the book with less scientific "jargon" and kept citations to the scientific literature in an appendix. Her goal mostly succeeds, although she tends to slip into more detailed terminology when she is discussing her field of geology—not an unexpected phenomenon.

The strengths of the book are many. There is a broad coverage of subjects in stream ecology, from geomorphologic channel building to the biotic interactions along a stream continuum. In addition, the discussion of the influences of man is very complete and quite interesting, with historical accounts dating back to the first trappers and moving forward to today's cities. There are an abundance of historical photographs—I particularly enjoyed the "series" of photographs that show a particular stream reach over time. Having lived in Colorado for over 25 years and studied most of the streams in the book, I found this fascinating.

The primary weakness of the book is that the author may have tried to put too much information in a relatively short volume—readers may be overwhelmed at times. Plus it appears that even the author would get lost and mix subject matters (for example, when discussing mining impacts, a sentence on logging effects would sneak in). And, in the last chapter, she tends to "sermonize" rather than summarize. Although sometimes distracting,

these do not detract from the overall message. This book should lead to many lively discussions.

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WETLANDS EXPLAINED: WETLAND SCIENCE, POLICY, AND POLITICS IN AMERICA.

By William M Lewis, Jr. *Oxford and New York: Oxford University Press.* \$45.00 (hardcover); \$18.95 (paper). vii + 147 p; ill.; index. ISBN: 0-19-513183-5 (hc); 0-19-513184-3 (pb). 2001.

A seemingly simple question—where is the edge of the wetland?—has generated a great deal of controversy and this new book. The author chaired the National Research Council (NRC) committee that reviewed wetland delineation, as performed under the Clean Water Act. His book describes the thinking behind wetland protection and delineation, and briefly covers the history of wetland misuse, subsequent protection, characterization of wetlands versus uplands, attributes of water, soil, and vegetation in wetlands, and approaches to delineation.

Disagreement about the exact boundary of a wetland is controversial because regulators need to draw a precise line, while nature rarely displays one. If hydrologic, soil, and vegetation indicators are used, the result can be three separate lines. Thus, some of the debate concerns the number of indicators needed. Regulators are currently required to record details for all three, even if one (such as dominance by wetland-dependent vegetation) would suffice (i.e., have low probability for error). To make wetland delineation more rational, Lewis offers a fresh idea: regulators should adopt a risk analysis approach (Chapter 7). Delineators could then use one indicator when there is little risk of error and reserve more time for situations where more than one indicator is needed. For this idea alone, policy-makers should read and heed this volume.

A clear and clever writer, Lewis manages to explain and entertain simultaneously. Even though I served on the NRC committee, I still appreciated his orderly description of, and insights into, wetland regulation. The book speaks to owners of wetlands (who should gain comprehension about the complex wetland-permitting arena); scientists, historians, and lawyers (who should benefit by obtaining a broad overview of the controversies); and policy and decision makers, practitioners of wetland delineation, and wetland ecologists (who should better understand the history of wetland regulation). We should all be challenged to improve the current permitting system, which seeks to prevent losses in the flood protection, water quality improvement, and biodiversity support capabilities

of wetlands simply by regulating filling. The value of wetland functions to society, and the costs that result when wetlands are eliminated, demand a more direct approach to achieve sustainability.

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WORLD ATLAS OF CORAL REEFS.

By Mark D Spalding, Corinna Ravilious, and Edmund P Green. Published by the University of California, Berkeley (California), in association with the United Nations Environment Programme World Conservation Monitoring Centre, Cambridge (United Kingdom). \$45.00. 424 p; ill.; index. ISBN: 0-520-23255-0. 2001.

Coral reefs are the most diverse of all marine habitats, and among the most threatened. In order to respond to the crises facing reefs, one needs to know where the reefs are, where they are most at risk, and the biological and social characteristics of the countries to which they belong. This book does this and far more. It begins with an introductory section (three chapters) about reefs in general, threats and their solutions, and how reefs are mapped. The following sections consider the western Atlantic and eastern Pacific, the Indian Ocean and southeast Asia, and the Pacific Ocean. Each section consists of several regionally defined chapters, and each chapter considers reefs on a country-by-country basis. Tabulated data for each country include population size; gross domestic product (GDP); land, marine, and reef area; fish consumption; percentage of reefs at risk; coral diseases; the diversity of corals, seagrasses, and mangroves; and characteristics of the protected areas that contain reefs. For each country, a detailed map, illustrations, and a review of the main features and recent history are provided. Coverage per country typically runs to several pages, but countries with large areas of reef (such as Australia) are considered in greater detail. Each chapter concludes with a selected bibliography (which is remarkably up to date) and information sources for the maps. The maps vary in detail, depending on the size and complexity of the area being considered; in some cases they even provide enough information to plan a trip. The illustrations are clear and interesting, and include not just the coffee-table shots of lovely reef dwellers, but also photographs taken from planes and satellites, and pictures of people and their activities on reefs.

No book is perfect, and in a few places I would have liked more detail (e.g., maps of the Bahamas), but these flaws are trivial in comparison with what has been achieved. Every coral reef biologist

should own this book, and it has been priced so reasonably that I expect most will.

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BIOGEOGRAFÍA DE AMÉRICA LATINA Y EL CARIBE. Manuales & Tesis SEA, Volumen 3.

By Juan J Morrone. Published by the Programa Iberoamericano de Ciencia y Tecnología para el Desarrollo, Oficina Regional de Ciencia y Tecnología para América Latina y el Caribe, UNESCO, and the Sociedad Entomológica Aragonesa, Zaragoza (Spain). EUR 15.00 (paper). 148 p; ill.; no index. ISBN: 84-922495-4-4. [In Spanish.] 2001.

A great deal has been happening in neotropical biogeography that largely passes under American radar unnoticed. The author of the current book is known to many American biogeographers for his very useful review (with J V Crisci) of quantitative methods in historical biogeography, published in the *Annual Review of Ecology and Systematics* (1995. Palo Alto (CA): Annual Reviews). Beyond that, his North American audience has been largely limited to fellow coleopterists. The appearance of a major synthesis of Latin American biogeography—the first since *Biogeografía de América Latina* by Angel L Cabrera and Abraham Willink (1973. Washington (DC): Organization of American States)—would normally attract a lot of attention. But it was published in an obscure, but important, series of monographs by a Spanish entomological society in collaboration with UNESCO, and is unlikely to show up in very many North American libraries unless it is specifically requested.

This is a work of biogeographical classification, continuing the 19th-century tradition of Sclater, Wallace, and Huxley, among others. The work of these pioneers has been criticized in our day for its eclectic and unoperational “seat-of-the-pants” nature, based as it is on an inexplicit weighting of shared taxa on the one hand and endemism on the other. Contemporary biogeographers of most “schools” attempt to demonstrate greater operability and rigor, although the resulting classifications seldom represent any improvement over the classical ones. Even as it has become clear that the individualistic hypothesis holds sway in biogeography at least as much as in community or vegetation ecology, both disciplines have come under great pressure from conservationists to revert to a classificatory-typological mode. This monograph is explicitly a response to such perceived needs and is justified as such in the foreword by Fermín Martín Piera of the National Museum of Natural Sciences in Madrid. It recognizes three regions

(Nearctic, Neotropical, and Andean) separated into eight subregions and 70 provinces. The treatment of each unit includes an historical synonymy of terms applied to it, a very useful feature that allows one to see to what extent Morrone's methodology has generated novel perceptions or relationships.

But what is that methodology? It is not presented explicitly in this publication. To grasp it one is obliged to seek out his very numerous earlier papers (over 30 since 1992), many of which are not easy to find—even those published in English are often in journals unavailable in any but a handful of North American libraries. It is important to know what the methodology *is*, because Morrone provides impressive-looking lists of characteristic taxa (plants, invertebrates, and vertebrates), but no basis for evaluating their representativeness. The basic method is presented in an accessible venue (1999. *The Southwestern Naturalist* 44(4):507–544) where it is applied to Mexico; it is grounded in parsimony analysis of endemism, originally proposed by Rosen in 1988. But it clearly incorporates elements of cladistic biogeography and panbiogeography, and the latter component is troublesome.

Future historians and sociologists of science should have a field day with the cult of Leon Croizat, otherwise known as panbiogeography. It is, in the words of a colleague, “a method akin to giving polygraph tests to disembodied spirits.” Although its terms and methods have become more explicit, its value has not. This is evident to Martín Piera in the Introduction: “Panbiogeographic analysis has not enjoyed much prestige among biogeographers, and there have always been more detractors than defenders of those who practice the method of Croizat. Nonetheless, the last decade of the 20th century has seen a resurgence of this methodology. . . . Overcoming old anathemas, panbiogeographic analysis defends itself as an independent method capable of generating its own predictions and an epistemological element of reciprocal elucidation with other biogeographic disciplines The work of Morrone is a good example of this fruitful interaction among . . . supposedly antagonistic methodologies” (p 6; translated from the Spanish by the reviewer). Well, perhaps. The utility of the specimen “tracks” (“trazos” in Spanish) given for each of the units identified remains to be seen.

The very telegraphic descriptions of the vegetation give one little impression of what the provinces actually *look* like (unlike the Cabrera and Willink book), and the identifications of relationships with other units are tantalizing, but undocumented. The summary of conservation status given for each, enumerating perceived threats, is superficial to the point of near-uselessness. In short,

there is much that is unsatisfying and problematic about this work, and given its publication venue it would be very easy to ignore it, were it not potentially so important.

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NEURAL SCIENCES

IN SEARCH OF MADNESS: SCHIZOPHRENIA AND NEUROSCIENCE.

By R Walter Heinrichs. Oxford and New York: Oxford University Press. \$39.95. x + 347 p; ill.; index. ISBN: 0-19-512219-4. 2001.

More than any other field in medicine, psychiatry has undergone dramatic epistemological and therapeutic changes over the last century. These changes have entailed reversals as to the very nature of psychiatric illness and its treatment, ranging from extremes of psychological to biological determinism. In the last 30 or 40 years, aided particularly by the discovery of the major psychotropic drugs and increasingly sophisticated methods of neurobiology, we have come to take for granted the basic biological nature of psychiatric illness. The ways in which psychiatrists have understood and treated schizophrenia have been at the core of these changes. In accessible and often moving prose, *In Search of Madness* is a highly original and intelligently critical summary of the evidence on the neurobiology of schizophrenia, which has played a critical role in the recent turn toward biological psychiatry.

Heinrichs undertakes a formidable task: the summary of a rapidly growing field (about 2,000 articles are published per year on schizophrenia) and the quantitative assessment of its key studies. To this end, he employs the tools of meta-analysis to measure both the strength and variability (via confidence intervals) of the neurobiological evidence in the following domains: symptoms; neurocognition; neurochemistry; and neurodevelopment. Heinrichs presents the fruits of his impressive labors in a series of chapters, each of which gives an excellent and concise summary of the basic neurobiology of the domain under examination, followed by the relevant meta-analyses.

This is not a celebratory book but, instead, a sober and balanced account of what actually has been accomplished over the last 20 years in the neuroscience of schizophrenia. Indeed, it is as much a cautionary tale of the limitations (thus far) of biological

science in explaining our most baffling of human disorders as it is a critical summary of the evidence. As Heinrich convincingly argues, no single biological or cognitive domain unequivocally marks off those with schizophrenia from ostensibly normal controls. In fact, the most robust measure, the P50 evoked potential, is a neurobehavioral rather than an exclusively biological marker, and even this best measure yields a 28% overlap between patients and controls. Although this search may someday yield stronger evidence, this provocative and compelling book reminds us that the long sought biological mechanism for schizophrenia remains at present more of a promise than a reality.

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THE INTACT AND SLICED BRAIN.

By Mircea Steriade. *A Bradford Book. Cambridge (Massachusetts): MIT Press. \$55.00. xv + 366 p + 12 pl; ill.; index. ISBN: 0-262-19456-2. 2001.*

Despite the modest title, there is a wealth of neurophysiological riches in Mircea Steriade's latest book. His major claim is that the use of brain slice preparations limits our ability to describe the proper behaviors of neurons, which are accessible only in the intact brain. The author argues that "the genesis of behavioral states cannot be localized within discrete brain areas, but depend on interactions between various brain structures" (p 63). In a most useful guide for serious neuroscientists, Steriade blends his own work with that of others to offer elegant electrophysiological and morphological evidence backing his views.

An introductory chapter is followed by an excellent summary of major neurophysiological methods in Chapter 2. The following chapter offers contrasting results from brain slice and intact brain preparations, while Chapter 4 examines brain pathways and networks underlying sleep, waking, and epileptic states. Steriade focuses on properties of thalamic and cortical neurons, and the pathways to and from these structures, but there is no shortage of information about amygdala, hippocampus, and brainstem. He identifies major neuronal types based on their firing patterns and neurotransmitters, and reports on studies concerning neuronal connections and reasons for synchronized firings. Although the author recognizes the usefulness of simplified preparations, he stresses the importance of examining neuronal circuits in intact brains during normal functioning, and backs up his argument with comparisons of results from the different techniques. The richly illustrated work includes a very complete reference list and a mag-

nificent collection of electrophysiological traces, mixed with morphological figures and a section of helpful color plates.

A final chapter deals with the attempts of others to identify the neural correlates of consciousness. Steriade is very critical of those who identify specific neuronal types associated with consciousness. It is important not to oversimplify the task of understanding how the brain produces conscious experiences, and the author chastises those who think we are getting close to identifying the neural correlates of consciousness. I can agree that the attempt to relate consciousness to a particular type of neuron, rather than interacting neuronal groups, probably will prove to be wrongheaded, but I do not think the future for such studies is as bleak as Steriade appears to believe. He argues that, since cellular recordings cannot be made in humans, and only humans can express subjective states, the relating of consciousness to specific neurons or neuronal circuits is a hopeless enterprise. He appears to accept Gerald Edelman's view that consciousness is sustained by large clusters of neuronal groups interacting more with themselves than with the rest of the brain, but declares that more than this cannot be said. I think that there are more innovations to come in brain analysis, and that, in considering what is possible, we should not view ourselves as being limited to the techniques and approaches available today.

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GRAPHICAL MODELS: FOUNDATIONS OF NEURAL COMPUTATION. *Computational Neuroscience.*

Edited by Michael I Jordan and Terrence J Sejnowski. *A Bradford Book. Cambridge (Massachusetts): MIT Press. \$32.95 (paper). xxiv + 421 p; ill.; index. ISBN: 0-262-60042-0. 2001.*

Graphical models of probability distributions are central to a mini-revolution in artificial intelligence (AI), computational statistics, and neural networks. They began with strong links to such things as structural equation modeling in statistics, semantic networks in AI, and connectionist networks, but are now firmly established as the subject of a research field in their own right. This book reprints 14 papers from *Neural Computation* (plus one chapter from the famous *Parallel Distributed Processing* books), along with a brief introduction.

There is certainly merit in collecting together a set of important articles in the field, and the editors are to be commended on their exemplary taste. But the stricture that all of the articles or, puzzlingly, all but one should come from *Neural Computation* leaves one somewhat wistful. So many criti-

cal contributions actually appeared in a wide range of other journals and conference proceedings—the editors must sometimes have felt it was cruel and unusual punishment not to be allowed to include any of them. For example, there is particularly little on Markov Chain Monte Carlo sampling.

Nevertheless, a wealth of important material did appear in this single journal, and is duly presented here. One striking observation that emerges is how the field of neural networks discovered that it had been speaking in the language of graphical models all along (is the first author really M Jourdain?), particularly starting from the Boltzmann machine, Hinton and Sejnowski's seminal study of probability density estimation in a recurrent neural network. Indeed, the Boltzmann machine occupies a central role in the book, being the target and illustration for many exact and approximate methods for probabilistic inference and learning. The book also covers some of the newest ideas in graphical models, notably sophisticated theory for approximate inference algorithms in a difficult, but unavoidable, class of graphical models, namely those involving loops.

This book is likely to be of interest primarily to researchers actively working in the field of graphical models. It contains both older (i.e., more foundational) and more recent contributions than the otherwise more comprehensive volume, *Learning in Graphical Models*, edited by Jordan (1999. Cambridge (MA): MIT Press).

PETER DAYAN, *Gatsby Computational Neuroscience Unit, University College London, London, United Kingdom*

NEURONAL SIGNAL TRANSDUCTION AND ALZHEIMER'S DISEASE. *Based on a symposium held in Cork, Ireland, September 1999. Biochemical Society Symposium, Volume 67.*

Organized and Edited by C O'Neill and B Anderton. London: Portland Press. £65.00. xii + 213 p; ill.; subject index. ISBN: 1-85578-133-6. 2001.

This volume contains a collection of articles summarizing the research and perspectives of leading groups in the field of molecular/cellular Alzheimer's disease (AD) research. It nicely covers (although with some redundancy) the biology of the amyloid precursor protein and its metabolites. Fibrillization and aggregation are prominent topics in the first chapter, and these events are suggested as potential targets for therapeutics development. Chapter 3 more directly introduces the participation of signal transduction mechanisms focusing on posttranslational modifications and the effects of protein kinase C (PKC) on processing of amyloid precursor protein (APP). Chapter 4

introduces a less than mainstream, but very interesting, research on the C-100 (also commonly referred elsewhere as C99 or CTFs) fragment of APP and its disrupting effects on intracellular signaling mechanisms. The following chapters introduce the genetics of neurodegenerative disorders and *tau*. Chapters are devoted to the remaining key molecules in AD, presenilins (PS) and apolipoprotein E (ApoE). Its relationship to *tau* and β -amyloid ($A\beta$) are presented in detail in additional chapters. An integrative approach is presented in Chapters 15 through 17, emphasizing the central role of intracellular calcium, the endoplasmic reticulum, and oxidative stress. These chapters also discuss the role presenilins and $A\beta$ may play in these disrupted signaling cascades. Chapter 17 offers a detailed and comprehensive review of the evidence, assigning a central role to calcium as the key element in the disrupted cellular physiology of AD. Two succinct but informative chapters on transgenic models for AD are also included. Two additional chapters present research on acetylcholine receptors and gene expression, and oxidation/inflammation cascades in relation to $A\beta$.

In summary, this book contains a useful collection of the most important aspects of cellular and molecular features of AD. Although all chapters are of interest, some would be of greater benefit to graduate students and scientists not familiar with topics such as APP metabolism (Chapters 3 and 4) and *tau* (Chapter 6). Good short reviews related to PS, ApoE, and transgenic models are presented in Chapters 9, 10, and 19. The most comprehensive review, integrative perspective, and most "representative" of the title of the book (or symposium), is given in Chapter 17, Dysfunctional intracellular calcium homeostasis: a central cause of neurodegeneration in Alzheimer's disease. Overall, this book offers a very good summary of this active field of research.

RENÉ ETCHEBERRIGARAY, *NeuroLogic, Incorporated, Rockville, Maryland*

VISUAL ATTENTION AND CORTICAL CIRCUITS. *Based on a workshop held in early 1999 at Two Harbors, Catalina Island.*

Edited by Jochen Braun, Christof Koch, and Joel L Davis. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$60.00. xix + 313 p + 16 pl; ill.; index. ISBN: 0-262-02493-4. 2001.

Traditionally, visual attention in psychology was a wispy phenomenon studied by behavioral methods, while neurophysiologists were restricted to studying more robust, concrete effects. Now the tables are turned—cognitive psychologists have shown that visual attention has a greater effect on

what we actually experience than details such as where the gaze is directed, and neurophysiologists with sophisticated new methods find attention everywhere in the brain (well, almost everywhere).

The current volume shows how attention can be studied physiologically, using ingenious experimental designs in awake monkeys and noninvasive anatomical measures in humans. Attention modulates responses in intraparietal, inferior temporal, motion sensitive, and prefrontal areas. The frontal eye fields, which would be better named frontal attention fields, may code directly for task relevance. Functional Magnetic Resonance Imaging (fMRI) studies in humans show that activation in primary visual cortex changes substantially as attention shifts from one hemifield to another. In both human and monkey, attentional effects are now found at the primary visual cortex, a modulation first reported in 1982 (B Bridgeman. *Neuropsychologia* 20(1):33–42) in single cells, but attributed here to work performed a decade later.

Cognitive psychologists have asked whether attention modulates visual processing early in the processing stream (early selection), or later as motor responses are being organized (late selection). There is evidence on both sides, and it is an active controversy. The editors point out that physiological work shows attention acting at multiple levels, a conclusion that psychological approaches to attention have not yet had time to accommodate.

Several papers in the volume, as well as the editors' masterful summary of the work, invoke saliency as a criterion for the direction of attention. Saliency requires a computation to judge it, however, implying a late selection by some computation outside the current domain of attentional research. It is a name for a problem rather than a solution to one. The editors conclude that perhaps saliency is the limited capacity that defines attention. The circularity of this conclusion shows how far attentional research has come, and how far it must still go.

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

HANDBOOK OF BEHAVIORAL NEUROBIOLOGY. *Volume 12: Circadian Clocks.*

Edited by Joseph S Takahashi, Fred W Turek, and Robert Y Moore. New York: Kluwer Academic/Plenum Publishers. \$175.00. xxiii + 770 p; ill.; index. ISBN: 0-306-46504-3. 2001.

It has been more than 20 years since the publication of *Biological Rhythms* (1981. New York: Plenum Press), edited by the late Jürgen Aschoff, a volume many consider a classic and the last decent text-

book for graduate clocks courses around the world. Since that time, the field of chronobiology—the study of biological circadian rhythms—has literally exploded onto the pages of the most prestigious journals and into the popular press like no other field. Since that time, the existence and function of highly conserved “clock genes” have been discovered in most organisms studied, raising interesting evolutionary questions about the antiquity of biological clocks. The molecular basis for melatonin biosynthesis has been largely worked out, as has the function of melatonin receptors within the brain. Since the publication of Aschoff's book, the discovery that transplantation of fetal hypothalamus into the brains of lesioned rodents could restore behavioral rhythmicity has raised hopes for new therapies as well as new analytical tools, and several pharmacological agents have been discovered that can alter the biological clock of animals and man. One of these substances is melatonin, which has been touted as a treatment for everything from jet lag and insomnia to aging, and has been the subject of popular as well as erudite textbooks.

Thus, the publication of the current volume was greatly anticipated and is now applauded for its long time coming. This massive book (770 pages) comprises 26 chapters authored by leaders in the field, and is organized in six parts ranging from introductory chapters to a curious trip through microbiological model systems to basic neuroscience and on to clinical research on sleep disorders in humans. There are features of this book that meet its high expectations. First, the sole chapter explaining formal properties of entrainment (by Daan and Aschoff) is a concise treatment of classical literature and a necessary primer for any serious study of clocks. Second, the discussions of the suprachiasmatic nucleus (SCN) by Moore and Leak, and those of the development of mammalian clocks (by Davis and Reppert) and of the cellular physiology of SCN function (by Bouskila et al.) are particularly useful and encyclopedic treatments of central issues of SCN function. Finally, chapters on sleep (by Borbély et al.) and on seasonal rhythms in humans (by Wehr) are especially informative and entertaining.

Yet, for such a large tome, there are glaring omissions, some of which are very understandable. First, in a field that has moved as rapidly as has biological clocks, the chapters on the molecular genetics of clock function in *Drosophila* (by Young) and in mammals (by Ralph and Vitaterna), albeit well written, are now woefully out of date. Second, it is difficult to understand why there are six long chapters on human circadian rhythms, many of

which are redundant in both information and citation, when there are no chapters on important model systems such as the avian pineal gland, zebra fish, and mammalian retina. This is particularly egregious when one considers there are three chapters reviewing microbiological model systems, whose relationship to "behavioral neurobiology" has to be considered a stretch. Further, there is no discussion of the regulation of melatonin biosynthesis or the effects of the hormone on circadian clocks. Finally, perhaps the most intriguing recent discovery in this field is the presumed homology among molecular clockworks in the many animal systems. Yet, there is no scholarly analysis of clock evolutionary biology except for a brief chapter that merely extols the real virtues of "comparative research." In all, this is a welcome addition to the clocks literature, but at a hefty price and with the aforementioned omissions, I believe the field still needs a replacement for Aschoff's volume as a reference for new clocks researchers.

VINCENT M CASSONE, *Biology, Texas A&M University, College Station, Texas*

HANDBOOK OF BEHAVIORAL NEUROBIOLOGY. *Volume 13: Developmental Psychobiology.*

Edited by Elliott M Blass. New York: Kluwer Academic/Plenum Publishers. \$140.00. xvii + 619 p; ill.; index. ISBN: 0-306-46489-6. 2001.

As Oppenheim notes in the preface to his reprinted article for this volume, developmental psychobiology ought to be the foundation for investigating the behavioral and psychological development of all species because it draws on concepts and theoretical notions to frame the investigation and interpretation of psychological development. Therefore, it provides a distinctly biological approach that avoids the conceptual pitfalls of simplistic reductionist models of molecular genetics or neurology.

In the years since the initial appearance of Volumes 8, *Developmental Psychobiology and Developmental Neurobiology* (1986. New York: Plenum Press), and 9, *Developmental Psychobiology and Behavior Ecology* (1988. New York: Plenum Press), of this handbook, the Human Genome Project has been virtually completed and we have experienced the decade of the brain. Thus, Blass (editor of all three volumes) provides an update based on our greater genetic and neurological sophistication that demonstrates again that developmental psychobiology is exquisitely designed to illuminate the processes whereby genomes of fertilized cells become behaviors in social and environmental contexts.

Of the 20 primary authors from the previous vol-

umes, nine have contributed an update. Six provide exciting new data and conceptual innovations. Fentress and Gadbois introduce a sophisticated descriptive and analytic scheme for the study of motor development. Burghardt admirably tackles the conceptual and empirical issues associated with the concept of play. Hogan builds a theory of neurobehavioral development, uniting behavioral systems that are organized before they serve their functions with those organized by the consequences of their functioning. Johnson and Leon demonstrate how early olfactory experiences are coded at the glomerular level. Hirsch et al. show that the visual system of flies is as tunable by visual and activity-dependent experience as the visual system of kittens, and these developmental processes contribute to the reproductive success of the flies. Holmes provides another developmental complement to the evolutionary account of nepotism by showing how the presence of the mother and the offspring's sleeping in the nest establish social preferences among ground squirrels.

Three authors have altered their previous chapters so extensively that they are new pieces. Brunelli and Hofer show that selective breeding, for strains of rat pups that produce many or few ultrasonic vocalizations when removed from their nest, affects their pattern of development rather than just the development of the selected trait. Kehoe and Shoemaker demonstrate that mild experiences of short-term maternal separation produce enduring changes in the neurobiology and behavior of rat offspring that are only manifested when the individual encounters relatively mild behavioral and neurochemical challenges. West and King show us how to investigate the subtleties and richness of developmental pathways.

New authors provide good reviews of four issues addressed in the previous volumes—Forger on sex difference in behavior; Blumberg on thermal homeostasis; DeVoogd and Lauay on avian song development; and Hill on taste development. A new chapter by Weller addresses the development of motivating systems in the rat.

GEORGE F MICHEL, *Psychology, DePaul University, Chicago, Illinois*

ERRATUM

Michael Keeley was coreviewer (with Ted Abel) of the review on *Gateway to Memory: An Introduction to Neural Network Modeling of the Hippocampus and Learning*, by Mark A Gluck and Catherine E Meyers [*The Quarterly Review of Biology*, 77(2): 229–230].



BEHAVIOR

TREE OF ORIGIN: WHAT PRIMATE BEHAVIOR CAN TELL US ABOUT HUMAN SOCIAL EVOLUTION.

Edited by Frans B M de Waal. Cambridge (Massachusetts): Harvard University Press. \$29.95. vii + 311 p; ill.; index. ISBN: 0-674-00460-4. 2001.

The goal of the nine behavioral primatologist authors in this book is to broadly understand human social evolution from studies of great apes: their social organization, communication, subsistence, reproduction, learned habits, and cognition. Human behavior is seen as a product of evolution and, therefore, amenable to the same explanatory framework as animal behavior. The nine chapters cover the following topics: sex and reproduction, social organization, social sophistication and cognition, and hominization.

There has been no attempt to synthesize the varying viewpoints, and authors were encouraged to speculate, so a convincing chapter arguing that hunting and meat eating may have driven the evolution of human social intelligence is followed by another suggesting, just as cogently, that hominization may have depended on eating and, importantly, cooking underground storage organs such as roots and tubers. This is a strength, since it gives readers not only insight into the diversity of current thinking on what "drove" the very rapid evolution of humans, but also illustrates the scientific process, whereby several competing and complementary hypotheses are presented for discussion. These differences of opinion are evident throughout—are chimpanzees or bonobos the best model of the last common ancestor of humans and apes? Is meat eating or are plant foods more important? Is human language a further development from primate communication precursors, or is it more functionally similar to grooming? The authors also bring in studies from other species, giving a perspective that goes beyond apes to include other primates and animals as well.

This book is an easy and stimulating way for teachers, lecturers, and students at all levels and in many disciplines (animal behavior, human biology, anthropology, and psychology) to get up to date with the current views and debates in the ape-human evolution field. The chapters are jargon-free and the writing is uninterrupted by references. For specialists there are plenty of cues as to

where to go for more information. There are detailed notes to each chapter at the back of the book, where various ideas and observations are elaborated, and a separate bibliography of over 400 references.

ANNA T C FEISTNER, *Durrell Wildlife Conservation Trust, Trinity, Jersey, United Kingdom*

ANIMAL SIGNALS: SIGNALLING AND SIGNAL DESIGN IN ANIMAL COMMUNICATION. *Based on a symposium held in Kongsvoll, Norway, 15–20 September 1998.*

Edited by Yngve Espmark, Trond Amundsen, and Gunilla Rosenqvist. Trondheim (Norway): Tapir Academic Press. \$80.00. 496 p; ill.; subject and taxonomic indexes. ISBN: 82-519-1545-7. 2000.

Animal communication is a bafflingly complicated subject. Studies of signaling systems in animals require knowledge of the physics of the communicatory modality, sensory physiology and neurobiology, and evolutionary theory. Given this complexity, symposium volumes establish their worth by containing chapters that either draw syntheses from scattered journal articles or contain otherwise unpublished data and insights. This volume, the result of a 1998 symposium, contains 25 papers, representing the work of 44 authors. All of the chapters but one deal with vertebrate signaling systems. Twenty chapters focus on visual or auditory communication, one chapter with major histocompatibility complex-correlated olfactory cues, and the remaining four are primarily theoretical in content. The cluster of chapters on the role of color in signals (Andersson's chapter on bird coloration; Cuthill et al. on ultraviolet signals in birds; and Marshall on reef fish), as a group, wonderfully illustrates the complex nexus of physics, neurobiology, and evolution that governs signal design. This integration does not appear elsewhere and these chapters will make this volume a useful tool for teachers of animal behavior courses. Although some of the other chapters are interesting, the rest of the book does not quite rise to this level. For example, Kilner's summary of her work on begging by cuckoo chicks concisely draws together a fascinating study. In a broader perspective, one of the most important enterprises in the contemporary study of animal signals is the development of signal-processing analogies across signal modalities and across taxa. These analogies then lead to neurobiological hypotheses. The near absence of chapters on olfactory signals, the complete lack of material on electrical communication, and the book's taxonomic narrowness reduce its value in furthering such a synthesis. This book is a worthwhile acquisition for investigators who work on commu-

nication and for teachers of animal behavior courses.

MICHAEL D BREED, *Environmental, Population & Organismic Biology, University of Colorado, Boulder, Colorado*

BEHAVIORAL ECOLOGY OF TROPICAL BIRDS.

By Bridget J M Stutchbury and Eugene S Morton. *San Diego (California): Academic Press.* \$69.95 (hardcover); \$39.95 (paper). ix + 165 p; ill.; index. ISBN: 0-12-675555-8 (hc); 0-12-675556-6 (pb). 2001.

Studies of tropical biota offer diverse opportunities to enhance and evaluate what we know about the evolutionary ecology of animals. The physical environment, diversity and evolutionary history of species, and overall complexity of interspecific interactions often differ from those at temperate latitudes. Given that most empirical studies of animals are conducted in Europe and North America, Stutchbury and Morton contend that much of what is accepted about the behavioral ecology of birds reflects a "temperate zone bias" in our understanding. By illustrating this bias on a series of topics, Stutchbury and Morton seek to "dispel the temperate zone biologists' ignorance of tropical biology and to stimulate more research on tropical birds" (p 8). Although the authors may be a bit dismissive about the state of knowledge outside 20°N or S, they do have a point; as a group, tropical species are comparatively understudied.

Organized into seven chapters, the book considers diverse subjects that include breeding ecology, life-history traits, mating systems, territoriality, communication, and biotic interactions. The success of these chapters in serving the overall goals of the book is uneven. The chapter on breeding ecology is effective in summarizing the timing and length of avian breeding seasons at tropical latitudes, but the coverage of life histories is selective and somewhat uncritical on key aspects of issues such as tradeoffs between life span and clutch size. The chapter on communication is the most comprehensive and discusses the function of song (male and female), formation of dialects, and plumage variation within and among species.

This book contains many testable ideas that, indeed, should stimulate future research. A problem throughout, however, is the authors' tendency to generalize based on their detailed studies of three species in central Panama. At times, this overreliance is at the expense of synthesis that is truly needed to characterize patterns and develop a theory for latitudinal variation in the behavioral ecology of birds.

JEFFREY D BROWN, *Natural Resources & Environmental Sciences, University of Illinois, Champaign, Illinois*

MODEL SYSTEMS IN BEHAVIORAL ECOLOGY: INTEGRATING CONCEPTUAL, THEORETICAL, AND EMPIRICAL APPROACHES. *Monographs in Behavior and Ecology.*

Edited by Lee Alan Dugatkin. *Princeton (New Jersey): Princeton University Press.* \$79.50 (hardcover); \$35.00 (paper). xxiii + 551 p; ill.; index. ISBN: 0-691-00652-0 (hc); 0-691-00653-9 (pb). 2001.

This book is a collection of chapters representing various "model systems" in behavioral ecology. As a firm believer in the old adage that with a good question, one searches for the most appropriate species in which to test it, I looked forward to reading what proponents of this alternate approach had to say, and perhaps to find new systems in which to test hypotheses without the logistic difficulties of having to start from scratch.

Taxonomically, the 25 chapters range widely—from insects and arachnids to mammals (even including a chapter on virtual ecology). A number of well-known model systems (particularly those used by Europeans) have been left out, but those included give a sense of the range of study systems used by behavioral ecologists and the questions they have used them to address.

Model Systems in Behavioral Ecology actually appears to be two rather different books squeezed into one. Each chapter includes a personal account of the investigator's intellectual journey, and how they chose (or more often, were chosen by) their system. The graduate students with whom I discussed this book found these anecdotes especially interesting, and thought anyone just entering the field would particularly enjoy the role that serendipity has played in many careers.

The second "book" is a series of reviews of the research in the 25 study systems, focusing largely on the contributions of the author, using their own study population. This aspect of the book is much less useful, as it duplicates recent review articles on many of these systems that are readily available. It also highlights a general problem with the book as a whole: the absence of a good definition of exactly what constitutes a model system. Is it a species, a taxon, an interaction, or a particular population? Whereas a single model system may be exploited by hundreds of laboratories in fields such as genetics and developmental biology, model systems in behavioral ecology are much more tied to individual researchers or small groups.

My students and I were disappointed that the editor did try to draw some generalities from these individual accounts in order to address questions such as: what makes a good model system, how does one choose it, why is this approach to our science valuable (compared to alternatives), and when does one drop a model system and switch to another? He could even have made this more inter-

esting for behavioral ecologists by casting the discussion in the light of such concepts as optimal foraging, i.e., considering a system as a patch (patch choice, depletion, marginal rate of return, departure rules, and state dependence), frequency dependence and alternative strategies, and the comparative approach. A deeper consideration of the applicability of a specific model system's contribution to the broad conceptual and theoretical issues that concern the editor would also have been valuable. Granted, many of the individual chapters do address these broader issues, and their authors' own prominence in the field is proof of the benefits of the model system approach, but more synthesis would have been valuable.

The book will be a useful guide for new students, as well as for more experienced researchers looking for a quick review of a particular species or for fascinating personal anecdotes to enrich their lectures. I will use the volume this way, and am glad to add it to my bookshelf.

LAWRENCE M DILL, *Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada*

BIOROBOTICS: METHODS AND APPLICATIONS. *Based on a symposium held in Orlando, Florida, 23–25 October 1998.*

Edited by Barbara Webb and Thomas R Consi. Menlo Park (California): American Association for Artificial Intelligence Press; Cambridge (Massachusetts): MIT Press. \$35.00 (paper). xiv + 208 p; ill.; index. ISBN: 0-262-73141-X. 2001.

A biorobot is an animal-like robot usually intended as both a sophisticated physical model of its animal counterpart and as a means for investigating the technological possibilities of biologically inspired behavioral systems. As this book demonstrates, biorobotics (alternatively biomimetic or biomorphic robotics) is a research discipline in its infancy, just beginning to develop models with a significant degree of biological realism, and with a methodology still in the process of being formulated. So why should biologists be interested in biorobotics? This book provides several persuasive answers and illustrates them with a number of detailed examples of work in progress. The principle argument for robot modeling is to overcome some of the limitations of computer simulation. Although simulations clearly have their place, they necessarily involve simplified representations of the animal's environment that often fail to capture some of its critical (and possibly hitherto undetected) properties. Therefore, robotics adds to the traditional toolbox of theoretical biology both the possibility of replacing environment simulation by the environment "itself," and the chance

to do "micro-environment exploration"—using a robot to discover what sort of signals are available in the sensory domains, and at the physical scale, of a target animal.

This short book is a sampler of current research, with six chapters on invertebrate (or invertebrate-like) sensorimotor mechanisms, and two on human-like perceptual development. The various contributions reveal a range of quite different research methodologies, some focused on specific biological target systems, some much more abstract, and others showing an underlying tension between biological and engineering goals. The best chapters demonstrate an in-depth knowledge of the relevant biological database (e.g., cricket phonotaxis, cockroach walking, lobster chemo-orientation, or human visual attention), an awareness of the compromises necessary in creating a physical model, and a strong desire both to address current biological hypotheses and to formulate new ones. The introduction and epilogue provide a brief history and review of biorobotics together with an insightful discussion of methodological issues. In all, this book can be recommended to anyone interested in exploring the current state of the art, and future potential, of this exciting new field.

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HUMAN BIOLOGY & HEALTH

GENES, PEOPLES, AND LANGUAGES.

By Luigi Luca Cavalli-Sforza; translated by Mark Seielstad. Berkeley (California): University of California Press. \$15.95 (paper). xii + 228 p; ill.; index. ISBN: 0-520-22873-1. [Originally published by North Point Press, New York.] 2000.

The intent of this book is to introduce intelligent laics to the fascinating subject of our prehistoric origins as inferred from evidence in genetics, archeology, and linguistics. The volume is pleasant and easy reading, and even though I work in this field, I encountered a substantial amount of information that was new or, if familiar, was presented in an interesting, novel context. In places, the account is somewhat autobiographical, granting readers a glimpse into an interesting and distinguished scientific career spanning the second half of the last century. As a researcher in this area, I am not the best judge of the book's accessibility to its intended readership. I did wonder how compre-

hensible some of the passages would be to nonspecialists, however. For example, uninitiated readers will learn little from the explanation of principal components. There is the occasional bloop: the author indicates that mitochondrial DNA is a small organ present in every cell and transmitted to the progeny by the mother (p xii).

More disturbing is the absence of any mention of the controversies surrounding several of the topics propounded in the book, especially those based on work by the author and his group. The intended audience will be unaware of the objections raised to Cavalli-Sforza's methods of representing and comparing genetic and linguistic trees, and the absence of any quantitative measure of agreement or consensus between the two. Nor are readers told that most of the (gene frequency) data underlying the principal component maps have numerous missing observations and that as a consequence these maps are based on interpolated and smoothed gene frequency surfaces. It has been shown that such maps are subject to large errors, and that even spatially random data treated in this manner exhibit apparent geographic trends. As a consequence, results featured as principal component maps should be approached with considerable caution. Other critics, such as Marek Zvelebil (on the European Neolithic) or Alan Fix (on interpretation of clines), are similarly ignored. Readers might have profited from a discussion (at an appropriate level) of the statistical underpinning crucial to the valid interpretation of results in this field.

Despite these reservations, I can recommend this book as the best extant source in English to anyone who wishes to know more about the origins of modern human populations. Readers will learn a lot from it. They should just take some of its claims *cum grano salis*.

ROBERT R SOKAL, *Ecology & Evolution, State University of New York, Stony Brook, New York*

BUILDING A BETTER RACE: GENDER, SEXUALITY, AND EUGENICS FROM THE TURN OF THE CENTURY TO THE BABY BOOM.

By Wendy Kline. Berkeley (California): University of California Press. \$35.00. xv + 218 p; ill.; index. ISBN: 0-520-22502-3. 2001.

This volume is a long overdue examination of American eugenics in the context of gender and female sexuality. Kline takes a fresh approach in examining this much-neglected theme by focusing on California, which despite its importance in the history of eugenics is also underrepresented in the literature. This reworked PhD dissertation is well structured, presenting the core issues both the-

matically and chronologically. A human angle is provided by detailing the relationship of key people to developments in California, including mental tester Lewis Terman, victim of sterilization Ann Cooper Hewitt, and Paul Popenoe of California's Human Betterment Foundation. The chapters trace the story from segregation of the "unfit," through the development of sterilization, sex and reproduction, the rise of sterilization, and then past the usual World War II cutoff point and into the 1960s. Through her treatment, Kline teases out some of the more subtle relationships (for example, among eugenics, feeble-mindedness, prostitution, and venereal disease).

Despite the solid research and the clarity of the presentation, the book is not without its problems—primarily it is too narrow. Kline gives the impression that gender and female sexuality were the sole issues in eugenics, although in reality there was a complex web of issues including gender, race/ethnicity, economics, disability, intelligence, and mental health. Not all eugenic thinking was related to gender and female sexuality. For example, in 1921 the Eugenics Record Office proposed legislation to allow any taxpayer to obtain an injunction preventing a blind person from marrying if there was a risk of their children requiring state assistance. Although economics is ignored throughout the book, Kline does suggest early on that race/ethnicity was at the center of eugenics along with gender and sexuality. But she then ignores it except in the strange argument that eugenic sterilization was racially motivated precisely because it was not aimed at ethnic minorities. Acknowledgement of the raft of issues and motivations at the heart of eugenics and some locating of this work in relation to those issues would have added immensely to the usefulness of the book. Similarly, Kline does not make explicit links with states outside of California, particularly the East Coast/Midwest region where eugenics was strongest. Both additions would have been invaluable because the interrelationships between the component parts of the eugenic ideology were so complex and because simple extrapolation from California is difficult due to state histories differing so enormously in eugenic legislation enacted, numbers sterilized, and the gender proportions of those sterilized.

Kline takes the story through to the 1960s because she wishes to disprove the alleged claim of other historians that eugenics had vanished as a scientific and academic discipline by the end of the 1930s. Although Kline presents interesting information on where eugenics went through to the 1960s, her basic claim is wrong. Most historians argue that eugenics reinvented and hid itself in

newer movements, such as population control, human genetics, and family planning. This is not in conflict with Kline's treatment of postwar eugenics, but is in conflict with her presentation of historical work to date.

The book is an original and important look at a theme that has long been neglected in histories of eugenics. It is unfortunate that Kline does not locate the central themes within the U.S. movement as a whole—either geographically or conceptually. Some readers will be able to do this for themselves, but those less well read in the history of eugenics will struggle. The book, however, does bring a new dimension to our understanding of eugenics, and its themes should be integrated into future work on American eugenics.

JONATHAN A P LELLIOTT, *History, University of Queensland, St. Lucia, Brisbane, Australia*

BOUNDED RATIONALITY: THE ADAPTIVE TOOLBOX. *Based on a workshop held in Berlin, Germany, 14–19 March 1999. Dahlem Workshop Reports.*

Edited by Gerd Gigerenzer and Reinhard Selten. Cambridge (Massachusetts): MIT Press. \$39.95. xv + 377 p; ill.; subject and name indexes. ISBN: 0-262-07214-9. 2001.

This volume presents the proceedings of a multidisciplinary workshop held in 1999, which addressed the issue of the actual, shortcut strategies humans have evolved in order to reach adaptive decisions, as opposed to the virtual, idealized notion of universal reason whose logic would require exhaustive examinations of the data and time-consuming logical procedures. Rationality is constrained (bounded) by the limited computational capacities of the human brain, the time and energy requirements of its processes, and the cultural and historical conditioning of the norms it follows. The general thesis of the book is that humans have opportunistically exploited the regularities of their environment to evolve “fast and frugal” strategies that bypass the step-by-step analysis of the choice situations to which they are confronted. This heuristic approach makes extensive use, for example, of stereotyping, imitation, and emotions that provide a set of ready-made, fast track answers (the adaptive toolbox) to physical, social, and intellectual challenges. Although these strategies for quick estimation, comparison, or categorization do not necessarily lead to an absolute optimization of choice making, they are nevertheless cost-efficient responses that have been proven to be statistically adaptive, hence their natural selection through evolutionary time.

The volume is separated into four parts, each comprising three or four position papers and con-

cluding with a “group report.” The first part introduces and defines the main concepts that are aimed at “rethinking rationality” in terms of evolutionism. The second part explores simple and robust heuristic strategies, and tries to determine why they are effective in the environments in which they have evolved. The next part focuses on the role played by emotions and social processes in decision making, both on the individual and collective levels. The final part is concerned with the role of culture in bounded rationality and examines how the cultural transmission of norms allow individuals to rely on behavioral algorithms that greatly cut the costs of search, experimentation, and data processing and storage. Each chapter is followed by bibliographical references and there is a subject and name index at the end of the volume. The general structure of the book preserves the dynamic of the symposium on which it is based, thanks to the thematic clustering of specialized position papers followed by collective reports that aptly summarize the state of the art for each one of the four topics considered. These reports, which have high-standard textbook qualities such as completeness and clarity of exposition, also point to problems that still need to be solved. The position papers themselves present original research and arguments from the point of view of economics, cognitive science, evolutionary biology, and anthropology.

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BIOMEDICAL SCIENCES

THE ANTIBIOTIC PARADOX: HOW THE MISUSE OF ANTIBIOTICS DESTROYS THEIR CURATIVE POWERS. *Second Edition.*

By Stuart B Levy. Cambridge (Massachusetts): Perseus Publishing. \$17.00 (paper). xx + 353 p; ill.; index. ISBN: 0-7382-0440-4. 2002.

The author fulfills the promise of the book's title, providing many examples of the overuse and consequent abuse of specific antibiotics with dangerous and sometimes fatal consequences for patients suffering from infections. Describing an antibiotic, the term coined by Selman Waxman in 1941, as “a natural substance made by one microorganism that inhibits growth of another microorganism” (p 33), Levy explains in detail the many interactions between bacterial elements that must be considered when using bacteria as a therapeutic. Antibiotics are constantly evolving and losing their therapeutic

effects because of overexposure to pathogens brought about by overuse to treat disease symptoms that may not be caused by bacteria and by the demands of patients who are unaware of the function and limitations of antibiotics.

Antibiotics are unusual drugs in that they treat communities as well as the individuals who take them. Bacteria, which cover our bodies in vast quantities (one hundred thousand billion on the skin and intestinal tract), move to other individuals and the environment readily, thus becoming resistant to antibiotics that travel to others as well. Antibiotic resistance that helps the bacteria, pathogenic or otherwise, to survive presents a major difficulty to the physician trying to treat a serious infection. The arsenal of antibiotics may be used up quickly, leaving the patient defenseless. The discovery and production of new antibiotics is limited, although manufacturers are constantly seeking different strategies to produce effective antibiotics. The major method at present remains to limit their use.

Providing a host of scenarios in which antibiotics have been used to kill harmful bacteria, followed by the emergence of antibiotic resistant bacteria, the author successfully shows why we all should use antibiotics very carefully or expect outbreaks of infectious diseases that cannot be eradicated easily, or perhaps at all. An epilogue on bioterrorism and anthrax puts the topic in graver perspective. This volume should be read and discussed by as many people as possible.

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EMERGING INFECTIONS 5. *Based on presentations given at the 2000 Interscience Conference on Antimicrobial Agents and Chemotherapy, Toronto, Canada.*

Edited by W Michael Scheld, William A Craig, and James M Hughes. Washington (DC): ASM Press. \$79.95 (paper). xv + 242 p + 11 pl; ill.; index. ISBN: 1-55581-216-3. 2001.

It is only been a generation since many of us believed that infectious disease had been beaten back and was no longer a primary threat to humanity. Tuberculosis had been tamed, polio too, smallpox completely extinguished, and other communicable maladies were on the run. *Emerging Infections 5* is a collection of papers from a meeting of the Interscience of the Infectious Diseases Society of America (ICAAC) that quietly and factually demolishes such illusions.

The old nasties like tuberculosis and malaria rearm and return as new nasties arise. The subjects of this book are defined as new, returning, or drug-resistant infections of increasing virulence (p 185). Among those discussed are West Nile virus infection, a staph that can sweep our hospitals, Q fever, ame-

biasis, and burrelia. AIDS, an industry all by itself, is omitted. The authors pay more attention to the actual microorganisms and to the symptoms they cause than to epidemiology, but respectful mention is made to such matters as the increased contact between suburbanites and white deer ticks, the dangers of infections contracted through hemodialysis, and the increase of maladies spread by the contaminated water in our growing Third World cities, among others.

The final two papers deal with bioterrorism. How very long ago the 10th of September seems, with its naïve conviction that bioterrorism was not a significant threat (p 215) and the remark that there has been no case of inhalational anthrax in the U.S. in over 20 years (p 225).

The two papers on bioterrorism are particularly valuable in that their authors wrote them before September 11th and cannot be accused of panic. They provide sage analyses and recommendations for what to do in preparation. They should be read carefully by all of us.

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CORPSE: NATURE, FORENSICS, AND THE STRUGGLE TO PINPOINT TIME OF DEATH.

By Jessica Snyder Sachs. Cambridge (Massachusetts): Perseus Publishing. \$25.00. xi + 270 p; index. ISBN: 0-7382-0336-X. 2001.

Not for the weak of stomach, this is the history of the forensic science of determining time of death. A corpse is an ecosystem whose residents and their excretions and secretions, juxtaposed against the time frame of development, serve as clocks. The book traces the beginnings of the field to the ancient Greeks and their descriptions of rigor mortis and algor mortis, to today's "body farm" in Tennessee, to tomorrow's analyses of vitreous humour and mitochondrial DNA as dating tools.

Forensic entomology, in particular, lends itself well to evoking disgust. Maggot lovers will thrill to the tale of a woman with a sinus headache accompanied by larvae wiggling from her nostrils. The author waxes eloquent on all manner of revolting details: "Looking inside, he saw, not the usual amorphous mass of coagulated brain tissue, but what he judged to be about a hundred plump, cooked maggots" (p 189).

The dating of death requires rather unconventional methods. The most common is pitching freshly killed pigs from car windows and then observing the comings and goings of various microbes and arthropods as the animals rot. The author details several variations on this theme, including dressing pigs in underwear to simulate

the human condition, and stuffing a human skull with hamburger and counting fly eggs at day's end. A graduate student recorded the types of pollen in his nose every day for a year, and a physiologist/botanist team chewed, spewed, and viewed under a microscope various salad components to write a guide for analyzing stomach contents.

The author captures the uncertainty and unpredictability of forensic science. One leader in the field admits that a corpse in a disturbed grave that he dated to a year earlier was actually a Civil War hero, in tiptop shape because metal leaching from his buttons slowed decay. Scientific errors in the book are few—describing chlorophyll as being alive, calling the bumps behind a fly's wings "halterers" rather than halteres, and some confusion over the plural of pupa. But overall, *Corpse* is a great read—just not while eating.

RICKI LEWIS, *Contributing Editor*, The Scientist

STEMLAB: AN ENVIRONMENT FOR LEARNING. Version 1.0.

By William K Purves. Sunderland (Massachusetts): The Mona Group. \$39.95 (CD-ROM). ISBN: 1-892852-14-4. 2000. [Requirements—MAC: PowerPC processor, MacOS 8.6 or later, 32MB RAM; Windows: Intel Pentium II/Celeron processor, Windows 98 or NT, 32MB RAM.]

THE PSYCHOPHARMACOLOGY OF HERBAL MEDICINE: PLANT DRUGS THAT ALTER MIND, BRAIN, AND BEHAVIOR.

By Marcello Spinella. Cambridge (Massachusetts): MIT Press. \$24.95 (paper). xi + 578 p; ill.; index. ISBN: 0-262-69265-1. 2001.

This volume is a welcome addition for those who are active researchers or educators, and for anyone who is interested in the mechanism of action of herbal products that alter mood and behavior in humans. This is a well-researched, well-written, and comprehensive collection of information on herbal products that affect the brain.

The first chapter is an introduction to the use of natural substances as drugs, and the legal classification of herbal, nonprescription, and prescription drugs. It clearly describes the types of evidence and documentation that are used to determine the action and effectiveness of drug therapy. Chapter 1 should be required reading for anyone (especially the public) who is about to embark on a plan of self-treatment.

Chapters 2 and 3 provide a review of basic neurology and pharmacology that is clearly written and will be easy to read by those who lack a good foundation in these concepts. The remainder of the

text, with the exception of the last chapter, describes herbal products based on their pharmacological actions: stimulants, cognitive enhancers, sedatives and anxiolytics, psychotherapeutics, analgesics and anesthetics, and hallucinogens. The final chapter is devoted entirely to the actions and use of cannabis.

Chapters 4 through 10 begin with a brief historical review on the use of each pharmacological category, followed by a discussion of the specific herbal plants within the category. A description of the plant, including a figure, its active constituents, and other major chemical compounds, is presented. The pharmacokinetics, mechanism of action, pharmacological effects, and adverse effects of each plant are discussed and thoroughly referenced. A brief summary is provided at the conclusion of the chapter.

The book is well organized and easy to read, containing tables and figures that are helpful and reflect the information presented in a concise manner. This would be an excellent volume for students taking a course on centrally acting herbal drugs.

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OUT OF ITS MIND. *Psychiatry in Crisis: A Call for Reform.*

By J Allan Hobson and Jonathan A Leonard. Cambridge (Massachusetts): Perseus Publishing. \$26.00. xii + 292 p; ill.; index. ISBN: 0-7382-0251-7. 2001.

This book is written from a particular angle. The authors are a Harvard professor of psychiatry and a Harvard graduate, and 97% of their cited sources and all but one of their named interviewees are from the U.S. Only three of the quotations heading each of their 13 chapters are from authors outside the U.S. The "crisis" of the book's title concerns U.S. psychiatry, especially as seen from Harvard and "Mass Mental" (as the authors repeatedly refer to the Massachusetts Mental Health Center). The wide world outside is rarely mentioned.

The book is separated into four parts: Psychiatry's Lost Mind; Finding the Mind's Brain; Psychiatry and the Brain; and Prescription for a New Psychiatry. All-too-familiar problems are highlighted: underfunded and fragmented mental health services, lack of community facilities for patients with severe mental illness, and psychiatry's unpopularity as a choice of medical specialty. Hobson and Leonard salute "the coming of strong and effective psychiatric medication" (p 4) and the "sunny prospects" (p 15) of "neurodynamics" (p 75)—a new

"psychology that will harness brain science knowledge to the task of advancing our understanding of the mind" (p 5). They call for a crusade to "blend our growing biomedical knowledge with sound therapy" (p 35).

The authors outline basic neuroanatomy and try to link what is known about brain structures with psychological processes. After a rather wide-eyed and bushy-tailed start, the book gets more cautious and modulated in its second half with some attention to the "embarrassment of interpretive riches" (p 191) and a caveat that "[w]hile serious efforts have been made to track schizophrenia through these neuromodulator/neurotransmitter thickets, most have had very limited success. Nor have we succeeded in tracking schizophrenia to its lair in some particular brain structure" (pp 191–192). The authors go on to note that "we lack general agreement on anything but a very muddy picture" (p 196). They provide interesting case histories to illustrate various kinds of psychiatric problems, and take an unpopular but necessary stand to defend electric shock therapy for some severely depressed people who are suicidal or psychotic (p 167).

The level of writing is that of popular journalism. The impact of its many felicitous phrases is diminished by its abundance of careless speculations. A contentious claim is cited that Charles Darwin probably suffered from an anxiety disorder (p 135). This may surprise readers of Darwin's *Voyage of the Beagle*, of his autobiography, and of his son's account of his life even more than might the unmentioned many other diagnoses which have been pinned over the years on the great man's malady. It is asserted that "suicide has become a leading cause of death in the United States" (p 24), but no data are given to demonstrate a recent rise in the suicide rate. The presence of panic in both a mother and daughter is taken to mean inheritance (p 147), when it might equally suggest the modeling of fear. If only it were true that "Parkinson's disease can be treated effectively by planting a small electrode . . . inside the thalamus to break up abnormal slow wave patterns" (p 177).

Few would question that we should strive to understand brain function and link it tightly with psychological processes wherever possible. As the authors indicate, however, tight links are still far too few. Moreover, as they do not note, we can give much effective psychiatric treatment with minimal knowledge of the brain. A good cook can prepare a delicious bouillabaisse without knowing any biochemistry at all, while a Nobel Prize laureate in biochemistry may be hopeless at making such soup. Furthermore, many mental health problems may be induced by environmental influences

including developmental and socioeconomic issues that we know little of as yet. Think of the association of high expressed emotion in the family with relapse of severe mental illness, a point the book passes over.

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CONCISE DICTIONARY OF BIOMEDICINE AND MOLECULAR BIOLOGY. *Second Edition.*

By *Pei-Show Juo*. Boca Raton (Florida): CRC Press. \$129.95. viii + 1154 p; ill.; no index. ISBN: 0-8493-0940-9. 2002.

BERIBERI, WHITE RICE, AND VITAMIN B: A DISEASE, A CAUSE, AND A CURE.

By *Kenneth J Carpenter*. Berkeley (California): University of California Press. \$40.00. xiv + 282 p; ill.; index. ISBN: 0-520-22053-6. 2000.

Anyone familiar with the history of tropical medicine knows just how prevalent, and how puzzling, beriberi was in the early 20th century. Characterized by weakness and numbness in the legs, and leading to swelling of the lower body, and even heart failure and death, beriberi seemed very much a disease of place. Although it was associated with certain locations, it could be introduced to new territories, affecting locals and sometimes even colonial officers. It was especially common in institutions and on ships. What, then, was its cause? What would explain its distribution? With the rise of bacteriology, most physicians favored a microbial explanation, but no specific germ was isolated. Could it be a toxin? Or, stranger still, some nutritional problem?

Carpenter, professor emeritus of nutrition at Berkeley, has written "a medical detective story" (p xi) that rivals any tale of microbe hunting. *The Vitamin Hunters* would not quite work as a title, of course, given the lack of vitality of vitamins, but does serve to indicate the narrative style. This is a lucid and engaging story of the scientific investigation of the cause of beriberi, and the subsequent isolation and synthesis of vitamin B₁, or thiamin. It thus provides us with a sequel to Carpenter's earlier work, *The History of Scurvy and Vitamin C* (1986. Cambridge: Cambridge University Press).

Historians of tropical medicine will be grateful to Carpenter for finally unravelling the complex story of Christiaan Eijkman's investigations of fowl polyneuritis, a convenient animal model for beriberi, stumbled on accidentally in Batavia (now Jakarta) in the 1890s. Although Eijkman was awarded the 1929

Nobel Prize for his "discovery" of vitamins, it seems that he wavered after initially suggesting that beriberi was a nutritional disorder, caused by a diet limited to milled white rice. The pull of bacteriology was just too strong at the turn of the century. Perhaps the nutritional deficiency merely prepared the soil for the still-unknown seed? It was not until the first meeting of the Far Eastern Association of Tropical Medicine, in Manila in 1910, that most colonial authorities agreed that beriberi was primarily a nutritional disorder, and it was not until the 1930s that R R Williams determined the chemical composition of thiamin and synthesized it. As Carpenter concludes: "Research that began as a project in colonial medicine, investigating a strange 'tropical' disease confined to particular places, has led to findings of much wider interest" (p 202).

Along the way, we learn about rice as a staple food; the principles of the chemical analysis of foodstuffs; the relationship of alcoholism and nutritional deficiency; and the means of estimating recommended daily allowances of vitamins and minerals. Most technical material, however, is clustered in appendixes on thiamin chemistry and biochemistry. Still, this is a book that will appeal principally to those with scientific training. The author has retraced the discovery story, mostly from published sources, and has little interest in the colonial context, or with social and political influences of any sort. Thus, medicine and colonialism in the Dutch East Indies still await their historian. That will be another story, and one can only hope that it will have the same narrative drive, clarity, and fascination as this account of the hunting of the vitamin.

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ADVANCES IN NUTRITIONAL RESEARCH. *Volume 10: Immunological Properties of Milk.*

Edited by Bill Woodward and Harold H Draper. New York: Kluwer Academic/Plenum Publishers. \$140.00. xxix + 410 p; ill.; index. ISBN: 0-306-46603-1. 2001.

ANNUAL REVIEW OF IMMUNOLOGY. *Volume 20: 2002.*

Edited by William E Paul, C Garrison Fathman, and Laurie H Glimcher. Palo Alto (California): Annual Reviews. \$72.00. xiv + 956 p + 25 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 1-20). ISBN: 0-8243-3020-8. 2002.

HUMAN PHYSIOLOGY: THE MECHANISMS OF BODY FUNCTION. *Eighth Edition.*

By Arthur Vander, James Sherman, and Dorothy Luciano. Boston (Massachusetts): McGraw-Hill. \$25.63. xxxii + 800 p; ill.; index. ISBN: 0-07-290801-7. 2001.

This is a highly readable volume that should appeal equally well to both students and teachers of biomedical sciences. Particularly attractive features include a clear, logical presentation, colorful and helpful illustrations, and a novel organization that incorporates classical physiology with physiology explained by the recent discoveries in cell biology and biochemistry.

The subject matter is discussed in three parts. The first part, Basic Cell Functions, provides a brief but helpful review of the chemical composition of the body, cell structure, protein activity and cellular metabolism, genetic information and protein synthesis, and movement of molecules across cell membranes. Part Two, Biological Control Systems, includes overviews of such topics as cellular communication, neurogenic and hormonal control mechanisms, and control of body movement and behavior. Chapters in Part Three, Coordinated Body Functions, deal with the organ systems, namely circulation, respiration, digestion, reproduction, and the regulation of water and inorganic ions (the kidneys), and organic metabolism, growth, and energy balance. A final chapter addresses immunologic defense mechanisms, environmental toxins, and stress. Each chapter is followed by a summary, a definition of key terms and applicable clinical terms, and a set of review and "thought" questions.

The book concludes with a useful glossary of terms mentioned throughout the text, and a subject index. A list of abbreviations is also provided on the inside of both covers. One criticism of this otherwise commendable book is the absence of key references for further reading. In addition, certain topics receive rather inadequate treatment. For example, neuropeptides are referred to in two places, but only in passing. Also, the discussion of inflammation fails to mention the important transcription factor NF-kappa B.

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ANNUAL REVIEW OF PHYSIOLOGY. *Volume 64: 2002.*

Edited by Joseph F Hoffman and Paul De Weer. Palo Alto (California): Annual Reviews. \$67.00. xiv + 969 p + 42 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 60-64). ISBN: 0-8243-0364-4. 2002.

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- Wiley, 605 Third Avenue, New York NY 10158-0012; 212-850-6000; 800-225-5945; www.wiley.com.
- Yale University Press, 302 Temple Street, New Haven CT 06511; 203-432-0960; 800-987-7323; www.yale.edu/yup.